

American Telecom, Inc Focus

Digital PBX & Hybrid Key Systems

■ PROFILE

Function • Focus—stored program computerized branch exchange (PBX) system for switching voice and data; Hybrid—electronic key system.

Applications Supported • PBX—commercial; financial; health-care; lodging; retail; office automation: facsimile, microcomputers, teleprinters, CRT terminals, dictation • Hybrid—small businesses with moderate growth.

System Parameters • switching technology: PBX—digital, time-division multiplexing (TDM) using delta modulation; Hybrid—analog space division • architecture: PBX—centralized processor tied to high-speed bus, data is nonblocking, voice is blocking; Hybrid—distributed control • common control: PBX—stored program; Hybrid—stored program • transmission: PBX—2-wire; Hybrid—2-wire • wiring plan: PBX—stations: 2-pair wire; Hybrid—stations: 2-pair wire • data switching capability: PBX—transmits voice and data simultaneously at 19.2K-bps asynchronous or 56K-bps synchronous; Hybrid 2400-bps maximum (using modems).

Traffic Capacity • PBX—6 CCS per line on 1,248 lines/188 trunks, multimodule system; 3 CCS per line on 1,984 lines/160 trunks, multimodule system; Hybrid—36 CCS per line for station-to-trunk calls, 9 CCS per line station-to-station calls • grade of service: P.01 • simultaneous conversations: PBX—475 maximum • nonblocking architecture: PBX—data-yes, voice-no.

Trunks/Stations/Consoles • PBX—1 cabinet: 12 to 40 trunks, 72 to 208 stations, 4 consoles; 2 cabinets: 40 to 80 trunks, 416 stations, 4 consoles; multimodule (up to 10 cabinets): 160 trunks, 1,984 stations, 4 consoles; Hybrid—24 to 32 trunks, 6 to 110 stations, 8 direct station select (DSS) consoles • trunks supported: CO, DID, FX, OCC, TIE trunks, WATS • see table 1 for configuration limits of PBX.

Voice Equipment • vendor supplied: analog and digital telephones • nonvendor equipment supported: all rotary (500-type) and Touch-Tone (2500-type) telephones • electronic feature telephones: American Telecom ET I and II, Focus Autocom, Focusphone, attendant console, direct station select console, proprietary 5-, 10-, and 15-button sets.

Data Equipment • vendor supplied: PBX—data switching software, data line cards, data interface units, Focus Applications Processor, Fujitsu MICRO 16 personal computer, Focus FAX 10 Group 3 digital facsimile transceiver • nonvendor equipment supported: PBX—terminals that support IBM Personal Computer, ASCII, IBM 3270, BSC, VT-100 • data rates: PBX—19.2K-bps



asynchronous or 56K-bps synchronous; T1 compatibility (scheduled for availability the end of 1984); 1.54M bps; half- and full-duplex supported • modems: PBX—all types • modem pooling: PBX—all types • multiplexers: PBX—all types • protocol converters: PBX—IBM 3270, X.25 • data modules: PBX—data terminal interface (DTI) for standard phones • interfaces supported: PBX—RS-232C, IBM 3270 via cluster controller emulation • printers: service printers • data storage: PBX—magnetic tape unit; Hybrid—Read Only Memory (ROM) • data terminals: PBX—IBM 3270, ASCII, VT-100, TTY • computers: PBX—minicomputers, personal computers, microcomputers.

Subsystem Support • automatic call distributors: PBX • call detail recording systems: PBX and Hybrid—Station Message Detail Recording (SMDR) • message center systems: PBX • hotel/detail management systems: PBX—numerous applications available.

Communications/Networking • abbreviated dialing: PBX and Hybrid • off-network dialing • on-network dialing • dialed digit translation • route optimization • tandem switching • transmission rates: PBX—19.2K-bps asynchronous or 56K-bps synchronous • protocols: PBX—X.25, ASCII, T1 • gateways: PBX—X.25, SNA/SDLC • local area network: PBX—AT&T, ISN, Ethernet.

First Delivery • PBX—1976; Hybrid—July 1983.

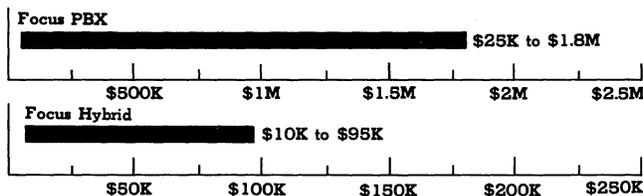
Systems Installed • PBX—over 4,000; Hybrid—over 500.

Installation Interval • PBX—12 to 16 weeks ARO; Hybrid—8 to 12 weeks ARO.

Comparable Systems • PBX—AT&T Dimension, System 75, System 85; Ericsson Prodigy and MD 110; Executone Eclipse; GTE Omni; Harris/Digital D1200; Hitachi DX; IPC Technologies DPX; ITT 3100; Mitel SX-100/200/2000; NEC NEAX 12A and 2400; Northern Telecom SL-1; Siemens Saturn II and III; Solid State Systems CEO and D-TEL; TIE/Communications Data Star • Hybrid—AT&T Horizon, Merlin; Executone Gateway; Goldstar Alphakey 616; GTE Electronic Key 3/8, 5/16, 8/20; Inter-Tel MPK I and II; Inter-Tel SPK; ITT 3100, Iwatsu Omega III; NEC Electra; Northern Telecom Vantage 12; Pentacom Key bx, San/Bar Vision 2000; TIE/Communications 100 HT and 300 HT; Toshiba Strata III; Wren W504/W508.

PURCHASE PRICE RANGE

hardware & software



AMERICAN TELECOM FOCUS PURCHASE PRICING bar graphs cover price range between "small" and "large" configurations; installation and first year's maintenance included • Focus PBX small configuration consists of 30 stations/8 trunks, single console; large configuration consists of 1,560 stations/140 trunks, 3 consoles, 20 percent data • Focus Hybrid small configuration consists of 15 stations/6 trunks, single DSS unit; large configuration consists of 90 stations/16 trunks, single DSS unit.

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Table 1. Focus PBX System Line and Trunk Capacities

TRUNKS	70-LINE SYSTEM	140-LINE SYSTEM	210-LINE SYSTEM	420-LINE SYSTEM	MULTIMODULE SYSTEMS	
					6CCS/L	3CCS/L
0	96	192	288	576		
8	80	176	272	560		
16	64	160	256	544		
24	48	144	240	528		
32	32	128	224	512		
40	16	112	208	496		
48	0	96	192	480		
56	—	72*	168*	464		
64	—	—	—	448	1248 Lines/	1984 Lines/
72	—	—	—	432	188 Trunks	160 Trunks
80	—	—	—	416	Max.	Max.
88	—	—	—	400	(8 Cabinets)	(10 Cabinets)
96	—	—	—	384		
104	—	—	—	360*		
112	—	—	—	336**		
120	—	—	—	—		
128	—	—	—	—		
136	—	—	—	—		
144	—	—	—	—		
152	—	—	—	—		
160	—	—	—	—		
168	—	—	—	—		
176	—	—	—	—		
184	—	—	—	—		
188	—	—	—	—		

* These configurations require one vacant card slot.

** These configurations require two vacant card slots.

NOTE: Configurations are based on pushbutton dialing and non-uniform traffic distribution. Capacities can change based on traffic, added features and end user requirements.

Environmental Specifications • temperature: PBX and Hybrid—40 degrees to 86 degrees Fahrenheit (normal), 32 degrees to 104 degrees Fahrenheit (maximum) • humidity: PBX and Hybrid—30 to 60 percent (normal), 20 to 80 percent (maximum) • power: PBX—115 VAC (+ 10% to 15%) at 60 Hz; Hybrid 127 VAC (+ 10% to 15%) at 60 Hz • dimensions: PBX lower assembly—24.13 x 28 x 31.37 (W x D x H); complete assembly—24.13 x 28 x 57.5 (W x D x H); Hybrid model 50—20.5 x 9.8 x 35.4 (W x D x H); model 100—20.5 x 9.8 x 49.2 (W x D x H); additional 17.7 inches high if extension cabinet is added to Hybrid models • weight: PBX (complete) 453 pounds; Hybrid (model 50)—37 pounds (unloaded cabinet with power supply) • floor loading: PBX—100 pounds per square foot; Hybrid—50 pounds per square foot • minimum equipment room dimensions: PBX—1 cabinet: 4.0 x 8.3 x 8.0 feet (W x D x H), 2 cabinets: 7.5 x 8.3 x 8.0 feet (W x D x H); Hybrid—4.0 x 4.0 x 8.0 (W x D x H) • FCC Registration: PBX—BJ885Z-67779-PF-E, Ringer Equivalence 2.0B; Hybrid—B258QM-70559-KF-E, Ringer Equivalence 1.2A.

Vendor • American Telecom Inc; 3190 Mira Loma Avenue, Anaheim, CA 92806 • 714-630-7721.

Distribution • PBX—Centel, Continental Telephone Service Corporation, General Dynamics Communications Company, GTE, North Supply Company, Telecom Plus International, United Telecommunications • Hybrid—American Telecom approved dealers, BellSouth Products, Pac-Tel Communications Systems, Regional Bell Operating Companies, Southwestern Bell Telecom.

Service/Support/Training • service, support, and training are provided by American Telecom or distributor • installation by American Telecom or dealer • warranty 1-year parts and labor; maintenance contracts available • local and remote maintenance.

■ ANALYSIS

At the 1984 International Communications Association (ICA) National Conference, held in Las Vegas, American Telecom introduced high-speed, nonblocking, data switching as a field upgrade to the Focus PBX system. American Telecom has developed the ability to transform a more or less "typical" digital

PBX into a system with powerful data switching capabilities without removing the present system, rewiring, or requiring extensive equipment to convert the system. The upgrade is accomplished simply by replacing existing circuit cards one for one with specialized circuit cards. This has ensured that the 4,000 systems already installed throughout North America will not become obsolete.

A cornerstone of American Telecom's Focus PBX design is compatibility throughout the line. A small 20-station PBX can migrate to a larger PBX with only minor disruptions to service at each upgrade point. Expansion is done in 8-line increments at any time.

The Focus PBX is a microprocessor-based, stored program controlled digital telephone system using time-division multiplexing (TDM) and delta modulation. It is a modular system that offers a full range of feature packages to accommodate most typical configurations. The PBX without any feature package enhancements offers over 150 standard telephone service features. Smaller companies with 72, 144, or 208 stations with a maximum of 40 trunks can enhance their systems with important features like automatic route selection (ARS), station message detail recording (SMDR), call distribution with recorded announcement, and message center options. Larger companies requiring from 416 stations and 80 trunks, up to 1,984 stations and 160 trunks also can be supported.

The versatility of the system is further enhanced with the introduction of the Computer-to-PBX Interface (CPI) allowing compatibility for data switching. It offers users the flexibility required to build a computer-communication network implementing advanced office automation concepts such as electronic message centers, electronic mail, and advanced calling services at lower costs. The system will utilize the Data Interface Unit (DIU) to support the CPI standard from the terminal rather than from the PBX alone. One CPI card will handle 24 equivalent 64K-bps terminal ports (see Figure 1).

Focus modules are physically smaller than most comparable units. They can be arranged in 3 configurations: local, extended, and

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remote. The local configuration puts all equipment in one room. The extended module allows for up to 2,000 feet of cable separating secondary switching modules from the primary switching module. This allows the user to utilize the space already available without having to design a special electrical room to house the equipment. The remote configuration ties 2 or more modules located in separate buildings using microwave or any other long-distance networking system (see Figure 2).

Each module contains an independent shared-function processor. Calls can be answered centrally and transferred without going outside the system. The failure of any module within a multimodule configuration, since each is a completely functional unit, will not cause a total system failure.

Other peripherals introduced by American Telecom, which are compatible with the Focus PBX, are the Fujitsu Mobile Telephone (FMT), the Focus Applications Processor, a teleprinter, and a desktop facsimile called the Focus FAX 10.

The Focus Applications Processor offers electronic message desk and advanced office system features. The processor utilizes Fujitsu's MICRO 16 personal computer to carry out advanced office services. A message desk can be set up for all internal calls to be directed.

Printers compatible with Focus can be connected either on-site or at a remote location. The teleprinter can be used to produce a printout of the status of the system alarms as well as for entering Maintenance and Administrative commands without disrupting call processing.

The Focus FAX 10 desktop facsimile is lightweight and is categorized as a Group 3 digital facsimile transceiver. Its features include international compatibility, downward compatibility to slower units, and easy to use operation. It transmits and receives A4-size documents over public telephone networks at speeds up to 4800 bps.

Fujitsu, like other Japanese manufacturers (NEC, Toshiba) who are supplying telecommunication systems in the United States market, has developed a low cost, dependable PBX system with state-of-the-art features. Its market share was predominately business and hotel/lodging, but it is now competing aggressively in the healthcare, retail, and commercial markets with much success. American Telecom, a subsidiary of Fujitsu, is letting its presence be known throughout the industry and will continue to grow from the strong foundation it already has established in the market.

The Focus Hybrid is an electronic key telephone system designed for smaller companies (6 to 110 stations). It provides a full array of PBX-type features. ARS, for example, is a standard feature with

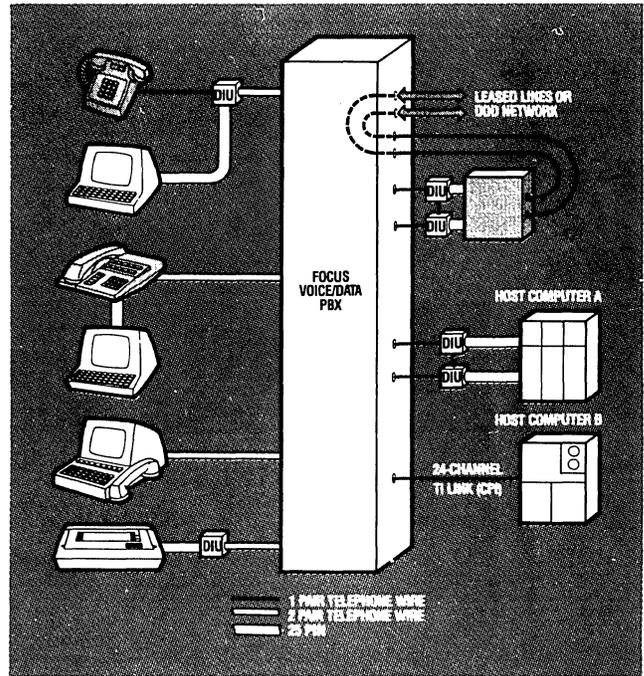


Figure 1 • Focus Data Support

the Hybrid. Since it is a key system, its trunk rates are less than PBX trunks. The system has virtually all the major features associated with a PBX—call forwarding, camp-on, central answering console, hunting groups, speed dialing, etc.

The system can operate with or without a central console. Hybrid systems are microprocessor-based and stored program controlled, employing a space division switching network and distributed control. Space division switching is implemented through a solid state speech path matrix, which is expandable in modular increments.

American Telecom, formed in 1976, is a major supplier of business communications equipment including the Focus digital PBX and Focus Hybrid telephone systems. The company is the business communications subsidiary of Fujitsu Limited, Japan and serves capacities of 10 to 2,000 lines throughout North America. Corporate and manufacturing facilities are based in Anaheim, California.

Strengths

American Telecom scored a significant coup in the PBX industry with the May 1984 announcement of high-performance digital switching and CPI compatibility on a field upgrade basis. This development preserves the existing 4,000-plus base of Focus systems and should help establish American Telecom as a major competitor in the hotly contested voice/data PBX marketplace. Support for Computer-to-PBX Interface (CPI) is another important plus, since there appears to be a growing migration to this proposed communications standard on the part of several other major PBX and computer manufacturers.

As the subsidiary of a very large Japanese electronics manufacturer, Fujitsu, American Telecom can also draw upon the vast technical, manufacturing, and R&D capabilities of its parent. Fujitsu is building a major presence here in the U.S., along with several other major Japanese competitors (NEC, Toshiba, etc), and will continue to aggressively market its PBX products through American Telecom.

Focus PBX and Hybrid systems have a full matrix of features, which should satisfy most users. The new digital switching features

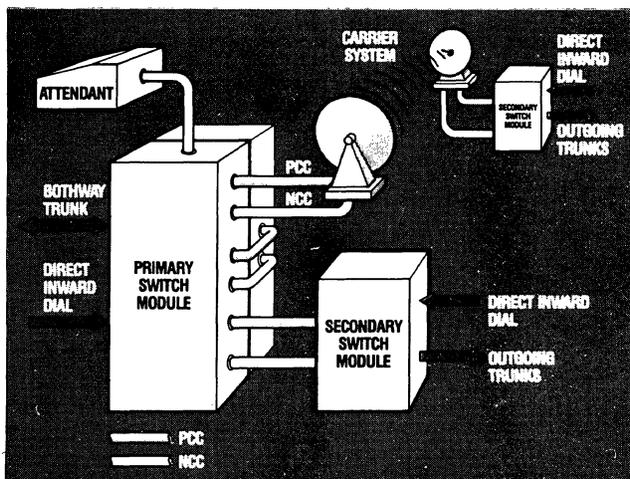


Figure 2 • Focus Remote Module

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should make the systems even more attractive, particularly since ATI pricing is very competitive with most other established digital PBX products. A basic system can be upgraded and expanded to the largest model, retaining the original cabinetry while replacing only specific circuit boards.

□ Limitations

Even with over 4,000 installations in the U.S., American Telecom is not a household word, compared to names like Rolm, Northern Telecom, and, of course, AT&T. The company established itself with smaller systems, particularly in the under-300-line range. Larger line sizes, particularly from 1,000 to 1,500 lines, are an increasingly important area to penetrate, and the company and its distributors will have some formidable competition.

The systems have blocking, which is no problem for most users. For data users, however, until the announcement of data switching enhancements there was really no data support other than using modems. The company's announced capability to provide nonblocking data communications puts it in a much more favorable position to compete in the marketplace as it currently exists.

The company needs a digital telephone instrument that can connect a computer terminal, similar to the raft of new products announced by the other major PBX manufacturers. Its existing line of feature telephones is OK, even with the display option in conjunction with a message center feature, but not particularly glamorous.

The current attendant console for the PBX, although highly functional and relatively easy to use, looks very much like the AT&T Dimension PBX console and has an overall dated look. Newer attendant positions are based on a CRT and associated keyboard, with the display highlighting all attendant activities as well as providing a more efficient interface with the system.

The Focus PBX has been around for over 8 years with few major enhancements or upgrades developed over the years. Perhaps the announcements at the 1984 ICA conference signal the coming of a newer and more powerful Focus product that will begin to emerge during 1985. Now is a good time to make the changes.

■ SOFTWARE

□ Terms & Support

Terms • all software is bundled into the PBX system price with the exception of optional features.

Support • PBX system software is supported by American Telecom and its associated dealers and distributors • field-developed software is supported by the individual dealer or distributor that authors the program.

□ Software Overview

Feature Packages are added to the PBX's basic set of features to enhance the system. All the Focus PBX Feature Packages have Service Order Administration (SOA) making all systems field programmable. PBX software is used to control operations, conduct self-test functions, and provide features. All features are software driven and targeted at 3 areas: (1) System Features, (2) Attendant's Features, and (3) Station Features. System software consists of the Operating System, Self-Test, and Configuration Tables.

The operating system defines major parameters and functions. The distribution of calls and methods of route selection and optimization is also controlled by the operating system.

The self-test provides online testing of the PBX system performance. Major and minor alarms are activated according to the fault found within the system. An LED is activated on the main console to notify the attendant when there is something wrong.

The configuration tables contain information that determines the station characteristics as well as control assignments. Each configuration is unique according to how the user wants the system to be set up. Hybrid system program software is supplied on Read Only Memory (ROM) as part of the system.

□ Features Overview

All features are a function of various software packages • PBX—Feature Package G is the most advanced and supports all features of Feature Packages A through F plus additional capabilities • Feature Packages E, F, and G can support multimodule systems • all standard features are bundled into the system price • optional features are extra-cost items • Hybrid—implementation of the Hybrid features is determined by the customer database which is stored on a memory card equipped with Random Access Memory (RAM).

□ PBX System Features

General System Features

Standard Features • automatic restore from power failure: system reloads contents of magnetic tape unit and resets relay logic on all type A cards • automatic station release: releases station from system • auxiliary equipment access: connect various devices such as tape and disk drives • equipment rotation: utilizes equipment in multimodule configurations to insure all equipment is functioning • flexible night answer: allows all stations to answer incoming calls after hours • flexible station numbering plan: stations can be numbered to correspond with specific requirements (e.g., hotel rooms) • intercom blocking: prevents station-to-station calls • maintenance and administration facilities: means for entering customer database information as well as service commands • multiple consoles: up to 4 consoles per system • multiple trunk groups: supports CO, TIE, WATS, etc • multiple dialing plans: access codes to activate various lines, both incoming and outgoing • music-on-hold/camp-on: access to customer-provided music source when call is on hold or camped-on • off-premise extensions: stations located remote to PBX • paging: access to customer-provided paging system via attendant and/or users • power failure transfer: predesignated trunks and extensions automatically connected during power failure • reserve power: power source activated when commercial supply falters • tone to dial pulse conversion: converts tone dialing to analog pulse train signal as needed by the telco central office or distant switching system.

Automatic Route Selection Option • channels outgoing calls over the most cost-efficient trunk:

_____ NA prch

Direct Inward Dialing Option • designated group of trunks that can complete incoming calls directly to stations without attendant assistance:

_____ NA

Direct Inward System Access Option • provides direct access into PBX via designated trunk; user dials authorization code to access system features:

_____ NA

Redundant Processing Option • system can be equipped with redundant processing so that if control equipment in first cabinet fails, control is transferred to second cabinet:

_____ NA

Restriction Features

Standard Features • area/office code restriction: 3- and 6-digit screening • class of service: programmed codes that determine station's access to specific features and facilities • data security: prevents unauthorized entry into data lines • inward restriction: DID calls blocked from completion to station; routed to alternate point • manual originating line service: attendant intervention required for all calls • outgoing restriction: station restricted from going outside PBX system • station restriction: prohibited from making outgoing and incoming calls • toll restriction 0/1: outside calling requiring 0 or 1 prefix denied.

Controlled Outgoing Restriction Option • permits attendant control of outgoing call for restricted stations:

_____ NA prch

PRCH: purchase price. NA: not available; price not disclosed by vendor. Prices effective as of December 1984.

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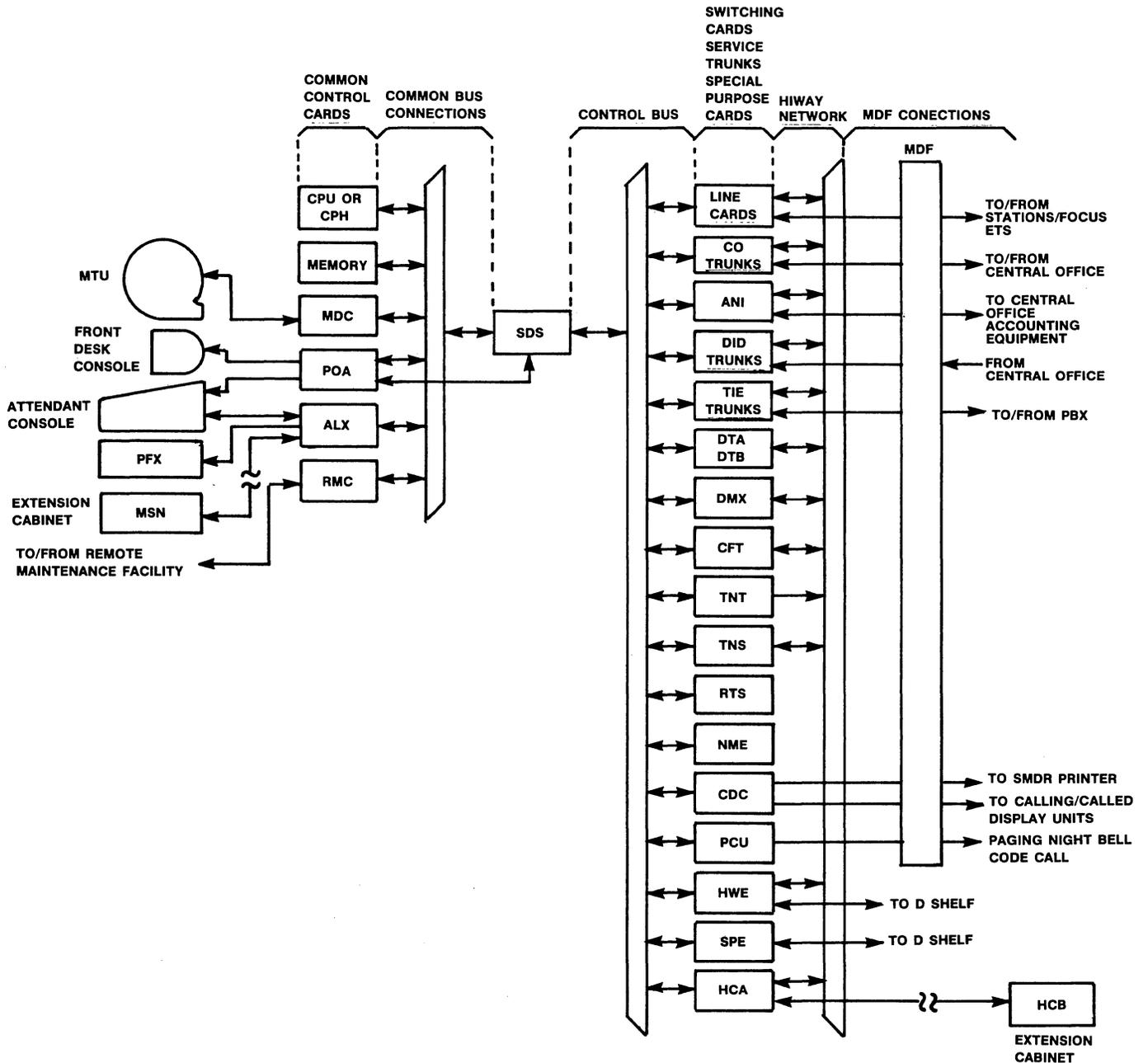


Figure 3 • Focus PBX Functional Block Diagram

Do-Not-Disturb Option • prevents break in to an established call from either the main console or another station: NA

Forced Account Code Option • access code that must be dialed first before call will be completed: NA

Call Routing Features

Standard Features • attendant console of trunk group access: controls station access to outside trunks.

ACD (Automatic Call Distribution) Option • calls are distributed

among a group of stations on a first-in, first-out basis: NA prch

ARS (Automatic Route Selection) Option • channels calls over the most cost-efficient trunk: NA

Call Accounting Features

Standard Features • feature usage statistics: stores system usage data into PBX memory.

Forced Account Code Option • requires an access code to be entered into the system before a call will be completed: NA prch

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SMDR (Station Message Detail Recording) Option • records and prints a copy of who made the call, what trunk was used to make the call, when the call was made, where the call was placed, and how long the call lasted:

NA

Resale of Services Option • processed data captured by SMDR into management reports, provides detailed call pricing:

NA

Data Features • data security: prevents other stations or attendant from interfering with data call in progress • through data switching: ability to use outside resources such as data bureaus, mainframes at other locations, and global communications networks, all through the system's modem pooling capabilities • supports time sharing • data port hunting with queuing • data speed: 19.2K-bps asynchronous or 56K-bps synchronous; half- and full-duplex supported.

Data Interface Unit Option • connects data terminal interface to PBX:

NA

Network Features

ARS Option • provides automatic dialing of all network calls; uses 3-digit code for off-premise locations:

NA prch

Satellite Operation Option • permits multiple locations in regional area to develop uniform numbering plan; includes automatic dialing, attendant consolidation, trunk consolidation:

NA

Centralized Attendant Service (CAS) Option • groups attendants for multiple PBX locations into central location; incoming calls to secondary switching modules routed to primary switching console for answering, then returned to desired station at off-premise location:

NA

Attendant Console Features

Standard Features • automatic recall: places call to busy extension after operator release • busy lamp field: verifies off-hook condition on internal extensions • camp-on: wait until off-hook condition ends; place call when station is idle • class of service display: reports features and restrictions of each station in relationship to the system program • control of trunk group access: permits or denies station user access to trunk group • conference call: connects up to 6 calls • digital clock • incoming call identification: allows attendant to process calls; identifies source of an incoming or recalled call • direct paging access: attendant connected to paging system when PAGE button depressed and lights • emergency trunk override: permits access to busy trunk or station • hold: incoming call is placed on hold until internal party is available • intercept: automatically forwards calls to attendant if the station is vacant, out of service, or in use • lockout: prevents attendant or another station from reentering a line • numerical call waiting display: displays calls waiting in order of first-in sequence • serial call: initiates a series of calls for the same calling party • station number display: visual aid for attendant to determine busy and available stations • switched-loop operation: all calls are handled over one of 6 loops • system alarm: indicates the existence of a major or minor malfunction • tone silence: silence ringing at attendant's console due to arrival of incoming or recalled calls • trunk busy-out by attendant: attendant can busy-out a trunk making it unavailable to the system • trunk location display: notifies attendant which trunk an incoming or outgoing call is using • trunk-to-trunk connection • 2-way splitting: alternates between calling and called party on a selected loop • verify break in: attendant can cut into a trunk to determine status.

Station Features

Standard Features • add-on conference: permits an internal extension to add one inside or outside call to an existing conversation • call forwarding all calls: sends a station's calls to a preprogrammed location • call forwarding busy/don't answer:

sends call to another extension when station is busy or doesn't answer • call hold: places call on hold • call park: places call on hold within PBX for retrieval at another station • call pickup: stations can answer another station's phone by dialing an access code • call pickup in multigroups: groups of stations are assigned • pickup group number to answer all phones in assigned group • call waiting transfer: station on a call can answer second call after being alerted to the incoming call by a special tone; station can transfer a call to another station • direct outward dialing: station can access outside trunk without attendant assistance • distinctive ringing: incoming calls to stations are distinguished by ringing cycle • individual transfer all calls: station can transfer all incoming and outgoing calls to another station • outgoing trunk camp-on: station remains online until desired trunk is available • recall dial tone: special dial tone that acts as confirmation of a feature selection • station speed calling: extensions can be programmed to dial frequently called numbers • trunk select: stations can access specific trunk lines.

Hybrid System Features

General System Features

Standard Features • Hybrid includes many features available in PBX, including ARS, SMDR, access to CO, FX, tie, WATS lines, flexible numbering, line lockout, music-on-hold, self-diagnosis, universal night answer • optional features similar to PBX.

Restriction Features

Standard Features • all features as PBX except data security • optional features same as PBX.

Call Routing Features

Standard Features • Automatic Route Selection.

Call Accounting

Standard Features • same as PBX • optional features same as PBX.

HARDWARE

Terms & Support

Terms • the Focus PBX and Hybrid may be purchased on a 1-, 2-, 3-, or 5-year lease • the installation and maintenance agreements may be discussed with the distributor at the time of purchase.

Support • service and maintenance agreements are based on the policies established by the dealers at the time of purchase • equipment may be installed by American Telecom or its dealers.

Hardware Overview

The Focus line includes 2 specific telephone systems designed for stored program activities. The PBX uses digital switching, with time-division multiplexing (TDM). The Hybrid uses a space-division transmission network and can operate as a key system. The basic philosophy of the PBX and Hybrid is a commonality of components and software throughout each system. The PBX can expand to 1,984 stations and the Hybrid can accommodate 110 stations at its maximum.

Standard rotary dial or dual-tone multifrequency (DTMF) stations are available in each system. The ET I and II, Focusphone, and Autocom electronic feature phones have advanced capabilities and are designed for use with the PBX system. Proprietary 5-, 10-, and 15-button sets are for use with the Hybrid. An adjunct unit connects to a Hybrid station that can function as a Direct Station Selection console.

Features available for the Focus PBX are determined by the system program, which is supplied on a magnetic tape. Implementation of the features is determined by the customer database, which is added to the tape. Customer database information is derived from entries made on Customer System Specifications (CSS) forms. The contents of the tape are loaded into the system memory to initiate call processing.

Random Access Memory (RAM) is used to store the operating

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program. Initial Program Load (IPL) occurs when the program is loaded from the system magnetic tape. No call processing is possible during IPL. After IPL, the tape serves as a backup in the event the solid state memory must be reloaded.

Common Control Cards within the system include the Central Processor Unit (CPU) or High-Speed Central Processor (CPH), Memory Speech Path Distributor (SDS), Alarm (ALX), Maintenance Scan (MSN), Magnetic Tape Drive Controller (MDC), and Remote Maintenance Controller (RMC). Mandatory in any system are the Speech Path Distributor, Alarm, and Magnetic Tape Drive Controller. Other cards provide specialized interfacing and control functions.

The Central Processor Unit card contains the circuitry which, under direction of the system program, provides centralized control of the entire system. The circuitry consists of an 8-bit parallel microprocessor, an interrupt control circuit, a direct memory access (DMA) port for use by the Magnetic Tape Drive Controller, an automatic power failure and program restart circuit, and a Programmable Read Only Memory (PROM), which contains the IPL subroutines.

The memory card provides the system with solid state RAM memory. Memory is available in capacities of 96K, 128K, 256K, 384K, and 512K bytes. The Speech Path Distributor (SDS) provides the system with a control interface for distributing signaling commands to various lines and trunks. The Alarm (ALX) card monitors system operation and detects failures. The ALX generates alarms to the attendant console and the Power Fail Transfer (PFX) card. A minor failure is considered when 7 stations or less are affected, or a failure of 4 trunks per 100 lines. A minor failure does not affect call processing. A major failure is considered when 32 stations or 8 trunks per 100 lines go down. A major alarm affects call processing. Light Emitting Diodes (LED) on the ALX card indicate major or minor alarms. Maintenance Scan (MSN) monitors the network for faults which, when located, activate the alarm. Magnetic Tape Drive Controller controls the transfer of data to and from the Magnetic Tape Unit (MTU), and system memory using Direct Memory Access. It is not used during call processing. Voice sampling is carried out at 800K bps. Data switching is provided at 200K bps. There are 32 internal digital highways which operate at 12.8M bps. Remote Maintenance Controller allows for commands to be input into the system once the system has been activated. Line cards within the system handle the interface of station sets to the system. Trunk cards interface between the Focus PBX and the telco central office.

The Focus PBX requires standard 97 to 127 VAC electric service; this is converted to a -52 VDC source from which all other voltages required by the system are derived. The system is equipped with a reserve power supply in case the main power supply is disabled. Power failure transfer, in which predesignated stations and trunks are automatically connected, occurs in response to conditions such as fuse blown, timer overflow, system clock failure, ringing generator fault, or power failure.

In extended configurations or multimodule systems, a Maintenance Scan card and Position Jumper card are installed in the extension cabinet such that alarm signals and additional attendant consoles can be distributed throughout the system.

Switching is carried out by time-division multiplexing of digital speech data. Each TDM highway allows up to 16 simultaneous voice transmissions. Timing of the system is ensured with 2 clocks generated by the Speech Path Distributor. A 12.8-MHz clock is used to increment a 16-bit time slot counter in each highway control card. An 800-KHz clock is used to reset the time slot counters after every 16 clocks (time slots).

The main controller in the Hybrid system is an 8-bit microprocessor located on the Common Control card and operated under the system program, which is permanently stored in a Read Only Memory (ROM) located on Memory Card C. Each local processor is a 4-bit microcomputer, which is controlled by ROM. The main and local processors exchange data via a buffer memory located on Memory Card C. Overall system organization is shown in Figure 4.

The HSPX (Speech Path Matrix) provides an interface between 16 line circuits and Intercom/Tone lines and/or CO trunk circuits.

The Intercom/Tone lines serve 2 purposes: (1) during call setup these lines carry call progress tones from the HIOT card (Intercom/Tone Trunk); (2) once the call is established, the Intercom/Tone lines form part of the speech path for station-to-station calls. The card, depending on its slot position in the cabinet, serves either 4 Intercom/Tone lines and 4 C.O. trunk circuits or 8 trunk circuits.

Each Speech Path Matrix card (HSPX) contains an array of 16 solid state analog multiplexer circuits. Except for the first line card installed in the system, which contains 6 line circuits, all other line cards contain 8 line circuits. The Intercom/Tone lines and the C.O. trunk circuits are connected as inputs to HSPX circuits.

Circuit Cards are designated as Common Control Elements, Speech Handling, or Special Purpose cards. Common Control Elements are mandatory in all systems. They include Common Control Cards, Memory Cards A, B, and C, as well as the Speech Path Matrix and Intercom/Tone Trunk.

Common Control (HCCC) cards contain the 8-bit parallel microprocessor, which acts as the main processor for the system. The logic for transmitting and receiving common control bus signals originates from this card. The card also contains a connector for the Maintenance Panel cable, which permits customer database information to be loaded into the system and status information to be read out from the system.

Memory Card A provides static Random Access Memory. Light Emitting Diode (LED) indicators and a set of switches for use in the maintenance operations are housed in the A card. Memory Card B contains low-power CMOS RAM, used to store the customer database. A set of on-board NiCad batteries will retain the contents of RAM for at least 1 month in the event of a power failure. Memory Card C contains the system control program, which is implemented in ROM, and a static RAM buffer to store ongoing call status information.

□ Representative System Configurations

PBX Configuration • 1 to 10 cabinets • redundant system • single cabinet range from 40 stations/12 trunks to 208 stations/40 trunks; 2-cabinet system maximum 416 stations/80 trunks; multimodule system maximum 1,984 stations/160 trunks • up to 4 attendant consoles • memory ranges from 96K to 128K bytes single cabinet, 128K to 512K bytes for 2-cabinet, 256K to 512K bytes for multimodule systems • field upgrade from single-cabinet to multimodule system.

Small System • 96K-byte memory; 36 stations/8 trunks; 1 console:

\$28,600 to \$33,200 approx prch

Medium System • 128K-byte memory; 185 stations/16 trunks; 1 console:

130,650 to 151,760

Large System • 256K-byte memory; 580 stations/85 trunks; 2 consoles; 10 percent data; 30 percent electronic feature telephones:

432,300 to 505,000

Hybrid Configuration • single cabinet • nonredundant system • Focus 20 up to 22 stations/8 trunks; Focus 50 up to 62 stations/24 trunks; Focus 100 up to 110 stations/32 trunks • up to 4 60-line DSS consoles or 8 30-button DSS consoles • field upgrade from Focus 20 to 50 to 100.

Small System • 25 stations/6 trunks; 1 DSS console:

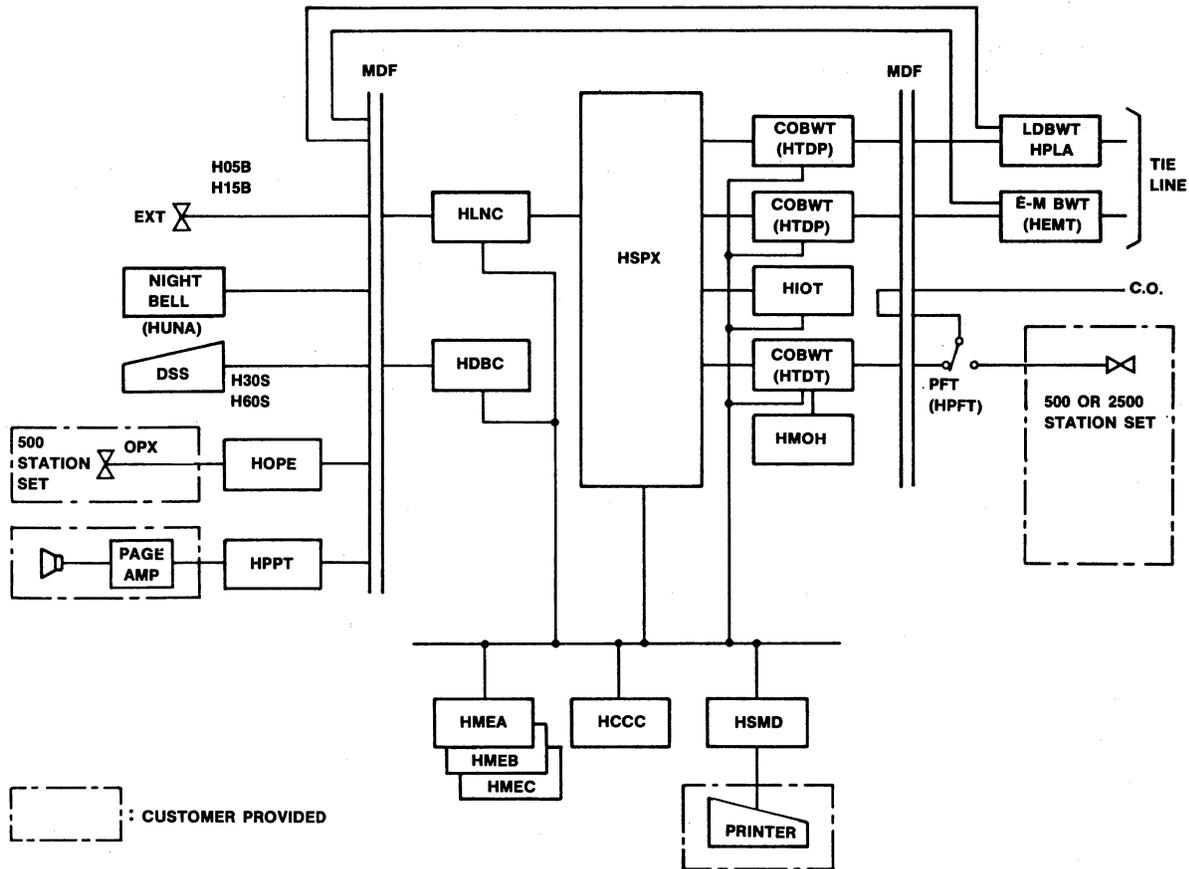
17,200 to 20,300

Large System • 65 stations/15 trunks; 2 DSS consoles:

44,500 to 52,400

APPROX PRCH: purchase price; price ranges are approximate and include installation. NA: not available. Prices effective as of December 1984.

American Telecom, Inc Focus Digital PBX & Hybrid Key Systems



Legend

HCCC	Common Control Card	HPPT	Paging Trunk Card
HMEA	Memory Card A	HUNA	Universal Night Answer Unit
HMEB	Memory Card B	HPFT	Power Fail Transfer Card
HMEC	Memory Card C	HRMC	Remote Maintenance Controller Card
HSPX	Speech Path Matrix Card	HRMI	Remote Maintenance Adapter Unit
HIOT	Intercept/Tone Trunk Card		
HLN6	Line Circuit Card (6 Circuits)	HRA	Loop Dial Tie Trunk Card
HLNC	Line Circuit Card (8 Circuits)	HEMT	E&M Tie Trunk Card
HTDP	C.O. BWT Circuit Card - Dial Pulse (4 Circuits)	HOPE	Off-Premise Extension Line Card
HTDT	C.O. BWT Circuit Card - DTMF (4 Circuits)		
HMOH	Music On Hold Circuit Card	H05B	5-Button Basic Telephone
HDBC	DSS Control Circuit Card	H10B	10-Button Telephone
HSMC	SMDR Controller Card	H15B	15-Button Telephone
		H30S	30-Button DSS with Busy Lamp Field
		H60S	60-Button DSS with Busy Lamp Field

Figure 4 • Focus Hybrid Block Diagram

Station Equipment Voice/Data

Attendant Console • primary function to service incoming calls and connect to desired internal station • places outgoing calls • provides status information on calls in progress • interface to PBX for administrative operations • desktop unit • available with Direct Station Selection (DSS) buttons • switched-loop operation:
\$2,950 to \$3,300 approx prch

Hybrid Direct Station Selection Module • attaches to standard Hybrid station • available in 30-button or 60-button models.

30-Button Model: 475 to 600

60-Button Model: 825 to 950

Focus Electronic Terminal (ET) • proprietary electronic station • Models I and II • 5 fixed function keys and 18 programmable buttons • hands-free dialing • Model II has 40-character LCD alphanumeric display • PBX only.

ET Model I: 450

ET Model II: 550

Focusphone • electronic key system functioning behind PBX

American Telecom, Inc Focus Digital PBX & Hybrid Key Systems

• up to 128 Focusphones per PBX • dedicated feature access buttons • multiple PBX extension line appearances • separate intercom (IC) links; maximum of 16 IC groups per PBX • 4-pair station wiring.

Focusphone Instrument:

275 to 350

Key Telephone Service Unit • provides key service features:

850 to 1,100

Focusphone Line Circuit Board for PBX • 8 circuits per board:

1,300 to 1,450

Focus Autocom • proprietary electronic station • 5 fixed function keys and 12 programmable buttons • hands-free dialing • 40-character LCD display:

375 to 450

Hybrid Station Sets • proprietary electronic station • required for Hybrid system • 5-button, 15-button, and 15-button with LCD display models • 15-button models have 8 programmable buttons, hands-free operation • 40-character LCD display.

5-Button Model:

275 to 325

15-Button Model:

345 to 395

15-Button/Display Model:

450 to 525

Data Communications Equipment

Simultaneous voice and data switching at speeds up to 19.2K-bps asynchronous and 56K-bps synchronous • nonblocking transmission for data • support for Computer-to-PBX Interface (CPI).

Data Interface Unit (DIU) • provides connection to data terminal from PBX • RS-232C supported:

\$650 to \$850 approx prch

Computer-to-PBX Interface (CPI) Circuit Board • supports up to 24 equivalent 64K-bps terminal ports:

NA

Peripherals

Focus Applications Processor • based on Fujitsu Micro 16

personal computer • will support advanced office information functions:

NA approx prch

Calling/Called Number Display Unit • status display that indicates both calling party extension number and called party's number • used when answering calls for multiple departments or administrative units:

450 to 500

Calling Number Display Unit • status display that indicates either calling party or called party extension number:

400 to 475

Call Waiting Display Unit • used with Automatic Call Distribution feature • displays up to 4 call groups • red and yellow status lamps for each group • system must be programmed for threshold levels of incoming calls waiting to be answered • maximum of 2 thresholds (red and yellow) can be programmed:

520 to 575

Front Desk Console • provides administrative functions associated with hotel/motel applications • automatic wake-up, message waiting, do not disturb, station restrictions, charges for telephone calls displayed • 7-digit LED display for room number, local call charges, number of local calls made, toll charges, number of toll calls:

950 to 1,250

System Maintenance & Diagnostics

System Reliability • redundant CPUs on PBX; distributed processing on Hybrid • reserve power supply • power failure transfer • automatic program load • mean time between failures (MTBF): minor 200 days, major 4 years • mean time to repair (MTTR): 1.5 hours.

System Diagnostics • system continuously diagnoses operation • major/minor alarm indications at attendant console • remote diagnostics provided by American Telecom distributor.

System Maintenance • normally performed by authorized American Telecom distributor • larger systems typically include inventory of line cards, trunk cards, phones, cable, test equipment, etc for both vendor and customer maintenance.

System Management • users can interface with PBX via attendant console for administrative changes like modifying class of service, call pickup groups, etc.

• END

Anderson Jacobson Integrated Office Exchange (IOX) Digital PBX System

■ PROFILE

Function • stored program computerized branch exchange systems for switching voice and data.

Applications Supported • office automation • general business • healthcare • retailers • hotel/motel • banking • military • education • service sector.

System Parameters • switching technology: digital switching using TDM/PCM • architecture: distributed processing tied to high-speed bus; nonblocking configuration • common control: stored program • transmission: 4-wire internal switching; maximum bus throughput 123M bps • wiring plan: stations—uniform 2-pair; attendant console—4-pair; internode—coaxial, fiber optic • data switching capability: 19.2K bps; full-duplex at station.

Traffic Capacity • 36 CCS per line (voice), 36 CCS per line (data) • grade of service: P.01 • simultaneous conversations: no limit • nonblocking architecture.

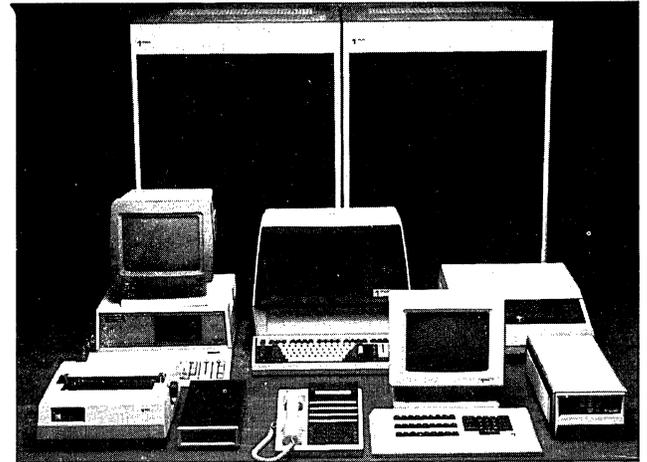
Trunks/Stations/Consoles • 1536 ports per system; maximum 23,552 ports in 16-node network • up to 1472 trunks; 1472 stations; 96 attendant consoles; 416 inter-PBX trunks; 46 T1 trunks • trunks supported: central office—one way (in/out), 2-way; DID; FX; tie lines; OCC • attended and unattended operation.

Voice Equipment • vendor supplied: analog and digital telephones • nonvendor equipment supported: all rotary (500 type) and Touch-Tone (2500 type) telephones • digital telephones: AJ Digi-Touch telset.

Data Equipment • vendor supplied: AJ terminals, modems, printers, computers • nonvendor equipment supported: terminals that support BSC, ASCII • data rates: synchronous and asynchronous to 19.2K bps; full duplex • aggregate data rate: 123M bps per node • modems: all types; modem pooling • multiplexers: all types • protocol converters: X.25 • data modules: datacom module for AJ Digi-Touch telset • interfaces supported: RS-232C, RS-422, RS-449 • printers: service printer • data storage: digital cassette unit, diskette subsystem, magnetic tape subsystem • data terminals: ASCII, TTY • computers: minicomputers, personal computers.

Subsystem Support • automatic call distributors: none • call detail recording: interfaces with available systems • voice message systems: interfaces with available systems • message center systems: interfaces with available systems • energy management systems: interfaces with available systems • hotel/motel management systems: interface to most management systems.

Communications/Networking • abbreviated dialing •



off-network dialing • on-network dialing • dialed digit translation • route optimization • tandem switching • satellite operation • transmission rates: maximum bandwidth per node 123M bps • protocols: X.25, SNA, BSC, ASCII • asynchronous to 19.2K bps • synchronous to 19.2K bps • T1 interface • gateways: X.25, SNA/SDLC (planned).

First Delivery • 1984.

Systems Delivered • under 10.

Installation Interval • 16 to 24 weeks ARO.

Comparable Systems • American Telecom Focus, AT&T Systems 75 and 85, CXC Rose, Ditrans 580 DSS, Ericsson MD110, Executone Summit, GTE Omni SIII, Harris/Digital D1200, InteCom IBX, Mitel SX-2000, NEC NEAX 2400, Northern Telecom SL-1/SL-100, Siemens Saturn III, TIE/Communications Mercury, United Technologies/Lexar UTX, Zitel PNX.

Environmental Specifications • temperature: 30 degrees to 109 degrees Fahrenheit • humidity: 10 to 90 percent • power: 117 VAC (+10 percent to 15 percent) at 60 Hz; separately fused outlet 30-amp service per cabinet • dimensions: 30x24x52 (WxDxH) • weight: 650 pounds per cabinet • floor loading: 100 pounds per square foot • minimum equipment room dimensions: 8x10x8 (WxDxH).

Vendor • Anderson Jacobson, Inc; 521 Charcot Avenue, San Jose, CA 95131 • 408-263-8520.

Canadian Headquarters • 321 Don Park Road, Markham, ON L3R 1C2.

Distribution • nationwide and worldwide through Anderson Jacobson independent dealers and distributors.

Service/Support/Training • service, support, and training by Anderson Jacobson distributor • installation by distributor; subcontractors • warranty 1-year parts and labor; maintenance contracts available • local and remote maintenance.

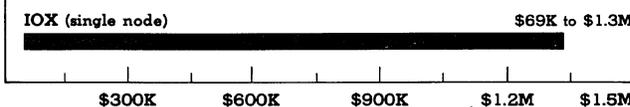
GSA Schedule • not included.

■ ANALYSIS

After a 2-year delay, Anderson Jacobson finally brought out its

PURCHASE PRICE RANGE

hardware & software



ANDERSON JACOBSON INTEGRATED OFFICE EXCHANGE (IOX) PURCHASE PRICING bar graph covers price range between "small" and "large" single-node configurations; installation and first year's maintenance included • small configuration consists of 20 trunks/120 stations; single console; voice only • large configuration consists of 150 trunks/1,100 stations; 3 consoles; 30 percent data • multinode systems expand upward configurations to approximately 23,000 ports.

Anderson Jacobson Integrated Office Exchange (IOX) Digital PBX System

Integrated Office Exchange (IOX) system to a fiercely competitive PBX market. Originally announced late in 1981, and scheduled for first deliveries in 1983, the IOX never made it to the marketplace. Numerous hardware and software design changes have been made in the past 2 years, which AJ says have eliminated the problems from 1982. The IOX was first displayed at the 1982 Tele-Communications Association (TCA) Conference, and it made its second debut on September 17, 1984 at the 1984 TCA Conference in San Diego. The first beta test site was smoothly cut over during the fourth quarter of 1984, and was formally announced in November. The company so far, has distributors for the IOX: R & R Communications, Los Angeles, CA, and American Business Communications, Inc, Bellevue, WA. Additional distributors will be brought on board during 1985, and volume shipments are set to begin in the first quarter 1985.

The IOX is as sophisticated as most of the major PBXs available: InteCom IBX, NEC NEAX 2400, Rolm CBX II, Ericsson MD 110, and AT&T-IS Systems 75 and 85. It has a distributed architecture using TDM/PCM techniques, a digital telset that digitizes voice in the unit, complete redundancy of major components and electronics, and integrated voice and data support up to 19.2K bps, synchronous and asynchronous. As a single node, the IOX can support up to 1,536 ports; with a networking capability, multiple nodes can be configured for a system that is claimed to handle up to 23,000 ports, all nonblocking.

The IOX's late entry into the digital PBX marketplace has cost it both potential sales and credibility. When Mitel's SX-2000 was delayed because of design problems, it cost the company a cozy arrangement with IBM, not to mention creating a cloud of doubt about its advertised capabilities. The system does indeed work well, but its future success has certainly been diminished from the bad press. Although the IOX is probably a very good switch, the end-user PBX market is very fickle—people don't forget when a system doesn't work as claimed, or if it has to "go back to the drawing board." If Anderson Jacobson is to shake off these shadows, it must produce a long string of success stories before the major users will take a second look.

□ Strengths

The Integrated Office Exchange has a distributed microprocessor architecture, total redundancy of all components and critical electronics, a digital telset that can connect data terminals via an RS-232C interface, integrated voice and data communications, an attendant position that provides a substantial amount of system information and administrative control, and ease of expansion via modular field-installed units. Its price is in line with the rest of the digital PBX industry.

□ Limitations

The late introduction of the IOX is probably its greatest limitation. Other manufacturers have been building their user bases, which has naturally depleted the prospects for AJ. Playing catch-up in the PBX business is risky, but AJ could capture a decent market share with a series of successful installations. Synchronous data speeds are currently limited to 19.2K bps, but the company says that 64K-bps support is not far off. Other areas include lack of an X.25 gateway, support for various IBM protocols like 3270, and support for a local area network (LAN). The company has indicated it plans to be competitive with the rest of the industry, therefore one can assume these and other enhancements will probably appear during 1985.

The IOX suffers from the **no standard syndrome**, just like the rest of the PBX industry. This refers to the inability of most end-users to easily configure a system using off-the-shelf components such as is common in the computer industry. Perhaps Anderson Jacobson could help its position by taking a bold step forward and providing end-users with an easy-to-use system configurator, with pricing.

In configuring an IOX, voice-only applications use a single port per station, whereas voice/data applications require a second port per station. This effectively reduces the potential top-end expansion of the switch, and should be considered when planning a system.

■ SOFTWARE

□ Terms & Support

Terms • all software is bundled into the IOX system price with the exception of optional features.

Support • IOX system software is supported by Anderson Jacobson and its associated dealers and distributors • field-developed software is supported by the individual dealer or distributor that authors the programs.

□ Software Overview

IOX software is used to control operations, conduct self-test functions, and provide features. It should be noted that all features of the IOX family are software driven and targeted at 3 areas: (1) System Features; (2) Attendant's Features; and (3) Station Features. System software consist of the Operating System, Self-Test, and Configuration Tables.

The operating system defines major parameters and functions. The distribution of calls and methods of route selection and optimization is also controlled by the operating system.

The self-test provides online testing of the IOX system performance. Error table printouts are available upon request. System fault error codes are stored in IOX memory and made available to local or remote access.

The configuration tables contain information unique to each IOX installation. These tables may be changed or moved. The tables are used to define station characteristics and control assignments.

Diagnostic software is used to diagnose problems not found by the self-test programs.

□ Features Overview

All features are a function of various software releases, all releases will run partially or totally in all IOX models, and all standard features are bundled into the system price. Optional features are extra-cost items.

General System Features

Standard Features • attendant console: incoming calls all processed by attendant console • distinctive ringing: station ringing cycles signal type of call • flexible numbering of stations: stations can be numbered with either 3 or 4 digits • foreign exchange (FX) service: access to FX trunks • intercept treatment: calls to vacant or unassigned stations receive distinctive signal • line lockout with warning: stations left off-hook after predetermined length of time are first sent a howler tone, followed by release from the PBX • listed directory number (LDN) service: access to local C.O. trunks • multiple LDN: access to more than one local trunk group with indication at console • night service: after-hours calls handled either by connecting trunks directly to stations or by dialing a special code to answer an incoming call • off-premises stations: connection for stations not located in same building as PBX • power failure transfer: prearranged stations are connected to trunks for service in a power outage • remote maintenance service: system to provide real-time diagnostics of system for both user and system supplier • rotary dial calling: dial telephones supported • tie trunk service: access to tie trunks • touch-tone calling: tone dial telephones supported • touch-tone to dial pulse conversion: converts tone signals to rotary dial pulses for connection to rotary dial central offices • trunk answer from any station: night service feature, users answer incoming calls by dialing special code • WATS service: access to WATS trunks, both oncoming and outgoing.

Code Calling Access Option • interface to customer-provided coded signaling system:

NC prch

Direct Inward Dialing (DID) Option • permits incoming trunk

NA PRCH: not available; price not disclosed by vendor. NC: no charge; feature activated by programming.

Anderson Jacobson Integrated Office Exchange (IOX) Digital PBX System

calls to bypass attendant and terminate directly on designated stations:

NA

Direct Inward System Access Option • provides direct access into IOX via trunk user dials authorization code to access system features:

NA

Loudspeaker Paging Option • interface to customer-provided paging system:

NC

Music-On-Hold Access Option • interface to customer-provided music source:

NC

Radio Paging Access Option • interface to customer-provided radio paging system:

NC

Recorded Telephone Dictation Access Option • interface to customer-provided telephone dictation system:

NC

Reserve Power Option • independent power source for temporary power during a short-term outage:

NC

Speed Calling Option • provides directory of frequently called numbers accessed by special dial code:

NA

Station Rearrangement & Change Option • permits user-controlled station moves and feature changes:

NC

Restriction Features

Standard Features • class of service: group of features and restrictions assigned to a station • code restriction: denies selected station lines completion of dialed outgoing exchange network calls to selected offices and area codes • data privacy: station user will deny other potential users the ability to override or gain access to the used line; restrictions released when station placed on-hook • data restriction: station or group denies other users ability to gain access to the station or group; attempted bridge-on is routed to a tone • fully restricted station: denies the ability to place or receive anything but station-to-station calls • inward restriction: stations prevented from receiving incoming tie trunk, and exchange network calls; either direct dialed or attendant completed • originating restriction: prohibits station line from originating calls • outward restriction: call attempts are routed to the intercept tone; station can not use CO, FX, CCSA trunks • station-to-station restriction: internal calls only are restricted • termination restriction: stations cannot receive calls at any time • toll restriction: prohibits users of particular trunks from dialing any number except specified office codes and area codes • miscellaneous trunk restriction: denies dial access from preselected station lines to preselected trunk groups.

Account Code for SMDR Option • requires dialing code for chargeback to specific business activities:

NA prch

Area Code Restriction Option • permits or denies station user outside trunk based on 3-digit area code:

NC

Authorization Code Option • requires dialing special code (password) before system will process call:

NA

Toll Restriction Option • permits or denies station user outside trunk access based on area code and local exchange (NXX) code:

NC

Call Routing Features

Standard Feature • Route Advance routes outgoing calls to alternate facilities when the first-choice trunk group is busy.

Automatic Overflow to DDD Option • optional routing of

private network calls via off-net facilities from a point on the network where all on-net routes are busy or none are provided:

NA prch

Automatic Route Selection Option • provides automatic routing of outgoing calls over alternate customer facilities based on the Direct Distance Dialing (DDD) number; incorporates the function of and replaces the code restriction and route advance features:

NA

Trunk Queuing Option • outgoing trunk calls to busy trunk group are placed in queue, then called back by system when trunk available:

NA

Call Accounting Features

Station Message Detail Recording (SMDR) Option • provides station or attendant identity, starting time, duration, and trunk group used for outgoing and/or incoming calls:

NA prch

Data Features

Data Communications Option • provides interface support for both asynchronous and synchronous data terminals • data privacy: prevents other stations or attendant from interfering with data call in progress • modem pooling: provides for sharing of modems for both incoming and outgoing data calls • data speeds: up to 19.2K-bps asynchronous, 19.2K-bps synchronous; full duplex • auto-call: IOX automatically dials specific number when Request for Service activated:

NC prch

Network Features

Satellite Operation Option • permits multiple locations in regional area to develop uniform numbering plan; includes automatic dialing, attendant consolidation, trunk consolidation, centralized SMDR:

NA prch

Tandem Tie Trunk Switching Option • allows tie trunk-to-tie trunk and tie trunk-to-exchange network connections through the switching system dialed directly by the remote PBX station user:

NC

Attendant Console Features

Standard Features • alphanumeric display for console: CRT displays provide call information and status • attendant control of trunk group access: restriction of station access to specific trunk groups • attendant direct station selection (DSS) with busy lamp field (BLF): single-button connection of calls to stations, visual display of busy condition of station • attendant lockout: prevents attendant from reentering connected station call • attendant transfer: calls can be transferred by attendant • attendant call waiting: extending call to a busy station sends special tone to user alerting of a waiting call • attendant verification of busy stations: attendant can check on status of a station line • calling number display to attendant: displays either station number calling or type of incoming trunk call • class of service display to attendant: displays station class of service to attendant • direct trunk group selection: attendant can directly access trunk group by depressing specific button on console • interposition calling and transfer: calls between attendants can be arranged, as well as call transfer • night console position: console arranged to handle night service • privacy: automatic splitting of attendant from incoming call while talking with called station • serial call: attendant can establish a series of station calls from a single incoming call, with the original call always returning to the attendant after completing each call • splitting: incoming call on hold while attendant talks with station • straightforward outward completion: attendant dials call for station user, then releases • switched loop operation: calls coming into console handled on one of several loops, which can be reused for next call • through dialing: attendant passes dial tone through to station user, who then dials a call • timed reminder: unanswered calls extended from console return to console for further handling after predetermined time • trunk group busy/warning indicators: LED

Anderson Jacobson Integrated Office Exchange (IOX) Digital PBX System

indicator that tells when all trunks in a group are in use (busy) or when a predetermined number of trunks in a group are busy (warning) • trunk identification by attendant: trunk type in use on a call identified by display • trunk-to-trunk connections: attendant can connect incoming or outgoing trunk call with outgoing trunk call • 2-party hold: attendant can put call on hold that uses 2 facilities for call.

Station Features

Standard Features • add-on conference: permits an internal extension to add one inside or outside call to an existing conversation • call hold: places call on hold • call park: places call on hold within IOX for retrieval at another station • call pick-up: stations can answer another phone either by dialing a code and the ringing extension, or by dialing the pick-up code and answering a ringing station in the same pick-up group • call transfer: station can transfer a call to another station • call waiting: station on a call can answer a second call after being alerted to the incoming call by a special tone • SMDR/Account Coding: permits station to assign account code when placing call • direct outward dialing: permits station to originate outside call without operator.

Digi-Touch Station Features • automatic camp-on: station user trying to reach busy extension dials code and stays online until busy station frees up • camp-on callback: station user trying to reach busy extension dials code and hangs up; system calls back once busy extension frees up • display: LCD unit that displays messages, number called, number calling • do not disturb: prevents incoming calls to a station • executive override: designated stations can break into existing conversations or can override the do-not-disturb feature • forwarding: calls can be diverted to another extension • message reminder: station user can leave a callback message • privacy: prevents call from interruptions such as camp-on or barge-in tones • queuing: permits station to access busy trunk facility by dialing a code and either staying on the line (standby) or hanging up (callback) • save/repeat: permits user to store an outside number for ease of redialing at a future time • station speed calling: users can program their extensions with up to 10 frequently dialed numbers • system speed calling: users can access additional numbers stored in IOX memory • trunk select: stations can access specific trunk lines:

Application Software

Anderson Jacobson plans to install its system in numerous application environments. Application packages include the following industries: health care; retailers; office automation; general business; banking; military; lodging; and service sector.

HARDWARE

Terms & Support

Terms • IOX models are available for purchase or on a 1-, 2-, 3-, or 5-year lease • lease rates include maintenance • purchase prices include installation.

Support • equipment installed by Anderson Jacobson distributors • service and maintenance is based on the policies established by individual dealers and distributors • prices vary based on costs incurred by distributors for overhead, discounts, installation, maintenance, training, and spare parts.

Overview

The Anderson Jacobson Integrated Office Exchange (IOX) is a modular voice and data digital switching system based on a 16-bit distributed multimicroprocessor architecture using pulse code modulation (PCM) technology with distributed codecs. The system's nonblocking matrix provides the capability for simultaneous speech and data up to 1,536 ports, and through networking, to up to 23,552 ports without port reduction or degradation of performance.

The IOX Digital Switch is a multiprocessor-based computer that controls all other system elements. It consists of card cages containing line and trunk interface printed circuit boards, providing up to 1,536 user ports, switching and signalling circuitry, controller and memory, and power supply. Multiple IOX

switches can be networked in a nonblocking fashion via digital port interfaces. Networking can also be accomplished through conventional E & M or other analog and digital trunks (T1). Standard 2-pair twisted wires can be used for remoting 32-port segments, which reduces substantially the cable normally required for remote sites.

The IOX provides universal port connection methods that will support future offerings from AJ, such as local area network (LAN) interfaces and office automation equipment. CMOS technology and the IOX system architecture permits a smaller size cabinet with color-coded cards that can be positioned anywhere in the cabinet to optimize the use of cabinet space and conserve power consumption. System reliability is assured because all major subsystems—switching, signalling, controller, memory and power supply—are fully redundant. Full diagnostics monitor system performance, and battery backup provides continued operation in the event of a power failure.

The IOX supports standard analog rotary or tone dial telephones. The proprietary IOX Digi-Touch digital telephone has 14 standard feature keys, a 12-key dialing pad, and is expandable in 6-button increments to an additional 18 direct access feature keys. An optional visual display tilts to the desired viewing angle to display 24 characters for call processing, data, conference and time features. An integral codec converts the analog voice signal to a digital bit stream. A field-installable Data Option Board with standard RS-232C interface can be added to IOX telsets. The system supports both asynchronous and synchronous data communications at standard rates from 110 to 19.2K bps, with higher data rates to be offered in the future (up to 64K bps). Users can initiate a data call on a per-station basis and simultaneously receive a voice call from the telset. For expanded features or local group services, the IOX Telset Expansion Module allows up to 36 additional feature keys in 6-key modules. A full range of voice features, data access features, speed dial numbers will be available with first customer shipments. IOX telsets operate in a voice or alternate voice/data mode over a single port and a single pair of wires. Simultaneous voice and data service uses another port and wire pair.

Representative System Configurations

IOX Configuration • multiple cabinet system • redundant • 128K to 1M bytes of memory • 16-bit microprocessors in distributed architecture • maximum 1,536 ports per system; maximum 930 digital telsets per system • standard telephones and digital telsets use single pair of wires • data option requires additional pair of wires and additional system port • can be field upgraded from smallest to largest configuration.

Small System • 25 trunks/190 stations; 1 console; 160 Digi-Touch telsets; 30 single-line 2500 telephones; no data transmission:

\$170,500 to \$196,900 prch

Large System • 55 trunks/750 stations; 2 consoles; 670 Digi-Touch telsets; 120 single-line 2500 telephones; DID; SMDR; ARS; 20 percent data communications:

724,950 to 935,500

Station Equipment—Voice/Data

Attendant Console • handles incoming calls for completion to extensions • completes outgoing calls • establishes system operating parameters, features, classes of service • includes CRT with associated keyboard:

\$2,900 to \$3,200 prch

Digi-Touch Telset • digital telephone • 8 preprogrammed feature buttons • 24 programmable feature/line buttons • 24-character LCD display • optional Data Option Board with

PRCH: purchase price; price ranges are approximate and include installation and first year's maintenance. Prices effective as of January 1985.

Anderson Jacobson Integrated Office Exchange (IOX) Digital PBX System

RS-232C interface • optional 36-button add-on module.

Basic Telset:

495 to 595

Add-On Module:

395 to 495

Data Option Board:

400 to 600

Data Communication Equipment

Simultaneous voice and data communication support at data speeds up to 19.2K bps between on-premise terminals or terminal and transmission facility • eliminates modems by pooling data communication; reduces long-distance modems by pooling data lines • adds data without compromising voice communication • various AJ data products available.

Peripherals

Service Teleprinter • instructs system computer when moves and changes are performed • connected to equipment cabinet in local mode • can be used for remote IOX communications • lists

Self-Test Error Table; Audit Table; Traffic Table; extension and trunk attributes; establishes security key:

\$1,300 to \$1,800 prch

■ SYSTEM MAINTENANCE & DIAGNOSTICS

System Reliability • redundant CPUs • error-correcting memory • redundant critical electronics • reserve memory power • backup battery • automatic program load.

System Diagnostics • system continuously diagnoses operation • major/minor alarm indications at attendant console • audit trail generated on system service teleprinter • remote diagnostics by AJ service centers.

System Maintenance • normally performed by Anderson Jacobson authorized distributor • larger systems typically include inventory of line cards, trunk cards, phones, cable, test equipment, etc for customer or vendor maintenance.

System Management • users can change such functions as pick-up groups and call routing, perform station relocations • system CRT or teleprinter used.

• END

AT&T-IS Call Accounting Systems

Teleseer, AP-16 & 3B5-AP

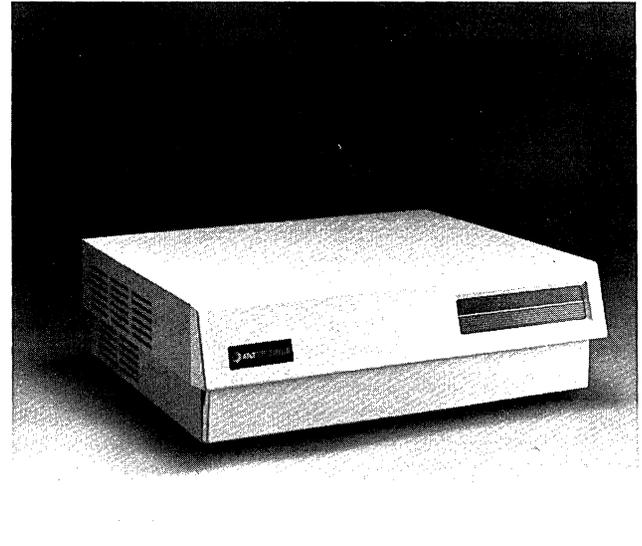
■ PROFILE

Function • Teleseer: telephone cost accounting system with station message detail recording capabilities for both direct output and internally formatted SMDR PBXs • data processed into detailed management reports • AP-16 and 3B5-AP: provide computing and control over peripheral equipment used in information management systems; can be a companion system to PBX or as standalone application.

Configuration • Teleseer: EIA-compatible, solid state microprocessor-based; integrated 103-type modem for remote diagnostics and downline loading of software changes; external battery; hardcopy asynchronous EIA-compatible keyboard send/receive (KSR) terminal, maximum call records 28,000 • AP-16: proprietary 16-bit CPU contains 3M bytes of main memory; 16-bit instruction set; 20-bit virtual addressing—with memory management circuitry—20-bit virtual address is converted to 22-bit physical address (UNIX timesharing operating system requires address conversion to support multiprogramming environment); CPU ports function asynchronously at 1200 bps following initialization; data rates of 300 to 9600 bps afterwards; ASCII character set in full duplex; memory is both byte and word addressable; 512 bytes of memory—each circuit; peripheral subsystems have an 8-bit microprocessor with 64K or 128K bytes of memory, random access memory (RAM); system interfaces with RS-232C, SSI (Standard Serial Interface)-type, switched DCP (Digital Communications Protocol)-type data terminals and printers; 16 simultaneous terminals and 30 printers maximum; DCIU (Data Communications Interface Unit) connection between host PBX and AP-16 or dial-up connections from EIA ports to switch; distributed processing architecture • 3B5-AP: 32-bit WE 32000 microprocessor supports UNIX operating system, controls all subsystem and monitor system diagnostics; 32-bit internal data representation and 32-bit address generation; 8K-byte cache circuit board; clock rate 10M Hz; supports 1M-byte memory array circuit board based on 64K dynamic RAM.

Associated System • Teleseer: all EIA-compatible PBXs with SMDR; RS-232C output interface required; 2 EIA cables used • AP-16 and 3B5-AP: all PBXs with SMDR output • interface required: RS-232C, SSI-type, switched DCP-type interface for data terminals and printers; DCIU connection between host PBX and AP.

System Parameters • Teleseer: maximum 500 PBX lines; 28,000 call records; 2,000 account code capacity • AP-16: 39 to 45 communication ports maximum depending on configuration; 16 simultaneous terminals and 30 printers maximum; 50K directory entries; maximum message center service users—5000, 200 for electronic document communications (EDC) • 3B5-AP: 44 to 54



AT&T-IS Teleseer

communication ports; 50K directory entries, maximum message center service users—9500; 48 printers maximum.

First Delivery • Teleseer: 1984 • AP-16: 1983 • 3B5-AP: 1984.

Systems Delivered • Teleseer: over 500 • AP-16: over 500 • 3B5-AP: under 10.

Installation Interval • Teleseer: 4 to 6 weeks ARO • AP-16: 16 to 24 weeks ARO • 3B5-AP: 16 to 24 weeks ARO.

Comparable Systems • Teleseer: Bitek International Systems, Control Key FM 5000, CP National Systems, DND Teletronics Systems, NEC Information System Mini-Phacs, Optimum Communications Systems, Techtran Industries Systems, XIOX Corporation Systems • AP-16/3B5: Northern Telecom Meridian SL-1 AP; NEC Telephones Astra-Phacs.

Environmental Specifications • temperature: 30 to 100 degrees Fahrenheit • humidity: 40 to 60 percent noncondensing • air conditioning: required • dimensions: Teleseer—5x16x14 (HxWxD); AP-16 and 3B5-AP—72x30x24 (HxWxD) • weight: Teleseer—24 pounds with battery; AP-16 and 3B5-AP—750 pounds • power: 115V AC 60 Hz.

Vendor • AT&T Information Systems; 100 Southgate Parkway, PO Box 1955, Morristown, NJ 07960; 201-898-8000 • National Sales Center 1-800-247-1212.

Canadian Distribution • contact headquarters in U.S.

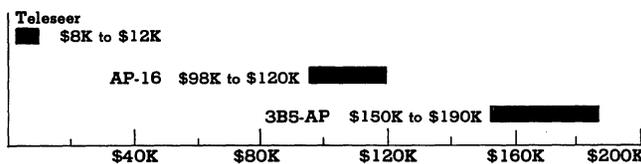
Distribution • nationwide through AT&T regional offices • Eastern Region: Parsippany, NJ • Southeastern Region: Tucker, GA • Western Region: Dallas, TX • Great Lakes Region: Chicago, IL • Pacific Region: Oakland, CA.

Service/Support/Training • service, support, and training provided by AT&T-IS • training consists of 1 or 2 employees trained by AT&T, who then conduct end-user training • additional customer support for AP-16/3B5 provided by Maintenance and Administration Panel (MAAP).

GSA Schedule • listed.

PURCHASE PRICE RANGE

hardware & software



AT&T-IS CALL ACCOUNTING SYSTEMS PURCHASE PRICING bar graph covers price ranges between small and large configurations • Teleseer supports from 10 stations up to 500 stations • AP-16 supports up to 45 communications ports and 30 printers • 3B5-AP supports up to 54 communications ports and 48 printers • price range includes installation and first year's maintenance.

AT&T-IS Call Accounting Systems

Teleser, AP-16 & 3B5-AP

■ ANALYSIS

Until the divestiture, AT&T was not in the call accounting business. Numerous systems and telemanagement software products were developed by other firms to convert raw data captured from AT&T PBX systems into useful telecom management information. AT&T really had no reason to get actively involved—so long as users kept leasing their telephone systems.

During the late 1970s, the tide began to swing away from AT&T. Other PBX manufacturers, such as Northern Telecom, Mitel, and Rolm, provided a single-source approach to the issue of management reporting on telecom expenses, which further soured AT&T's image to end users. The transition from regulated utility to unregulated equipment supplier came as a major shock to AT&T, in terms of how the company conducted business for over a hundred years, and the aftershocks are still being felt. AT&T Information Systems, the post-divestiture equipment supplier for AT&T, has turned some remarkable feats of product development in the 18 months following the official divestiture of the communications giant. Telecom management was one of the key areas AT&T invested its huge resources, and today there are 3 specific products available for AT&T-IS users for what the company refers to as "voice management."

The first was the Applications Processor-16, or AP-16, which was unveiled with the original announcement of the System 85 digital PBX back in 1983. Early in 1984, AT&T-IS announced a small, compact call accounting and report generating system called Teleser, which was targeted at smaller installations (under 250 stations). The unit was earmarked particularly at the large installed base of analog Horizon hybrid systems as an enhancement. Teleser could also operate with a Dimension PBX system, provided the Dimension was equipped with the Station Message Detail Recording (SMDR) feature. Teleser is an OEM version of the M5000 unit manufactured by Moscom, Inc. of Rochester, New York. AT&T's December 1984 announcement of its large-scale System 85, known as Version 2 Releases 2 and 3, also saw the unveiling of the 3B5 Applications Processor, which is based on the Bell Labs-developed WE 32000 32-bit microprocessor. It supports the same applications software as the AP-16, but has a higher capacity and greater overall processing power. AT&T's System 75 has an integrated applications processor capability to support certain voice management functions, but can also use the AP-16 if additional processing power is required.

The Teleser basically gathers SMDR-formatted data from its associated PBX system and processes it into management reports. Connection to the PBX is usually through an EIA RS-232C connector, one of which is in both the PBX and Teleser. A standard cable handles the connection. Up to 28,000 call records can be stored in Teleser before it needs to generate any reports. Users can produce reports on demand or on a scheduled basis. A memory overflow alarm is available to alert the telecom manager when the system's call record limit is approaching. AT&T provides the call processing and report generating software, and users can obtain updates to rate tables and V&H coordinate tables as required.

Both the AP-16 and 3B5-AP are based on UNIX, the powerful timesharing operating system developed by Bell Laboratories. The AP-16 has up to 3M bytes of error-correcting memory and the 3B5 supports up to 8M bytes of memory. The AP-16 uses a 16-bit minicomputer that controls an array of microprocessor-based subsystems. The 3B5 runs under control of the 32-bit WE 32000 CPU, which controls the same basic cadre of peripheral subsystems as the AP-16. The 3B5 also has a high-speed cache memory to increase processing power.

Subsystems for the AP-16 include 2 different hard disk drives (40M or 160M bytes); a 9-track tape drive; a high capacity minirecorder (HCMR) with streaming capabilities for backup; a line controller subsystem for connecting to data networks and other AP-16s; a Standard Serial Interface (SSI) subsystem for connecting serial devices; an EIA Terminal subsystem for connecting devices with an RS-232C interface; and a Digital Communications Protocol (DCP) Terminal subsystem for connecting specific AT&T terminals to the AP-16, such as the 500

Business Communications Terminal (BCT) family. The 3B5 applications processor supports the same subsystems as the AP-16. Only the 160M-byte hard disk drive is offered with the 3B5. Both systems support a wide variety of terminals.

AT&T-IS has several application software packages for its 2 APs. For call accounting applications, Call Detail Recording and Reporting (CDRR) software is required, along with V&H coordinate tables. Other packages include Message Center, Directory, Terminal Change Management, Facilities Management, Electronic Document Communications, Terminal Emulation, and Call Management System software. Centralized System Management (CSM), announced with the 3B5, manages operations of several AP-16/3B5 units and is designed exclusively for the 3B5-AP.

Virtually all PBX systems, and most electronic key and hybrid systems, have SMDR as a standard or optional feature. Distributors of these systems will usually offer a call accounting system to produce management reports as part of their total product package. AT&T is one of only a few companies that provides both PBX and call accounting systems manufactured in-house. AT&T Applications Processors support several unique communications management packages in addition to call accounting, which again adds to the products' uniqueness. Northern Telecom, for example, appears to have entered the same ring as AT&T with its Meridian SL product line. Using "loosely-coupled" processors, the Meridian SL-1 can also support multiple applications concurrently. This particular approach—providing additional system functionality via specialized processors—will help increase the overall value of these systems to their prospective users.

□ Strengths

AT&T's Teleser provides a low-cost call accounting solution for small to medium businesses. It is easy to install, and its 28,000 call record capacity will handle most needs. The system provides a group of management reports that should satisfy the information requirements of telecom managers and analysts.

The company's 2 applications processors support a large variety of terminals as well as numerous specialized management applications programs. Both APs run under UNIX, which offers the potential for more sophisticated applications products in the future.

□ Limitations

Teleser has a few limitations. With a design limit of about 500 PBX stations, the system will satisfy most small to medium users. However, if the system in question does not have the proper software release (i.e., the feature package that provides SMDR), the total cost for SMDR with full call costing and management report generation will be fairly steep. If the phone system is an AT&T Horizon, the SMDR feature is available only in the Advanced Horizon, an expensive upgrade for users with older installed Horizons. A call record limit of 28,000 is sufficient for users with under 100 stations, but larger users will probably exceed that limit more frequently. This means the telecom administrator will have to schedule report printing sessions on a regular basis to keep system memory from overflowing.

Both applications processors are designed to work exclusively with AT&T PBX systems. Connection to the PBX is via a proprietary link called the DCIU or dial-up connections over an RS-232C interface. AT&T-IS says both APs can be used as standalone systems, but they will most likely be used in support of a PBX. Both machines are expensive. Users who want only call detail recording and report printouts can expect to spend well over \$100,000 for this capability, while there are equally good systems available elsewhere in the industry for a fraction of the price. The APs are designed to support multiple applications, such as Electronic Document Communications, Message Center, and Terminal Change Management. In these situations, the total product is definitely superior to the competition.

■ SOFTWARE

□ Terms & Support

Terms • Teleser: all software is bundled into the system's price

AT&T-IS Call Accounting Systems

Teleseer, AP-16 & 3B5-AP

with the exception of optional features • AP-16/3B5-AP: application software is licensed separately; operating system software is bundled with system price.

Support • all systems are supported by AT&T Information Systems.

Software Overview

Software for the Teleseer SMDR is user specific and resides on a cartridge. It is prepared at the factory when the system is ordered, based on a database prepared by the user and AT&T-IS. The AP-16 and 3B5-AP are equipped with system software, including the UNIX operating system and device drivers, and can be ordered with various applications software. Software and data on the APs can be stored on fixed nonremovable hard disk drives, high capacity minirecorders, or 9-track tape units. The AP-16 CPU supports up to 3M bytes of main memory, and the 3B5 supports up to 8M bytes. Each peripheral subsystem contains its own error detection/correction software. Operating features are implemented in ROM.

Features Overview

Teleseer features are bundled into system according to user specifications. AP-16 and 3B5-AP features reside in main memory as well as individual subsystems.

System Features

Standard Features • Teleseer: cost accounting system, EIA-compatible, 28,000 call record capacity, external battery, integrated 103-type modem for remote diagnostics and downline loading of software changes and updates, software cartridge, remote alarm, teleprinter, RJ11 jack for remote system update • AP-16: applications processor, controls peripheral equipment; 16-bit minicomputer; peripheral subsystems—hard disk, 9-track magnetic tape, high-capacity minirecorder, line controller, Standard Serial Interface (SSI) terminal, digital communications protocol interface (DCPI) terminal, EIA terminal; maintenance and diagnostics capabilities, UNIX operating system • 3B5-AP: application processor, controls peripheral equipment; UNIX operating system; peripheral subsystems—memory disk, tape, I/O, asynchronous data link interfaces (ADLI), synchronous data link interface (SDLI), teletype terminal interface (TTI), digital communications protocol interface (DCPI).

Applications Software

Both Applications Processors support several software products that perform a wide range of office and telecom management functions. Each package can run on both the AP-16 and 3B5-AP, with the exception of Centralized System Management (CSM), which runs exclusively on the 3B5-AP.

Message Center • provides text messaging capabilities:

\$170 mo	\$4,560 prch	\$600 maint
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Call Detail Recording & Reporting (CDRR) • provides complete range of telecom management reports on call activities:

300	7,990	1,104
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Directory • provides detailed in-house company directory; required with either Message Center or CDRR:

100	2,665	372
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V&H Coordinates • specialized tables used for pricing telephone calls • required with CDRR:

NC	100	NC
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Terminal Change Management • provides ability to change features, move stations within associated PBX:

350	9,325	1,296
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MO: monthly rate for 48-month lease; maintenance included. PRCH: purchase price. MAINT: monthly maintenance cost after first year; purchased systems. NA: not available; price not disclosed by vendor. NC: no charge. Prices effective as of May 1985.

Facilities Management • provides extensive reports on telecom facilities; line status reports, line utilization reports, etc:

400	10,655	1,464
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Electronic Document Communications (EDC) • electronic mail:

NA	NA	NA
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Terminal Emulation • provides ability for system to function as user-specified terminal devices:

NA	NA	NA
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Call Management System • provides ACD/UCD management information reports:

NA	NA	NA
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Centralized System Management • provides operations management for multiple System 85 configurations or very large single systems; controls multiple AP-16s and/or 3B5s • includes Terminal Change Management, Facilities Management, Traffic Management, Cost Management, and Adjunct Processor Management software modules:

800 to 900	45,000 to 50,000	2,800 to 3,500
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HARDWARE

Terms & Support

Terms • AT&T systems are available for lease or direct purchase • lease rates include maintenance • maintenance contracts available.

Support • equipment installed by AT&T (user installed on Teleseer) • service and maintenance based on policies established by AT&T.

Overview

The AT&T Teleseer is connected to the host PBX by two 115V AC power outlets. One is for the SMDR, the other goes to the printer. It handles up to 500 lines with a maximum of 28,000 call records. The software is prepared at the factory and is loaded into the unit. Teleseer generates standard Summary and Activity reports plus user-configurable selection reports. The AP-16 is a 16-bit minicomputer that controls peripheral equipment attached to the host PBX. Interfaces are provided to accommodate RS-232C, SSI-type, and switched DCP-type data terminals and printers. These include 500 BCT via SSI ports, the 515 BCT via switched DCP ports, and data terminals with an EIA RS-232C interface port. Maximum number of terminals and printers is 16 and 30, respectively. The maximum main memory is 3M bytes; each memory circuit pack contains 512K bytes. Peripheral controllers each have an 8-bit microprocessor with 64K or 128K bytes of memory for self-diagnostics and initialization. The system uses fixed nonremovable hard disk drives, high capacity minirecorders, or 9-track tape units. The 3B5-AP uses a 32-bit WE 32000 microprocessor. Its operating system, like the AP-16, is UNIX, and interfaces with a variety of printers and terminals similar to the AP-16. Both asynchronous and synchronous data rates up to 9.6K bps are supported. The memory controller supports up to 8 memory circuit boards, each of which has a 1M-byte memory array based on 64K dynamic RAM devices. Memory is arranged in 32-bit words with an additional 8 bits stored for hamming code information.

Representative System Configurations

Teleseer • basic unit, software, battery backup:

NA mo	\$6,100 prch	NA maint
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AP-16 • 16-bit minicomputer under control of AP version of UNIX operating system, 40M-byte disk, 9-track magnetic tape

MO: monthly rate for 48-month lease; maintenance included. PRCH: purchase price; price ranges, where indicated, are approximate and include installation. MAINT: monthly maintenance cost after first year; purchased systems. NA: not available. Prices effective as of May 1985.

AT&T-IS Call Accounting Systems

Teleseer, AP-16 & 3B5-AP

drive for Call Detail Recording and Reporting (CDRR), LADS (local area data system) interface, 16 BCT terminals, 2 printers:
 3,200 to 3,400 108,600 to 118,400 11,000 to 13,000

3B5-AP • 32-bit WE 32000 microprocessor, UNIX operating system, 9-track magnetic tape drive, printers, terminals, software:
 4,000 to 4,500 150,000 to 180,000 14,900 to 16,000

System Components & Peripherals

Teleseer

Record System Software:		
NA mo	\$700 prch	NA maint
System Initialization:		
NA	600	NA
Remote Alarm:		
NA	280	NA
Update Replacement Software Cartridge:		
NA	400	NA
Remote System Update:		
NA	300	NA

AP-16 & 3B5-AP

500 Business Communications Terminal (BCT) • keyboard

display/CRT terminal with 13-inch screen and detached typewriter-style keyboard:

\$92 mo \$3,400 prch \$261 maint

515 Business Communications Terminal (BCT) • integrated workstation, a CRT display terminal, and telephone all housed together:

NA 2,995 NA

SYSTEM MAINTENANCE & DIAGNOSTICS

System Reliability • main system functions stored in software • diagnostic error detection and recovery routines stored in main memory • AP-16 uses distributed processing • battery backup • power failure transfer to battery.

System Diagnostics • diagnostic routines on all system operations • alarm signal notifies attendant of minor or major outage in system (AP-16/3B5) as well as when system reaches 95-percent memory capacity (Teleseer) • system diagnostics can be handled remotely.

System Maintenance • performed by AT&T-IS personnel.

System Management • rate tables updated by vendor automatically for Teleseer • reports printed on system printer • menu-driven operation in APs.

• END

AT&T-IS Merlin

Electronic Key Telephone System

■ PROFILE

Function • electronic key telephone system for switching voice.

Applications Supported • targeted at small- to medium-sized businesses with up to 20 telephones.

System Parameters • analog, space division switching • decentralized multiple microprocessor control with stored program • 2- or 4-pair station cabling; modular connectors.

Traffic Capacity • Model 206: up to 3 unblocked connections • Model 410: up to 6 unblocked connections • Model 820: up to 10 unblocked connections.

Trunks/Stations/Consoles • Model 206: 2 trunks/6 stations • Model 410: 4 trunks/10 stations • Model 820: 8 trunks/20 stations.

Voice Equipment • vendor supplied: 5-button, 10-button, and 34-button electronic telephones • hands-free unit • headset adapter • nonvendor equipment supported: none.

Data Equipment • vendor supplied: acoustic coupler adapter • nonvendor equipment supported: none.

First Delivery • January 1984.

Systems Delivered • over 2,000.

Installation Interval • immediately to 2 weeks from purchase for customer-performed installation • 2 to 4 weeks ARO for AT&T-IS installation.

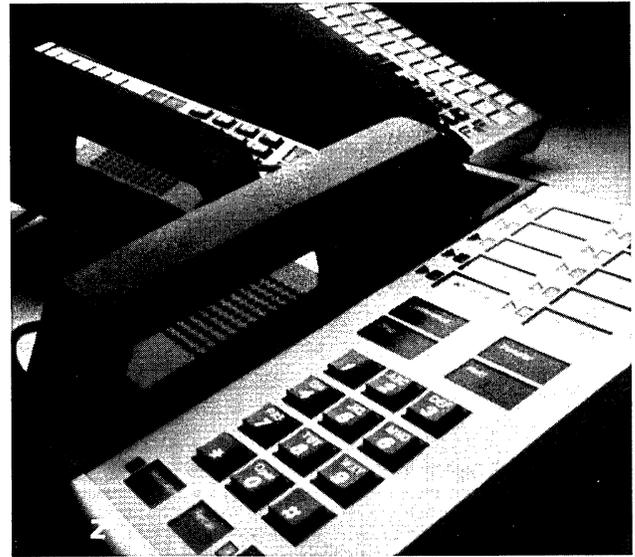
Comparable Systems • AT&T-IS Com Key 416; Comdial Maxkey; Executone Equity; Inter-Tel MPK I/II, SPK I/II, Phoenix; ITT EKS 701/801; Iwatsu Omega III/IV; NEC Electra 616, 16/48; Northern Telecom Vantage 12; PKS/Communications Prestige; Stromberg-Carlson Progress DKS; TIE/Communications Meritor, Ultrakey, Econokey 612, Paragon 16; Toshiba Strata VI.

Environmental Specifications • temperature: 50 to 80 degrees Fahrenheit • humidity: 30 to 60 percent • power: standard 117 VAC at 60 Hz; standard outlets • air conditioning: not required • dimensions: 14.25x10x9.5 inches (WxDxH) (control unit) • weight: 11 pounds (control unit) • FCC Registration: AS593M-64884-MF-E, ringer equivalence 0.8A.

Vendor • AT&T Information Systems; 100 Southgate Parkway, Morristown, NJ 07960 • 201-898-8000.

Canadian Headquarters • contact AT&T-IS in U.S.

Distribution • nationwide through AT&T-IS direct sales force • regional areas through Bell Operating Companies • over 900 independent dealers nationwide, including Computerland, Sears Business System Centers, Amerisource.



Service/Support/Training • service, support, and training can be provided by AT&T-IS or distributors • system can be installed by AT&T-IS or customer; service by replacement of faulty modules and station equipment; training by user • maintenance contracts available through AT&T-IS or selected distributors.

GSA • product listed.

■ ANALYSIS

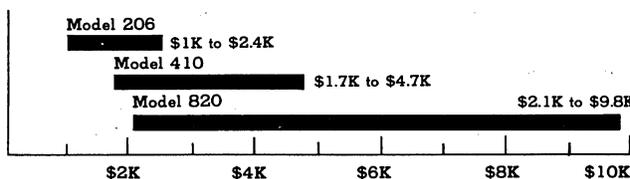
AT&T introduced the Merlin key system late in 1983 as the ultimate replacement for its venerable 1A2 and ComKey electromechanical key systems. Merlin has multiple microprocessor control, stored program-based features, and modular packaging. AT&T touts it as its first system designed for installation by end users.

Merlin is a totally new system; there are no components reused from other AT&T products. It is designed to provide basic key telephone service plus features found on PBXs and hybrid key systems. Station instruments are designed along the lines of the company's System 75 and 85 stations, the 7000 Series. All components for Merlin are packaged in a compact 11-pound cabinet. Additional capabilities are implemented by plugging specialized modules in preassigned slots in the back of the control unit. Station users program features by setting a switch on the instrument, making the required changes, and restoring the switch to its normal position.

Three models are currently available: the 206, 410, and 820. The 820 was introduced in November 1984, and supports up to 8 trunks and 20 stations. A new feature package module was also announced. Station instruments are available in 5-, 10-, and 34-button versions. A hands-free unit and headset jack are available.

The low-end key system marketplace is very competitive, and AT&T-IS has a tough job ahead. It should be easier than most other competitors, though, since AT&T-IS has a very large installed base of 1A2 and Com Key systems that it can sell Merlin

PURCHASE PRICE RANGE hardware & software



AT&T-IS MERLIN PURCHASE PRICE bar graph covers price ranges between "small" and "large" configurations • Model 206 supports up to 2 trunks and 6 stations • Model 410 supports up to 4 trunks and 10 stations • Model 820 supports up to 8 trunks and 20 stations.

AT&T-IS Merlin

Electronic Key Telephone System

in to. Its distributors currently number about 900, but this is expected to increase to 1,500 during 1985. AT&T-IS is limited only by the current size of Merlin, which is 20 stations. This suggests larger versions of Merlin will appear, and, as this report went to press, AT&T-IS unveiled 2 larger Merlin systems, the 1030 and 3070. The 1030 supports up to 10 trunks and 30 stations, while the 3070 handles up to 30 trunks and 70 stations. The new systems will be available by mid-year, and will use the same station equipment to the current Merlin. To take full advantage of its competitive position, AT&T is indeed moving swiftly with Merlin. Users generally are very satisfied with 1A2 key equipment, and it will be difficult to make them change. Watch for AT&T to raise monthly prices of its embedded base equipment as an inducement to upgrade to Merlin.

AT&T's rather large product gap (30 to 100 stations) appears to be closing rapidly, in the light of recent announcements. The company's venerable Horizon has filled this gap since 1979, but its technology is dated, by present digital standards, and persistent rumors of a scaled-down version of the popular System 75 suggest its days are numbered. For those low-end users who are part of a larger corporate communications network, or who want the latest high-tech equipment, the smaller System 75 is an ideal solution. Firms who don't have those particular requirements, and who are looking for a compact, modular system with plenty of features, will find the Merlin an excellent choice. By the end of 1985, AT&T-IS will have a comprehensive product line covering virtually all possible applications.

Strengths

Merlin is a completely modular system. It can be installed with only a screwdriver. It is easy to use, and easy to program. Once cables are installed, the system can be up and running within an hour. AT&T even provides a special user installation guide, which makes the whole process much easier. It has as much flexibility as traditional 1A2 equipment, without the hassles of 25- and 50-pair cable. Its newest models, the 1030 and 3070, will satisfy user requirements at higher line sizes.

Limitations

The system cost per station runs from \$350 to approximately \$950, which is comparable to a digital PBX system. This is exclusive of any installation costs, too. Merlin is limited to 20 stations currently, but the larger versions, announced recently, are likely to appear soon.

SOFTWARE

Terms & Support

Terms • software provided either as part of basic system or through plug-in feature package modules • basic system software bundled with system price • feature modules available separately.

Support • Merlin software is supported by AT&T-IS and authorized distributors.

Software Overview

Merlin software controls all system operations and provides features. Features are either built into the system or are user-programmable. Operating features are implemented in Read Only Memory (ROM) while customer-programmable activities are performed in Random Access Memory (RAM).

Features Overview

Features are functions of plug-in feature package modules. System comes equipped with **Basic Features**, which can be enhanced by **Feature Packages 1 and 2**. For detailed feature descriptions, refer to the **Glossary** in Section 1100 of this volume.

General System Features

Standard Features • automatic line selection • push-button dialing • ringing cutoff • call hold • call waiting • intercom with voice signaling • abbreviated dialing.

Feature Package 1 Option • station conference call • call transfer • on-hook dialing • timed reminder for intercom calls on

hold • outgoing call restriction • speed dialing • automatic intercom dialing • last number dialed recall • save last number dialed • privacy • do not disturb:

\$230 prch

Feature Package 2 Option • expanded toll restriction • personal/system speed dialing • message waiting • group paging • personalized ringing • all features in FP1:

650

Music-On-Hold Option • connects customer-provided music source • plug-in module.

135

Music-On-Hold/Paging Option • provides connection to customer-provided paging and music sources • plug-in module.

285

Extra Alert/Power Failure Option • connects additional audible signal for noisy areas • provides telephone service for up to 2 telephones in power outage • plug-in module:

135

HARDWARE

Terms & Support

Terms • Merlin is available for direct purchase or for 24- and 48-month lease plans • lease rates include maintenance • installation rates separate from equipment cost • installation options: AT&T-IS provides total installation; AT&T-IS installs cable only; customer performs entire installation.

Support • equipment supported by AT&T-IS or distributor • training by AT&T, distributor or customer self-instruction • maintenance by replacement.

Overview

Merlin is a compact, programmable electronic key system that utilizes several types of computer technology in implementing its design. Three specific technologies were used in the development of Merlin: CBIC (Complementary Bipolar Integrated Logic), IIL (Integrated Injection Logic), and NMOS (N-channel Metal Oxide Semiconductor).

The **control unit** contains most of the circuitry and software for Merlin within a small wall- or desk-mounted case. A Bellmac 8 microprocessor, a custom-designed integrated circuit called the protocol handler, the voice switching network, the power supply, and interface circuits and connections to outside lines and devices are part of the control unit.

The Bellmac 8 directs activities of the entire system. It has its own fixed program and data storage—8K bytes of Read Only Memory (ROM) and 1K bytes of Random Access Memory (RAM)—which allow customers to program the system to meet individual needs.

Working with the microprocessor to manage information flow is the **protocol handler**. This custom-designed integrated circuit uses NMOS technology. Besides managing communications, the protocol handler provides for potential system enhancements such as messaging between telephones and automatic testing and trouble isolation. Like the microprocessor, the protocol handler also has both fixed program and data storage (128 bytes of RAM and 1K bytes of ROM).

Another part of the control unit, the **voice switching network**, handles call processing. Switching is done by 2 specially designed 8-port x 8-link integrated circuits which use IIL technology.

Interface circuits within the control unit provide the access to central office or PBX lines, paging or alerting devices, music-on-hold equipment, and acoustic-coupled modems. Other interface circuits provide access to power-failure services, line restriction, and Touch-Tone or rotary dialing options.

A variety of feature cartridges make additional functions available by increasing memory size and adding additional

PRCH: purchase price. Prices effective as of February 1985.

AT&T-IS Merlin Electronic Key Telephone System

software. As the user requires more functions from Merlin, the system's feature complement can increase to meet those needs. For example, by adding 32K bytes of ROM and 6K bytes of RAM to Merlin, Feature Package 1 not only increases the system's memory capacity, but also more than doubles the number of functions available. It adds such features as conference calling, 1-button dialing, and last number dialed. Other cartridges provide music-on-hold, paging, auxiliary signal, and power failure transfer.

Feature cartridges are easily plugged into the control unit. A 50-pin connector makes it almost impossible to insert the cartridge incorrectly. To protect the cartridges against commercial power outages, each cartridge has battery backup for up to 4 days.

Both the Models 206 and 410 can support their full complement of trunks and stations without any modifications. The larger Model 820 requires the addition of expansion modules, each containing circuitry for 2 trunks and 5 stations. The entire system uses modular connectors for ease of installation.

Telephone sets currently available have 5, 10, or 34 buttons. All are available with fixed or adjustable desk stands, or can be wall mounted. The 5-button telephone allows for 1 intercom, 2 to 4 line buttons, and up to 2 features. The 10-button telephone supports 1 or 2 intercoms, 2 to 8 line buttons, and up to 7 custom features. The 34-button telephone has the same 10 buttons as the 10-button set, plus 24 additional programmable buttons. Up to 2 intercoms and 8 line buttons can be supported.

Representative System Configurations

Maximum System Configurations

Model 206: up to 2 trunks/6 stations • **Model 410:** up to 4 trunks/10 stations • **Model 820:** up to 8 trunks/20 stations.

Model 206 Configuration • control unit; Feature Package 1; 4 5-button stations:

\$2,020 prch

Model 410 Configuration • control unit; Feature Package 1; 3 5-button stations; 3 10-button stations; 1 34-button station:

3,655

Model 820 Configuration • control unit; 3 expansion modules; Feature Package 2; 8 10-button stations; 3 34-button stations; 2 hands-free modules; music-on-hold module:

7,415

System Components

Control Unit Model 206:

\$990 prch

PRCH: purchase price; installation not included. Prices effective as of February 1985.

Control Unit Model 410:

1,385

Control Unit Model 820:

1,540

Model 820 Expansion Module • 2 trunks/5 stations:

520

Feature Package 1 Cartridge:

230

Feature Package 2 Cartridge:

650

Music-On-Hold Cartridge:

135

Music-On-Hold/Paging Cartridge:

285

Auxiliary Signal Control/Power Failure Cartridge:

135

Station Equipment—Voice/Data

5-Button Station • 5 programmable buttons • 6 preset buttons • volume control • test/program switch • integral speaker:

\$200 prch

10-Button Station • 10 programmable buttons • 6 preset buttons • volume control • test/program switch • integral speaker:

335

34-Button Station • 34 programmable buttons • 6 preset buttons • volume control • test/program switch • integral speaker:

435

34-Button Deluxe Station • same as standard 34-button unit, but can function as attendant position with direct extension selection:

590 to 630

Hands-Free Module • connects to any station via modular cable:

290

System Maintenance & Diagnostics

System Reliability • backup battery for memory and other logic circuits.

System Diagnostics • system design eliminates need for specialized diagnostic circuitry.

System Maintenance • performed either by AT&T-IS, distributor, or customer • maintenance by replacement.

System Management • users program features at stations.

• END

AT&T-IS Horizon

Hybrid Voice Telephone Switching System

■ PROFILE

Function • stored program computerized hybrid system for switching voice.

Applications Supported • general business; hotel/motel; banking; health care; retail; service sector.

System Parameters • switching technology: analog using space division/PAM • architecture: centralized with blocking • common control: 16-bit microcomputer with system features implemented in ROM and RAM • transmission: 2-wire internal • wiring plan: 4-pair uniform • data switching capability: up to 4800 bps asynchronous using modems.

Traffic Capacity • CCS rating: 500 CCS for system • grade of service: P.01 • simultaneous conversations: 24 • blocking architecture; 24 internal links available.

Trunks/Stations/Consoles • 4 to 32 trunks; 4 to 120 stations; up to 2 attendant consoles and selector consoles (see Table 1) • trunks supported: local C.O. 1-way incoming/outgoing, 2-way; WATS; OCC; 2-wire tie lines; FX; DID (Advanced Phase 2); loop start.

Voice Equipment • **vendor-supplied:** 2500-type telephones; Multibutton Electronic Telephone (MET) 10-button telephone; 7203M MET telephone; Touch-a-Matic 7104 Voice Terminal; 30- or 40-button attendant console; 40- or 80-button selector console; Customer Access Unit (CAU) • **nonvendor equipment supported:** 2500-type telephones • electronic feature telephones: 10-button MET telephone • digital telephones: none.

Data Equipment • **vendor-supplied:** none • **nonvendor equipment supported:** low-speed modems • data rates: 4800 bps using modems • data terminals: Customer Access Unit (CAU) for programming system changes.

Subsystem Support • automatic call distributors: Horizon Call Management System (CMS) • call detail recording systems: Teleser (Advanced Phase 2 only) • hotel/motel management systems: Horizon Hospitality system.

Communications/Networking • tie line networks: functions as end office • tandem switching: none • route optimization: none.

First Delivery • 1979.

Systems Delivered • over 49,000.

Installation Interval • 6 to 8 weeks ARO.

Comparable Systems • American Telecom Focus Hybrid; Executone Gateway; NEC Telephones Electra; IIT 3100; Mitel SX-100; Northern Telecom Vantage; OKI Discovery III; TIE/communications Meritor; Toshiba Perception, Strata.

Environmental Specifications • cabinet dimensions: 27" (W) x 43" (H) x 21" (D); 339 pounds maximum cabinet weight; floor



loading 94 pounds per square foot; power requirements: standard 115 VAC 60 Hz, 3-prong outlet separately fused at 15 amps; temperature: 32 to 90 degrees Fahrenheit; relative humidity: no restrictions • no RF interference equipment located in area • cabinet can be located in office area; does not require separate room • minimum space required: 4' x 6'.

Vendor • AT&T Information Systems; 100 Southgate Parkway, P.O. Box 1955, Morristown, NJ 07960; 1-201-898-8000 • National Sales Center (toll-free) 1-800-247-1212.

Distribution • nationwide through AT&T-IS regional offices • Eastern Region: Parsippany, NJ • Southeastern Region: Tucker, GA • Western Region: Dallas, TX • Great Lakes Region: Chicago, IL • Pacific Region: Oakland, CA.

Service/Support/Training • service, support, and training provided by AT&T-IS • installation provided by AT&T-IS • training consists of 1 or 2 employees trained by AT&T, who then conduct end-user training • additional customer support provided by Customer Access Unit (CAU).

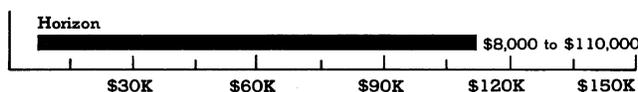
■ ANALYSIS

AT&T's Horizon was originally designed to fill the gap between the company's Dimension PBX and Com-Key product lines. It also represented a new direction for AT&T, in which users were able to make changes in their system's configuration and features, and could obtain detailed statistical information about their system's performance.

Although considered a dated design by many, the Horizon continues to be a successful product for AT&T-IS, particularly with the addition of the **Advanced Phase 2 System**. This latest version

PURCHASE PRICE RANGE

hardware & software



AT&T-IS HORIZON PURCHASE PRICING bar graphs cover price ranges between "small" and "large" configurations for hardware and software • small configuration consists of 72K words of memory with 4 trunks and 4 stations; large configuration includes Advanced Phase 2 software with 25 trunks and 110 stations, with 75% MET stations.

AT&T-IS Horizon

Hybrid Voice Telephone Switching System

TABLE 1: HORIZON SYSTEM CAPACITIES

	HORIZON VSPLUS (16A)	HORIZON VSPLUS EXPANDED	HORIZON BPLUS (32A)	HORIZON ADVANCED CS
Maximum number of stations (1)	39	51	79	120
Maximum number of MET stations	39	39	59	59
Maximum number of non-MET stations	36	48	76	119
Maximum number of Extended Stations (2)	4	8	14	14
Maximum number of trunk lines (1)	16	16	32	32
Maximum number of tie lines (2)	4	8	14	14
Simultaneous conversations	16	16	24	24
Maximum number of toll restricted stations	35	48	42	120
Maximum number of Central Answering Positions (CAPS)	2	2	2	2
Maximum number of DSS Selector Consoles	2	2	2	2

Notes

1. Includes MET, non-MET, and attendant stations; basic system can have full complement of trunks and stations if no auxiliary features used.
2. Maximum tie lines and extended stations cannot be achieved simultaneously.

includes such requested features as Direct Inward Dialing and Station Message Detail Recording, as well as increased user interaction with the system via the Customer Access Unit.

The Horizon comes in 4 basic sizes, ranging from the VSPlus with maximums of 16 trunks and 39 stations to the Advanced CS with 32 trunks and 120 stations. A Hospitality version for small hotel/motel applications is available, with maximums of 16 trunks and 107 stations. For incoming call handling situations, the Horizon Call Management System is available. It can support up to 24 agent positions and 44 trunks in a single-processor version, and 48 positions and 88 trunks in a dual-processor system.

All Horizons come in single-cabinet nonredundant configurations. System control consists of a 16-bit computer with up to 120K words of memory, depending on the model. The smaller VSPlus can be field expanded from 4 stations and 4 trunks to 51 stations and 16 trunks without any reconfiguration. Upgrades to the Model BPlus and the Advanced CS require a system reconfiguration, usually in the form of a cabinet change and new software. Both the VSPlus and the BPlus are targeted at small businesses with moderate growth. Small to medium businesses with growth potential should install the Advanced CS. Hardware in the BPlus and Advanced CS is basically the same. Software is different depending on the system ordered.

The latest version of the Advanced CS is Phase 2, announced June 1984, which incorporates several new features, including Direct Inward Dialing and Station Message Detail Recording. The new DID trunk cards are scheduled for availability November 1984. A new AT&T product called Teleseer, also announced in June 1984, takes output generated by the Horizon via an RS-232C interface, and processes the data into a full series of management reports.

Rumors have been persistent for about a year that a digital Horizon has been in the works. Since the Horizon is an analog system, not designed for any data communication activities, and with the industry moving rapidly toward an all-digital universe, the stage would seem to be set for this type of product. Within the Hybrid Key/PBX industry, which the Horizon ushered in, there are only a few products to date, i.e., NEC Electra 100, ITT 3100, and Toshiba Perception, that are digital. And since most major PBX systems are able to support under-100-line configurations cost-effectively, it seems that this strategy is not appropriate. If AT&T does introduce a digital Horizon, or something fitting the description, it should appear before mid-1985, and should maintain a high degree of compatibility with the analog Horizon. It will probably fit comfortably within the current AT&T datacom environment, but operate solely as an end unit, rather than as a switching hub, like System 75. Otherwise, there will probably not be any announcement of a Horizon replacement, and the new product will come in the form of an expanded Merlin or

down-sized System 75. With over 40,000 systems installed to date, AT&T will continue to support the Horizon, but it's not likely the product will be manufactured much more than 18 to 24 months.

Strengths

Horizon operates very well, once it is properly programmed. It provides solid, efficient telephone service, and its cost is competitive. Installation is generally very smooth, and the system software has been upgraded several times over the years, which has improved its ease of use. Users are responsible for programming the Horizon, and it's essential that the training occur within a week of the cutover. Otherwise, it means either doing it the hard way, or having AT&T do it, usually for about \$1,000. Horizon will handle most small to medium business communication requirements very satisfactorily, provided the user doesn't try to stretch the system's capabilities too far.

Limitations

With any trailblazer, there are bound to be good and bad points to consider. Horizon was the first attempt by AT&T to get users involved in the operation of their systems. As a first attempt, it's not bad, but far from what it could be, particularly when it comes to user-friendliness. The primary customer interface is the Customer Access Unit (CAU), which, upon first glance, is a model of simplicity. Getting used to it takes some doing, and it takes quite a bit of time designing and writing the individual station worksheets. Station user training is now the responsibility of the "System Manager," and this person is also responsible for programming the system and keeping custody of the CAU. The hand-holding users expected from the AT&T of old is no more—users are definitely on their own, and sometimes there's quite a culture shock that goes with it. Training manuals are fairly easy to use, but tend to be confusing at times, leaving the reader wondering what to do next (other than call AT&T).

On a more functional level, some of the Horizon's features are difficult to operate successfully without a lot of practice. The station transfer feature is a particular nuisance, requiring more steps than virtually any other system on the market. The call coverage feature, another way of providing call forwarding, is flexible only that it can be changed via the CAU. It would be much easier if the user could program the forwarding.

Horizon is **not** a data communication switch, and is not marketed as such. It is strictly a **voice-only system**, with a moderate complement of features. Modems can be connected on the end of station lines, and the system will support data speeds up to about 4800 bps, assuming modems are used end-to-end.

AT&T-IS Horizon

Hybrid Voice Telephone Switching System

■ SOFTWARE & FEATURES

□ Terms & Support

Terms • all software is bundled into the Horizon system price with the exception of optional features.

Support • software supported by AT&T-IS.

□ Features Overview

Horizon software controls operations, conducts self-test functions, and provides features that are targeted at 3 functional areas: System Features, Attendant Features, and Station Features.

General System Features

Standard System Features • abbreviated ring; modified ringing cycle to off-hook MET phone • distinctive permanent signal treatment: station left off-hook for 11 seconds is automatically disconnected from the line • flexible numbering (Advanced Phase 2 only): stations can be numbered with 1, 2, 3, or 4 digits • frequently called number list (Advanced Phase 2): table of frequently called numbers with associated costs for ease of call pricing with SMDR option • hold and conference release on abandon (Advanced Phase 2): calls on hold or on a conference call that remain unanswered after a preset time are disconnected from the line • immediate ring: called party receives ringing tone within 1 second of dialing • intercept treatment with reorder tone: calls to an unavailable access code or station line receive a special signal • multilink intercom with privacy: 24-path intercom with privacy • personal dial codes (Advanced Phase 2): each station has a special code that permits the user to originate calls at other stations and have that station function as the user's personal line • pooled facilities: special facilities (WATS, tie lines) can be accessed on specific phones via access codes • station department identification: defines specific department for SMDR • system alarm indications: visual indication at CAP and on circuit boards of system faults • through dialing: attendant can pass dial tone through to station user when making a call • touch-tone to dial pulse conversion: converts tone signals from system to dial pulses • touch-tone calling: all stations tone dial • trunk-to-trunk conferencing: 2 trunk lines can be connected • direct group calling: incoming calls routed directly to specific group of stations.

Central Answering Position (CAP) Option • maximum of 2; functions as attendant console; 40-button unit:

<u> </u>	<u> </u>
\$29.50 mo	\$775 prch

Customer Access Unit (CAU) Option • external unit used to program system features, obtain system traffic data; available with or without cassette unit.

Without Cassette Unit:

<u> </u>	<u> </u>
17.00	535

With Cassette Unit:

<u> </u>	<u> </u>
NA	3,000

Dial Dictation Access Option • provides connection to customer-provided central dictation unit:

<u> </u>	<u> </u>
NA	NA

Direct Inward Dialing Option • supports DID trunks for calling directly to desired station; Advanced Phase 2; circuit board supports 2 DID trunks:

<u> </u>	<u> </u>
NA	NA

Extended Station Capability Option • non-MET sets only; circuit board that supports stations located greater than 2,000 feet from system; requires circuit pack, mounting panels, 20-Hz ringing generator, and loop signaling transmission unit:

<u> </u>	<u> </u>
19.00	600

External Alert Access Option • provides circuitry for external bells, horns, etc:

<u> </u>	<u> </u>
NA	NA

Loudspeaker Paging Access Option • connects to customer-provided external paging system; access usually by dial code:

<u> </u>	<u> </u>
1.50	35

Music On Hold Access Option • connects to customer-provided music source:

<u> </u>	<u> </u>
NA	NA

Out-Of-Building Station Option • connects stations less than 2,000 feet from system; requires station protector, gas tube protector, circuit pack, supplemental power supply:

<u> </u>	<u> </u>
11.00	355

Power Failure Transfer Option • connects predetermined stations to specific trunk lines in the event of a power outage:

<u> </u>	<u> </u>
NA	NA

Supplementary Answering Position Option • second answering position:

<u> </u>	<u> </u>
29.50	774

Tie Lines Options • connects to tie lines from other PBX systems; circuit board for 2 tie trunks; 2-wire tie trunks:

<u> </u>	<u> </u>
12.00	390

Restriction Features

Standard Features • class of service: stations can have up to 4 classes of service, which define access levels to certain features.

Toll Restriction Option • block calls to local calling area, or to specific area codes and NXX exchanges; up to 64 codes programmable:

<u> </u>	<u> </u>
NA mo	NA prch

Routing Features

Standard Features • pooled facilities access feature provides lamp indication on MET set to alert user when a specific trunk group is available.

Call Accounting Features

Station Message Detail Recording (SMDR) Option • records call data on all outgoing calls for subsequent processing into management reports.

SMDR Circuit Card:

<u> </u>	<u> </u>
\$49.00 mo	\$1,750 prch

RS-232 Interface:

<u> </u>	<u> </u>
8.00	220

Teletypewriter:

<u> </u>	<u> </u>
61.00	1,500

Traffic Measurement Facilities Option • measures feature usage; requires scanner/receiver connector, central polling unit, dedicated CO line, auxiliary printer:

<u> </u>	<u> </u>
NA	NA

Attendant Console Features

Standard Features • automatic release; automatically releases incoming calls when transferred from one call to another • call transfer; a user connected to another party can transfer that party to another extension by means of a transfer code, followed by the extension number • camp-on; connects incoming call to busy station, connects call through when station hangs up • cancel; terminates a start call and automatically reconnects the answering position to the original calling facility • manual release; releases the answering position from any active call • return coverage on busy; allows camped-on party to be returned to the attendant after a finite period of time • return coverage on don't answer; returns party to attendant if station is left unanswered • splitting; attendant holds calling party until private consultation with called party is complete; calling party is split away until released.

Attendant Station Selector Console (DSS/SB/MW) Option • enables attendant to enter Direct Station Selection (DSS) mode,

MO: approximate 4-year monthly lease charge including maintenance. PRCH: purchase price. NA: not available/applicable. NC: no charge. Prices effective as of September 1984.

AT&T-IS Horizon

Hybrid Voice Telephone Switching System

Station Busy (SB) mode, or Message Waiting (MW) mode; requires 40- or 80-button station selector console.

40-Button Console:	\$25.00 mo	\$650 prch
80-Button Console:	45.00	1,160
Night Service Option • allows any station to answer any call after hours:	NA	NA

Station Features

Standard MET Features • account code entry button: used for programming a user's account code • automatic intercom with station busy: single-button access to intercom path between 2 MET sets; visual indication of in-use status • call coverage: station call forwarding • call coverage ring options: calls forwarded on all calls (no delay in sending ringing), calls forwarded on busy, calls forwarded on don't answer (system rings several times before forwarding call) • call conference: connects up to 3 users • call park: call on hold within system; can be picked up at another station by dialing a code • call pickup: user within a pickup group can dial and answer another station within the group • call hold: station can place call on hold • call transfer: station can transfer call to another station • call waiting indication: tone alert to station that another call is waiting • compatibility with speakerphone, automatic dialers, headset units • dial access to attendant: attendant reached by dialing "O" • distinctive alert: signals station of specific incoming call status • facilities busy indication: visual indication that all trunks in a group are busy • flexible DSS/out: MET button that can be programmed to automatically dial a specific trunk group or station number when depressed • I-use indication: visual signal that a feature is being used • line status indication: visual signal that displays condition of a line • manual exclusion: denies access to a specific line at other stations • manual signaling: generates audible signal at another station • outward restriction: denies dial access to outside lines • per call ringer cutoff: disables ringer at other stations • personnel line access: permits access to outside line on a station(s) with no intervention by attendant • pooled facilities with button access: permits direct access to a specific facilities group without dialing an access code • preselection: station can override line preference features by manually selecting desired line access button while on-hook • prime line preference: specific line at station is automatically accessed when user goes off-hook • recall button: recalls dial tone from system without hanging up • ringing line preference: audible signal will operate on predesignated line • station DSS: station can designate a button(s) that will dial another station • station message waiting: light in hold button can be activated by attendant with DSS selector console to alert user of a message • station-to-station calling: stations can directly dial each other • tone ringing: audible signal is electronic tone.

MET Station With Busy Lamp Field Option • standard MET set but with 20-lamp busy lamp field:

	\$12.50 mo	\$375 prch
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Standard Non-MET Features • call coverage • call park • call hold • call pickup • call conference • call transfer • call waiting • auxiliary device compatibility • dial access to attendant • outward restriction • station hunting: calls routed to alternate station, can be circular or terminal • station message waiting (requires MW telephone) • station-to-station calling.

Application Software

Hospitality System • used in small/hotel applications • supports up to 107 lines, 16 trunks • maximum single-line stations 104, maximum MET stations 11, maximum consoles 1:

	NA mo	NA prch
--	-------	---------

Horizon Call Management System • functions as automatic call distribution (ACD) system • single and dual configurations • maximum trunks (single) 24, (dual) 48; maximum agent positions (single) 44, (dual) 88 • incoming calls handled by next available agent that has been idle the longest:

	NA	NA
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HARDWARE

Terms & Support

Terms • available on direct purchase, month-to-month lease, 2-, 4-, and 6-year leases • leases include maintenance • purchased systems have 1-year warranty.

Support • equipment installed by AT&T-IS • training provided by AT&T-IS • maintenance provided by AT&T-IS; maintenance contracts available for purchased systems.

Overview

The Horizon has 4 models, each contained in a single cabinet. All components are contained in the cabinet, including the power supply. Plug-in circuit boards are used to develop the system configuration. All station sets use uniform 4-pair wiring. The Horizon cannot be upgraded to a Dimension system, if the user's needs increase beyond the Horizon's capacities. Upgrades within the product line are relatively easy.

Representative System Configurations

Horizon B Plus • nonredundant system • voice only • 30 stations, 8 trunks, 1 console with 40-button DSS unit, CAU w/o tape, paging access, 20 MET sets, 2 MET sets w/BLF, 6 single-line telephones:

	\$983.00 mo	\$28,200 prch	\$138 maint
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Horizon Advanced Phase 2 • nonredundant system • voice only • 68 stations, 16 trunks, 1 tie line, 1 off-premises station, 1 console with 80-button DSS unit, CAU w/o tape, SMDR output, 58 MET sets, 10 single-line telephones:

	1,886.00	53,750	256
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Station Equipment—Voice/Data

Multibutton Electronic Telephone (MET) • 10-button set • 5 fixed buttons, 5 programmable buttons • touch-tone pad, tone ringer, volume control, recall button:

	\$9.50 mo	\$315 prch	NA maint
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Multibutton Electronic Telephone With Busy Lamp Field • same as standard MET, includes 20-LED busy lamp field:

	12.50	375	NA
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Single-Line Touch-Tone Telephone:

	2.75	77	NA
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Central Answering Position (CAP) • 40-button set • 5 fixed buttons like MET • touch-tone pad, tone ringer, volume control, recall button:

	29.50	775	NA
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Direct Station Selection (DSS) Selector Console • connects incoming calls to stations • functions as busy lamp field and message waiting unit • 40-button and 80-button versions.

40-Button Unit:

	25.00	650	NA
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80-Button Unit:

	45.00	1,160	NA
--	-------	-------	----

MET Station Circuit Pack • 4 stations per board:

	14.00	465	NA
--	-------	-----	----

Non-MET Station Circuit Pack • 4 stations per board:

	22.00	700	NA
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CO/PBX Loop Packs • 2 trunks/PBX stations per board • supports CO, WATS, FX trunks:

	11.00	355	NA
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MO: approximate 4-year monthly lease charge for minimum and maximum system configurations including maintenance; 4-year monthly lease charge including maintenance for system components. PRCH: purchase price. MAINT: monthly maintenance fee. NA: not available/applicable. NC: no charge. Prices effective as of September 1984.

AT&T-IS Horizon Hybrid Voice Telephone Switching System

Tie Line Circuit Pack • 2 circuits per board • supports 2-wire E&M lines:

12.00	390	NA
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DID Trunk Circuit Pack • 2 DID trunks per board • Advanced Phase 2 only:

NA	2,000	NA
----	-------	----

Extended Station Circuit Pack • 2 circuits per board • distances over 2,000 feet from switch:

19.00	600	NA
-------	-----	----

SMDR Circuit Pack • interface between Horizon SMDR and outside processing units:

49.00	1,750	NA
-------	-------	----

Power Supply:

12.00	390	NA
-------	-----	----

Peripherals

Customer Access Unit (CAU) • device for customer programming of station features • touch-tone pad, 3 or 4 command keys • available with or without cassette tape drive.

W/O Tape:

\$17.00 mo	\$535 prch	NA maint
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With Tape:

NA	3,000	NA
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Subsystems

Teleseer SMDR Unit • accumulates call data records from Horizon and processes into management reports • stores up to 28,000 call records • supports up to 500 stations.

Teleseer Unit:

\$145.00 mo	\$6,100 prch	NA maint
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Record System Software:

40.00	700	NA
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System Initialization Software:

15.00	600	NA
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Remote Alarm:

NC	280	NA
----	-----	----

Update/Replacement Software Cartridge:

NC	400	NA
----	-----	----

Remote System Update • updates rate tables, area codes:

NC	300	NA
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■ SYSTEM MAINTENANCE & RELIABILITY

System Reliability • main system functions stored on ROM; restored upon power-up • standby battery option can keep contents of RAM up for 4 days • power failure transfer connects designated trunks to stations upon power outage.

System Diagnostics • system automatically monitors performance, signals of malfunction at attendant position • technicians use Service Access Unit (SAU) to execute specific diagnostic routines • on-site diagnostics only.

System Maintenance • no action by user; all maintenance by AT&T • repairs generally by replacing circuit board.

System Management • Customer Access Unit (CAU) permits users to configure pickup groups, call coverage, relocate stations, change class of service, change toll restriction codes.

• END

AT&T-IS Dimension PBX Systems

Dimension Prelude, 400, 600SN, 600 & 2000/Custom

■ PROFILE

Function • stored program computerized branch exchange systems for switching voice and data.

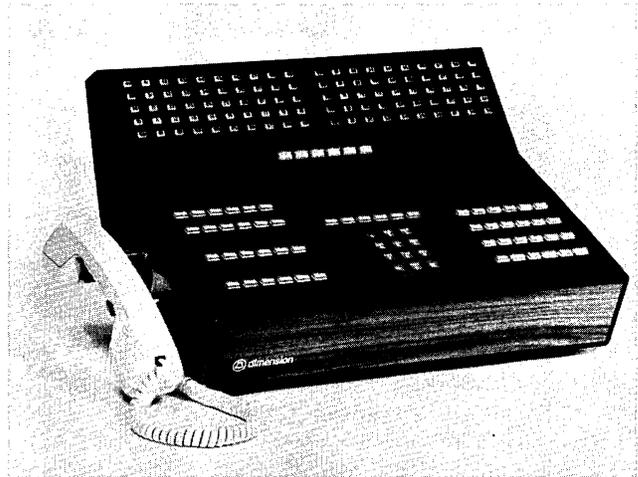
Applications Supported • office automation; word processing; hotel/motel; health care; retail; general business; banking; service sector; energy and security (building) management.

System Parameters • switching technology: analog with TDM/PAM • architecture: centralized using time-division bus; blocking • common control: 16-bit computer with 32K to 1024K words of memory; operating system built into EPROM • transmission: 2-wire twisted pair • wiring plan: 2, 3, or 4 pairs per station; twisted pair • data switching capability: up to 9600 bps, asynchronous and synchronous; full- and half-duplex.

Traffic Capacity • CCS rating for system/stations: 1662 CCS for single-bus Dimension Prelude, 400, and 600; 3672 CCS for dual-bus Dimension 600, Dimension 2000/Custom; 6 to 10 CCS per station average • grade of service: P.01 • simultaneous conversations: 64 (single bus) to 128 (dual bus) per network module; processor can handle up to 1,800 busy-hour calls • nonblocking architecture: none.

Trunks/Stations/Consoles • Dimension Prelude; 4 to 78 trunks; 32 to 372 stations; 2 to 4 attendant consoles • Dimension 400; 26 to 64 trunks; 112 to 436 stations; 4 attendant consoles • Dimension 600SN (Small Network); 20 to 184 trunks; 60 to 350 stations; 14 attendant consoles; networking • Dimension 600; 20 to 184 trunks; 240 to 1,084 stations; 14 attendant consoles • Dimension 2000/Custom; 200 to 840 trunks; 1,200 to 7,200 stations; 38 attendant consoles.

Voice Equipment • vendor supplied: 500- and 2500-type telephones; Multibutton Electronic Telephones (MET), 7000 Series electronic telephones; 40- to 80-button attendant console with either 100-lamp busy lamp field (BLF) or 100-button direct station selection/busy lamp field (DSS/BLF); Call Management System telephones (ACD application) • **nonvendor equipment supported:** industry-standard 500- and 2500-type telephones • rotary dial/touch-tone service: both supported • single-line/key telephones: industry-standard single-line and 1A2-type key



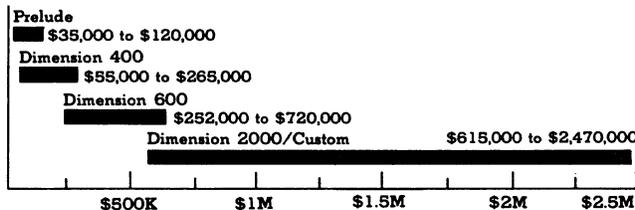
equipment supported • electronic feature telephones: 5-, 10-, 20-, and 30-button MET telephones; 7101A single-line voice terminal; 7103A voice terminal; 7203H multiappearance hybrid voice terminal • digital telephones: 7403D multiappearance digital voice terminal; 7405D multiappearance digital voice terminal.

Data Equipment • vendor supplied: 16-bit minicomputer running UNIX operating system (AP-16, Applications Processor); 500 Business Communications Terminal (BCT); 513 BCT asynchronous display terminal; 515 BCT integrated voice/data workstation; System Management Terminal (SMT); Force Administration Data System (FADS); Sceptre videotex terminal; 400 series printers; Distributed Communications Service (DCS); Peripheral Interface Controller (PIC) • **nonvendor equipment supported:** IBM 2780/3780 Remote Batch Terminals (RBT); Teletype Model 33/35 teleprinters; IBM 3270 System; microcomputer interface: minicomputer interface; magnetic tape interface • data rates: up to 9600-bps asynchronous or synchronous • modems; any type that supports up to 9600-bps async/sync; modem pooling available • multiplexers; most types supported • protocol converters: most types supported • data modules; Data Interface (DI) connects data terminal to PBX via Data Port (DP), which connects to PBX backplane; 2 DIs connect to a DP; Voice/Data Link (VDL) connects PBX modules together for switching data between modules • interfaces supported: RS-232C, RS-366 • printers: 400 series, 43A teleprinter, journal printers • data storage: 20-/40M-byte hard disk for Applications Processor; 9-track 1600-bpi tape drive • data terminals: 500 Business Communications Terminal (BCT); 513 BCT asynchronous display terminal; 515 BCT integrated voice/data workstation; System Management Terminal (SMT); Sceptre videotex terminal; standard ASCII/TTY terminals with RS-232C interface.

Subsystem Support • automatic call distributors: Call Management System; uniform call distribution • call detail recording systems: station message detail recording (SMDR); call detail recording and reporting (CDRR); Teleser • voice message systems: product based on IBM Audio Distribution System • message center systems: Message Center Service; Electronic Document Communications • electronic directory systems: Directory Enhancement for Message Center • centralized

PURCHASE PRICE RANGE

hardware & software



AT&T DIMENSION PBX PURCHASE PRICE bar graphs cover price ranges between "small" and "large" configurations for hardware products including feature package software • Dimension Prelude configuration consists of 32K memory for all systems; small system includes 10 trunks and 90 stations; large system includes 28 trunks and 230 stations • Dimension 400 small configuration consists of 48K memory with 15 trunks and 100 stations; large configuration consists of 64K memory with 36 trunks and 320 stations • Dimension 600 small configuration consists of 176K memory with 45 trunks and 390 stations; large configuration consists of 256K memory with 125 trunks and 740 stations • Dimension 2000/Custom small configuration consists of 256K memory with 85 trunks and 910 stations; large configuration (2000) consists of 384K memory with 195 trunks and 1,860 stations.

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attendant service: optional feature • energy management systems: Energy Communications Service Adjunct • hotel/motel management systems: Automatic Wake-up Service; Communications Interface for Property Management System.

Communications/Networking • abbreviated dialing: included with Electronic Tandem Network (ETN) option • off-network dialing: included with ETN • on-network dialing: included with ETN • dialed digit translation: included with ETN • route optimization: route advance; automatic route selection; outgoing trunk queuing • tandem switching: included with ETN • transmission rates: 9600-bps (data) asynchronous and synchronous • T-1 interface optional • gateways: none supported • local area network: interfaces to AT&T Information Systems Network (ISN).

First Delivery • Dimension Prelude: 1984 • Dimension 400: 1975 • Dimension 600SN: 1984 • Dimension 600: 1980 • Dimension 2000/Custom: 1976.

Systems Delivered • to date, AT&T has shipped over 40,000 Dimension PBX systems.

Installation Interval • depending on model and configuration, 6 to 24 weeks ARO.

Comparable Systems • American Telecom Focus, Anderson Jacobson IOX, Anaconda-Ericsson ASB 100/900, Bell Operating Company Centrex service • DTI 580 DSS Series • Ericsson MD 110/Prodigy • Executone Eclipse/Vista/Enterprise • GTE Omni Series, GTD-4600 • Harris Digital 400/1200 • Hitachi DX Series • InteCom IBX • IPC Technologies DPX Series • Mitel SX-100, SX-200, SX-2000 • NEC NEAX-12A, NEAX 2400 • Northern Telecom SL-1 Family • Oki Discovery, Spectrum • Rolm CBX II • Siemens SD-192/232, Saturn Family • Solid State Systems STS-16, CEO • Tele/Resources TR/150 Series • TIE/communications Mercury • United Technologies/Lexar UTX Family • Zitel PNX.

Environmental Specifications • cabinet dimensions: 31.5 inches (W) x 24 inches (D) x 69.5 inches (H); 750 pounds maximum cabinet weight; floor loading 50 pounds per square foot • power requirements: commercial 120 VAC at 60 Hz with 20 ampere circuit breaker per cabinet; input voltage range from 99 VAC to 129 VAC; each 20-amp circuit protected by thermal magnetic circuit breaker (ITE Q120-B020 or equivalent); outlet requires Hubbell Twist-Lock receptacle IG-2310, or equivalent • environment: temperature range 65 degrees to 95 degrees Fahrenheit; relative humidity: 20 to 60 percent noncondensing; air conditioning recommended; minimum 6-inch distance between ceiling and top of each cabinet required for air flow • minimum floor space required for 2-cabinet system 80 square feet (8 feet x 10 feet with 8-foot-high ceiling).

Vendor • AT&T Information Systems; 100 Southgate Parkway, P.O. Box 1955, Morristown, NJ 07960 • 201-898-8000; National Sales Center 1-800-247-1212 (toll-free).

Distribution • nationwide through AT&T regional offices • Eastern Region; Parsippany, NJ • Southeastern Region; Tucker, GA • Western Region; Dallas, TX • Great Lakes Region; Chicago, IL • Pacific Region; Oakland, CA.

Service/Support/Training • service, support, and training provided by AT&T-IS • training consists of one or two employees trained by AT&T, who then conduct end-user training • additional customer support provided by Maintenance and Administration Panel (MAAP).

■ ANALYSIS

For over 10 years, the AT&T Dimension PBX has been the system to beat. Its over 40,000 installations worldwide is rivaled only by the Mitel SX-200, which has about 10,000 less. Although not the first on the market with a stored-program computer-based PBX, the Dimension introduced more businesses to the benefits of this technology than any other PBX. Although the system's technology is knocked by many in the industry as outdated, Dimensions are still being manufactured and sold—solid testimony to a product that has been right for the times.

But the industry is changing. The trend is toward the integration of voice and data communication—a capability not inherently in the

design of the original Dimension. AT&T has continually refined the Dimension by adding features, improving customer management of the system, and, most recently, enhancing data communication support. Although AT&T now has its own digital PBX products, the System 75 and Dimension System 85 (Report 910-A789-3000), it appears the firm does not intend to let Dimension disappear from the scene—at least not for a while. There are still many users who have little or no need for integrated voice/data switching, and AT&T intends to keep these users satisfied.

The Dimension product line includes the Prelude, the 400, 600, 600SN, and the top-end 2000 and Custom. An earlier entry-level system, the Dimension 100, has been phased out, although it is still supported in the field. Each model is expandable from its smallest to its largest configuration in the field. Upgrades from one product to another generally require a complete changeout of major system components, although existing equipment cabinets can be reused. Station line sizes range from 20 to over 6,500.

The Dimension Prelude is a multicabinet, nonredundant system. The system control consists of a 16-bit computer with 112K EPROM operating system memory and 32K words of RAM. The Prelude is available in three single-cabinet models (A, B, C) and seven multicabinet models (D through J). The smallest model (A) is equipped for 32 lines and 4 trunks. The largest model (J) is a 3-cabinet model and is equipped to grow to 308 lines and 78 trunks. The Prelude is closely related to the Dimension 400 PBX using Feature Package 15.

The Dimension 400 is a two-cabinet, nonredundant system. System control consists of a 16-bit computer with 40K to 128K words of memory. The system can be expanded from the minimum of 112 stations/26 trunks to a maximum of 436 stations/46 trunks (maximum line configuration) or 308 lines/110 trunks (maximum trunk configuration) **without reconfiguration**. It is targeted for medium businesses with moderate to large growth patterns.

The Dimension 600SN is a multicabinet, redundant system. System control consists of a 16-bit computer with 256K words of memory. The 600SN (Small Network) is a smaller version of the 600 that is designed to permit networking in location with 60 to 350 stations. Dimension 600SN offers similar capacity to the Dimension 400, however, the 600SN can operate as part of a Distributed Communications System (DCS) or Electronic Tandem Network (ETN). The 600SN uses the same **Feature Package 8** software as the larger Dimension systems, and supports transparent communication between Dimension PBXs in an ETN or a main/satellite environment via DCS, along with centralized management and control. It offers digital data switching up to 9600 bps.

The Dimension 600 is a two- to four-cabinet, redundant system. System control consists of a 16-bit computer with 256K words of memory. If the redundant feature is used, another computer with 256K words is installed in the system. The system can be expanded from two cabinets with 240 stations and 20 trunks to four cabinets with 1,024 stations/42 trunks (maximum line configuration) or 608 lines/266 trunks (maximum trunk configuration) with a **minimum amount of reconfiguration**. It is targeted for medium to large businesses with moderate growth patterns.

The Dimension 2000/Custom is a 5- to 75-cabinet, redundant system. System control consists of a 16-bit computer with a capacity of 512K words. If the redundancy feature is used, another computer with 512K words is installed in the system. The system can be configured from five cabinets with 1,200 stations and 200 trunks to 75 cabinets with 2,036 trunks and 6,552 stations when using Feature Package 8 and 768 stations/192 trunks when using Feature Package 9 (Hotel/Motel) **with a minimum amount of reconfiguration**. The Custom is usually used for 2,400-station applications and up. The Dimension 2000/Custom is targeted for very large multidivisional businesses with large growth patterns.

All AT&T PBX systems share commonalities that bear mentioning. Switching is performed by pulse amplitude modulation (PAM)/time-division multiplexing (TDM) techniques, except for the System 85, which uses PCM. The PBX interfaces with outside

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trunks, tie trunks, and station equipment. Every call and feature is supervised and controlled by the computer. All communication within the PBX systems take place over the I/O bus. The path is between the computer to the remainder of the PBX, back to the computer. When redundant computers are used, one computer system will monitor the other and automatically take control of the PBX if the primary computer has a malfunction. Ongoing operation will continue without interruption.

The time-division multiplexing control group is an interface between the computer and the audio cards in the PBX. The TDM eliminates the need for large numbers of hardwired connections because a single voice connection is time sliced into thousands of time periods. The sampling speed is so high, a constant voice pattern appears to be heard by the user.

The memory and memory control are comprised of circuit packs that consist of program memory (ROM) and variable data memory (RAM), which consists of 17 bits (16 bits for data and 1 bit for parity). When the PBX is configured for the customer, the configuration tape is read into the RAM for operation under control of the ROM.

All AT&T stations and attached devices use either 2, 3, or 4 wires. The number of wires used depends on the station device: 2 wires for analog, 2 wires for power, and 4 wires for digital. The number of wires required for each station device depends on the design of the device.

AT&T Information Systems (formerly American Bell) was formed to meet the requirements of the divestiture of AT&T operations that took place in January 1984. AT&T Information Systems will be the primary marketing force for all AT&T PBX products.

□ Strengths

Dimension Prelude is a modular PBX in the Dimension family that is expandable from the small 32-station to medium 308-station size. It is a low-cost system that offers a full range of voice features, call management capabilities, network and tandem switching arrangements, and system management and control capabilities. Prelude is closely related to the Dimension 100/400 PBX, Feature Package 15. Features that were added to FP15 for the Prelude are Automatic Attendant Access, Automatic Callback-Busy/Don't Answer, Directed Call Pickup, Night Station Service-Automatic, 6-Way Meet-Me Conference, 6-Way Station Conference, and Splitting-2-Way Manual. Deleted features from FP15 are Attendant Release Loop, Automatic Identified Outward Dialing, Centralized Attendant Service, and Electronic Custom Telephone Service. Prelude adds communication and networking for the small PBX customer that was previously lacking in the Dimension family.

The Dimension 400 has a 400-station variation for internal growth. This gives the user the flexibility of changing large areas with a minimum amount of reconfigurable efforts. The same software capabilities are present in the Dimension 400 as in a smaller system plus FP15 (General Business).

Dimension 600SN (Small Network) is a smaller Dimension 600. Designed for cost-effective networking in sites with 60 to 350 stations, the 600SN is priced significantly lower than the standard 600. Unlike the Dimension 400, the 600SN can operate as part of a Distributed Communications System (DCS) or Electronic Tandem Network (ETN). 600SN works with an Applications Processor, providing facilities management/terminal change management, message center and directory, call detail recording and reporting, electronic document communication, and data communication features.

600SN uses FP8 software, which is the same Feature Package used by the large Dimension systems and System 85. Transparent network communication is available along with digital data switching up to 9600 bps. The 600SN offers the customer a migration path to larger PBXs and System 85.

The Dimension 600 has a 900-station variation for internal growth. The 600 was long awaited, since there was a very large gap in performance between the 400 and the 2000. The 600 alleviated this problem with its capabilities and dual processing features. The Dimension 600 supports all the FPs as the larger PBXs **excluding FP11** (Deluxe-Hospitality).

The Dimension 2000/Custom has a 6,000-station variation for internal growth. National companies will have compatibility with all other Dimension systems when using a Dimension 2000/Custom.

□ Limitations

The Dimension's use of analog time-division switching doesn't hinder its success as a voice-only PBX, but limits its data switching capabilities. Users with significant data requirements are usually encouraged to migrate to the Dimension System 85, or, for applications under 400 station lines, the System 75.

Although the Dimension has traditionally been more expensive than most other PBXs on the market, it nonetheless has been the all-time best seller. Interestingly, it is now possible to get a more powerful System 75, with all its sophisticated data/voice switching capabilities, for considerably less than a comparable Dimension. According to AT&T, it will regularly increase Dimension pricing on a 6-month basis, an obvious effort to encourage embedded-base Dimension users to migrate to the newer digital products. After frustrating users for many years with payment plans like month-to-month and the "famous" Variable Term Payment Plan (VTTP), AT&T Information Systems, the unregulated subsidiary of parent AT&T, can offer the Dimension for direct purchase, as well as month-to-month, and 2-, 4-, and 6-year lease plans. Third-party leasing is also available, an option unknown to most Dimension users. AT&T's marketing thrust is undoubtedly digital, and analog Dimensions are sold only when it has no other alternative, or the customer needs a system quickly, and won't wait 6 to 8 months for a System 75 or 85.

Another limitation is the Dimension's internal traffic capabilities. Systems usually have either 64 or 128 time slots per operating module, which does **not** produce a nonblocking environment, especially if there is data switching. The emphasis today, if all the major digital PBX manufacturers are to be believed, is nonblocking switching. The Dimension, in a low to medium traffic situation (3 to 12 CCS per station line), can hold its own with any machine on the market, but when calling volumes get higher, users run the risk of using up all the time slots, effectively bringing the system "to its knees." The solution to this dilemma is usually a recommendation to install the next higher product, i.e., a Dimension 400 moving to a 600, a 600 to a 2000. This means a stiff installation charge, because major components must be replaced when making the transition. Careful planning of **all** system requirements, especially traffic, should eliminate this problem. The newer digital PBXs from AT&T have more powerful traffic handling capabilities than the analog Dimension, and are probably the more appropriate route to follow when considering an upgrade.

Although Dimension Feature Packages have numerous applications and functions, they are still essentially fixed in their structure. There has been a considerable effort made to construct vertical marketing areas, however, and if the customer does not have the requirements that are covered in the Feature Packages, a detailed effort must be made to determine the closest Packages to fit the needs of the organization.

AT&T Information Systems is going to have a difficult task competing in the extremely competitive PBX marketplace. The divestiture has placed it in a strongly competitive position where it lacks experience and must quickly learn the rules of the game and develop an effective market strategy. It is now in a position that it was never in before. Its products are numerous, however, and it must have the resources to actively compete on a one-to-one basis without the big hand of AT&T behind every move.

■ SOFTWARE

□ Terms & Support

Terms • all software is bundled into the PBX system price with the exception of optional features.

Support • PBX system software is supported by AT&T • field-developed software is supported by the individual operating company that authors the programs.

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□ Software Overview

PBX software controls operations, conducts self-test functions, and provides features. It should be noted that all Feature Packages of the AT&T PBX family are software driven and targeted at three functional areas: System Features, Attendant Features, and Station Features. System software consists of the Operating System, Self-Test, and Configuration Tables.

The operating system defines major parameters and functions, and also controls the distribution of calls and methods of route selection and optimization.

The self-test feature supports online testing of PBX system performance. Error table printouts are available upon request. System fault error codes are stored in the PBX memory and made available to local or remote access.

The configuration tables contain information unique to each AT&T installation, and can be changed or moved. The tables are used to define station characteristics and control assignments.

□ Features Overview

AT&T bundles PBX features into **Feature Packages**. Dimension features have evolved over the years into 5 specific groupings: **Prelude**, designed for the Prelude product line; **FP 8**, Deluxe Intercity with Electronic Tandem Network (ETN) and Electronic Custom Telephone Service (ECTS), available in two versions, Issue 2 and Issue 3, which include specialized applications; **FP 9**, Hospitality Communications System/Hospital Communications Management System used for lodging and healthcare applications; **FP 11**, Deluxe Hospitality/Hospital Communications System, which adds features to FP 9; and **FP 15**, Deluxe General Business, which is used for most typical business applications, includes ECTS • all system features can be upgraded to the most recent releases by returning the system tapes to AT&T for updating, also known as **blow-back**.

General System Features

Standard Features • Attendant Console: incoming calls all processed by attendant console • Distinctive Ringing: station ringing cycles signal type of call • Flexible Numbering of Stations: stations can be numbered with either 3 or 4 digits • Foreign Exchange (FX) Service: access to FX trunks • Intercept Treatment: calls to vacant or unassigned stations receive distinctive signal • Line Lockout with Warning: stations left off-hook after predetermined length of time are first sent a howler tone, followed by release from the PBX • Listed Directory Number (LDN) Service: access to local C.O. trunks • Multiple LDN: access to more than one local trunk group with indication at console • Night Service: after hours calls handled either by connecting trunks directly to stations or by dialing a special code to answer an incoming call • Off-Premises Stations: connection for stations not located in same building as PBX • Power Failure Transfer: prearranged stations are connected to trunks for service in a power outage • Remote Access to PBX Services: outside callers can dial special trunk, enter authorization code, and transact calls like an internal station • Remote Maintenance and Testing Service (RMATS): system to provide real-time diagnostics of system for both user and system supplier • Rotary Dial Calling: dial telephones supported • Tie Trunk Service: access to tie trunks • Toll Terminal Service: access to special trunks for long-distance calling in hotel/motel (FP 9/11 only) • Touch-Tone Calling: tone dial telephones supported • Touch-Tone to Dial Pulse Conversion: converts tone signals to rotary dial pulses for connection to rotary dial central offices • Trunk Answer from Any Station: night service feature, users answer incoming calls by dialing special code • WATS Service: access to WATS trunks, both oncoming and outgoing • Wide Frequency Tolerant Power Supply: internal power source able to accept variable power levels from commercial power sources.

Automatic Call Distribution (ACD) Option • routes incoming calls to agent positions based on agent available for a call; FP 8 only:

NA mo	NA prch	NA maint
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Centralized Attendant Service (CAS) Option • routes incoming LDN calls from multiple system locations to centralized attendant positions; except Prelude, FP 9:

NA	NA	NA
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Code Calling Access Option • interface to customer-provided coded signaling system:

NA	NA	NA
----	----	----

Communications Interface for Property Management Systems Option • provides access to customer-provided front desk system for room status, wake-up, reservations, etc; FP 9/11 only:

NA	NA	NA
----	----	----

Customer Administration Center System (CACS) Option • system for handling customer-controlled administrative activities, such as moves and feature changes; FP 8 only:

NA	NA	NA
----	----	----

Customer Administration Panel (CAP) Option • device used for making feature changes, obtaining traffic information from system:

NA	NA	NA
----	----	----

Direct Department Calling (DDC) Option • permits incoming trunk calls to bypass attendant and terminate directly at preselected group of stations; except FP 9:

NA	NA	NA
----	----	----

Direct Inward Dialing (DID) Option • permits incoming trunk calls to bypass attendant and terminate directly on designated stations:

NA	NA	NA
----	----	----

Energy Communications Service (ECS) Option • controls activity of various energy-consuming devices in hotel/motel or hospital; FP 9/11 only:

NA	NA	NA
----	----	----

Energy Communications Service Adjunct (ECSA) Option • controls activity of various energy-consuming devices via PBX station lines; except Prelude:

NA	NA	NA
----	----	----

Enhanced Uniform Call Distribution (EUCD) Option • provides additional features over standard UCD; FP 8 only:

NA	NA	NA
----	----	----

Facilities Administration & Control Option • provides detailed information on system facilities activities; FP 8 only:

NA	NA	NA
----	----	----

Force Administration Data System (FADS) Option • provides traffic data on both CAS and UCD operations; FP 8/11 only:

NA	NA	NA
----	----	----

Loudspeaker Paging Option • interface to customer-provided or AT&T-provided paging system:

NA	NA	NA
----	----	----

Music-On-Hold Access Option • interface to customer-provided music source:

NA	NA	NA
----	----	----

Radio Paging Access Option • interface to customer-provided radio paging system:

NA	NA	NA
----	----	----

Recorded Telephone Dictation Access Option • interface to customer-provided telephone dictation system:

NA	NA	NA
----	----	----

Reserve Power Option • independent power source for temporary power during a short-term outage:

NA	NA	NA
----	----	----

Speed Calling Option • provides directory of frequently called numbers accessed by special dial code; except FP 9:

NA	NA	NA
----	----	----

Station Rearrangement & Change Option • in conjunction with

PRCH: one-time right-to-use fee. MO: month-to-month lease charge including maintenance. MAINT: annual maintenance charge. NA: not available/applicable. NC: no charge. Prices effective as of October 1984.

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CACS or CAP, permits user-controlled station moves and feature changes:

NA NA NA

Uniform Call Distribution (UCD) Option • routes incoming calls to designated stations according to preset pattern; Prelude, FP 11/15 only:

NA NA NA

Restriction Features

Standard Features • Class of Service: group of features and restrictions assigned to a station • Code Restriction; denies selected station lines completion of dialed outgoing exchange network calls to selected offices and area codes • Data Privacy; station user will deny other potential users the ability to override or gain access to the used line; restrictions released when station placed on-hook • Data Restriction; station or group denies other users ability to gain access to the station or group; attempted bridge-on is routed to a tone • Fully Restricted Station; denies the ability to place or receive anything but station-to-station calls • Inward Restriction; stations prevented from receiving incoming Common Control Switching Arrangement (CCSA), tie trunk, and exchange network calls; either direct dialed or attendant completed • Originating Restriction; prohibits station line from originating calls • Outward Restriction; call attempts are routed to the intercept tone; station can not use CO, FX, CCSA trunks • Station-to-Station Restriction: internal calls only are restricted • Termination Restriction; stations cannot receive calls at any time • Toll Restriction; prohibits users of particular trunks from dialing any number except specified office codes and area codes • Miscellaneous Trunk Restriction; denies dial access from preselected station lines to preselected trunk groups.

Authorization Code Option • requires station user to dial special access code prior to dialing desired facility; FP 8 only:

NA mo NA prch NA maint

Call Routing Features

Standard Feature • Route Advance routes outgoing calls to alternate facilities when the first-choice trunk group is busy:

NA mo NA prch NA maint

Automatic Alternate Routing Option • automatic routing of tie trunks over up to four alternate trunk groups:

NA NA NA

Automatic Overflow to DDD Option • optional routing of private network calls via off-net facilities from a point on the network where all on-net routes are busy or none are provided:

NA NA NA

Automatic Route Selection Option • provides automatic routing of outgoing calls over alternate customer facilities based on the Direct Distance Dialing (DDD) number; incorporates the functions of and replaces the code restriction and route advance features:

NA NA NA

Deluxe Queuing Option • allows all trunk calls to be placed in queue whenever all routes for completing a particular call are busy:

NA NA NA

Outgoing Trunk Queuing (OTQ) Option • outgoing trunk calls to busy trunk group are placed in queue, then called back by system when trunk available:

NA NA NA

Call Accounting Features

Standard Feature • Automatic Identification Outward Dialing (AIOD); calling station or trunk is identified to permit individual billing on toll calls.

Centralized Station Message Detail Recording (CSMDR) Option • records station calling details for multiple Dimension PBXs; FP 8 only:

NA mo NA prch NA maint

Call Detail Recording & Reporting (CDRR) Option • using

Applications Processor, records calling data and outputs detailed management reports; FP 8 only:

NA NA NA

Station Message Detail Recording (SMDR) Option • provides station or attendant identity, starting time, duration, and trunk group used for outgoing and/or incoming calls:

NA NA NA

Station Message Register Option • records number of local message unit calls generated by hotel/motel guest phone; FP 9/11 only:

NA NA NA

Data Features

Standard Features • Data Privacy: denies other stations ability to override or gain access to data line while in use • Data Restriction: denies access to station or trunk group while data is being transmitted.

Data Communications Access Option • permits connection of customer-provided data equipment to PBX stations/trunks via standard modems; FP 8 only:

NA mo NA prch NA maint

Data Switching Option • permits direct connection of data devices to PBX via Data Interfaces and Data Ports for switching to other devices; FP 8 only:

NA NA NA

Network Features

Advanced Private Line Termination (APLT) Option • maximum of 99 trunk groups that provide access to and termination from private line networks:

NA mo NA prch NA maint

CCSA Access Option • access from the inward dialing from the CCSA network, outward dialing from the PBX without attendant assistance:

NA NA NA

Facilities Restriction Level (FRL) Option • class of service information for a station that determines which facilities it can access; FP 8 only:

NA NA NA

Inter-PBX Call Transfer Option • calls transferred to and from a Main and Satellite PBX system:

NA NA NA

Main/Satellite Option • allows multilocation PBX users to concatenate their attendant positions at two locations:

NA NA NA

Tandem Tie Trunk Switching Option • allows tie trunk-to-tie trunk, tie trunk-to-CCSA, and tie trunk-to-exchange network connections through the switching system dialed directly by the remote PBX station user:

NA NA NA

Traveling Class Mark (TCM) Option • class of service (FRL) information about a station user attempting to complete a call over an ETN that determines the facilities the call can use at a distant switching node; FP 8 only:

NA NA NA

Uniform Numbering Plan Option • permits users at a Satellite or Main PBX to place calls over tie trunks using a uniform dialing plan:

NA NA NA

Attendant Console Features

Standard Features • Alphanumeric Display for Console: LED displays provide call information and status • Attendant Control of Trunk Group Access: restriction of station access to specific trunk groups • Attendant Direct Station Selection (DSS) with Busy Lamp Field (BLF): single-button connection of calls to stations, visual display of busy condition of station • Attendant Lockout: prevents attendant from reentering connected station call • Attendant

AT&T-IS Dimension PBX Systems

Dimension Prelude, 400, 600SN, 600 & 2000/Custom

Transfer: calls can be transferred by attendant • Attendant Call Waiting: extending call to a busy station sends special tone to user alerting of a waiting call • Attendant Verification of Busy Stations: attendant can check on status of a station line • Calling Number Display to Attendant: displays either station number calling or type of incoming trunk call • Class of Service Display to Attendant: displays station class of service to attendant • Direct Trunk Group Selection: attendant can directly access trunk group by depressing specific button on console • Hospital and Hotel/Motel Console: special versions of standard console with feature activation buttons for specific functions • Interposition Calling and Transfer: calls between attendants can be arranged, as well as call transfer • Night Console Position: console arranged to handle night service • Privacy: automatic splitting of attendant from incoming call while talking with called station • Serial Call: attendant can establish a series of station calls from a single incoming call, with the original call always returning to the attendant after completing each call • Splitting: incoming call on hold while attendant talks with station • straightforward Outward Completion: attendant dials call for station user, then releases • Switched Loop Operation: calls coming into console handled on one of several loops, which can be reused for next call • Through Dialing: attendant passes dial tone through to station user, who then dials a call • Timed Reminder: unanswered calls extended from console return to console for further handling after predetermined time • Trunk Group Busy/Warning Indicators: LED indicator that tells when all trunks in a group are in use (busy) or when a predetermined number of trunks in a group are busy (warning) • Trunk Identification by Attendant: trunk type in use on a call identified by display • Trunk-to-Trunk Connections: attendant can connect incoming or outgoing trunk call with outgoing trunk call • Two Party Hold: attendant can put call on hold that uses two facilities for call.

Attendant Conference Option • attendant can establish a connection between a maximum of six stations and the attendant:

NA mo	NA prch	NA maint
-------	---------	----------

Attendant Release Loop (ARL) Option • permits incoming trunk calls to an unanswered station to be held off-loop whenever the station is ringing or the Attendant Call Waiting is provided for the call:

NA	NA	NA
----	----	----

Controlled Restriction • attendant-controlled restrictions of station users to outgoing exchanges, station-to-station calling, call receiving, and call origination:

NA	NA	NA
----	----	----

Intercept Treatment Recorded Announcement Option • calls that cannot be completed are routed to an audio announcement message:

NA	NA	NA
----	----	----

Message Waiting Service Option • remotely lights a lamp on a station to indicate message waiting:

NA	NA	NA
----	----	----

Multiple LDN, DID & Non-DID Option • allows up to four CO directories to be linked to the system:

NA	NA	NA
----	----	----

Timed Recall on Outgoing Calls Option • outgoing trunk calls from selected stations are automatically transferred to attendant after a finite period of time:

NA	NA	NA
----	----	----

Visually Impaired Attendant Service Option • special signals to augment attendant console:

NA	NA	NA
----	----	----

Station Features

Standard Features • Call Forwarding: calls routed to alternate stations if called station is busy or if it is unanswered • Call Hold: calls can be placed on hold • Call Park: calls placed on hold within system for retrieval at another station • Call Pickup: stations within a designated group can answer another ringing phone by dialing a code • Call Waiting: busy station notified of a waiting call by special tone • Calling Number Display to Station: using

adjunct display incoming station calls identified to called station • Dial Access to Attendant: stations can dial attendant by dialing "0" • Single-Digit Dialing: access to specific system functions by dialing a single digit (FP 9/11 only) • Station Hunting: calls to busy stations routed to alternate stations • Station-to-Station Dialing: internal calls dialed without attendant assistance • Threeway Conference Transfer: incoming and outgoing calls can be transferred to other stations or bridged to make threeway conference.

Electronic Custom Telephone Service Option • specialized features activated via 5-, 10-, 20-, or 30-button electronic feature telephones; except Prelude and FP 9:

NA mo	NA prch	NA maint
-------	---------	----------

Automatic Callback Option • a station calling a busy station is automatically connected to the called line when both lines are idle at the same time:

NA	NA	NA
----	----	----

Automatic Intercom Option • provides talking path between two ECTS stations with automatic signaling of the called station:

NA	NA	NA
----	----	----

Common Audible Ringing Option • allows ECTS station tone ringer to be activated when any one of two or more specified line appearances on this station has a terminating call:

NA	NA	NA
----	----	----

Custom Intercom Option • abbreviated 2- or 3-digit code for frequently called stations:

NA	NA	NA
----	----	----

Dial Intercom Option • ECTS user can depress intercom access button, go off-hook, and dial a code to call one of a maximum of 27 other ECTS stations:

NA	NA	NA
----	----	----

Exclusive Hold Option • allows an ECTS station user to hold a call, replace the handset without losing the call, or place a call on another line:

NA	NA	NA
----	----	----

Executive Override Option • specified user can break into a conversation in progress:

NA	NA	NA
----	----	----

Hold Option • allows an ECTS user to place the other party of a conversation in a hold status by depressing a button:

NA	NA	NA
----	----	----

Hot-Line Service Option • allows stations to automatically call a preassigned number when station user goes off-hook:

NA	NA	NA
----	----	----

Incoming Call Preference Option • ECTS feature automatically selects a line access button that has a call in the ringing state:

NA	NA	NA
----	----	----

Last Extension Called Option • ECTS feature allows user to automatically call the PBX extension that was last dialed:

NA	NA	NA
----	----	----

Last Line Preference Option • ECTS feature allows user to be connected to last line connected prior to off-hook:

NA	NA	NA
----	----	----

Line Ringing Option • ECTS feature provides a different ring tone for a specific line that appears on the station:

NA	NA	NA
----	----	----

Line Status Indication Option • ECTS feature provides indication of call status for each line-access button:

NA	NA	NA
----	----	----

Manual Exclusion Option • ECTS feature allows the exclusion of the answering position on all other internal stations:

NA	NA	NA
----	----	----

Manual Intercom Option • ECTS feature allows a maximum of 15 ECTS stations to access common intercom paths:

NA	NA	NA
----	----	----

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Dimension Prelude, 400, 600SN, 600 & 2000/Custom

Manual Originating Line Service Option • automatically routes call to attendant when the station goes off-hook:

NA	NA	NA
----	----	----

Manual Terminating Line Service Option • all terminating calls must be completed by attendant:

NA	NA	NA
----	----	----

No Line Preference Option • ECTS feature requires user to manually select a station line access button for each call:

NA	NA	NA
----	----	----

Personal Central Office Line Option • ECTS communication channel link between station and dedicated trunk circuit via PBX:

NA	NA	NA
----	----	----

Priority Hold Option • ECTS feature allows user to hold a call, replace the handset, and place another call:

NA	NA	NA
----	----	----

PBX Line Access Option • ECTS user can access a PBX line with all features:

NA	NA	NA
----	----	----

Station Busy Indicator Option • ECTS feature allows one ECTS station to see switchhook status of another ECTS station:

NA	NA	NA
----	----	----

Station Direct Station Selection (DSS) Option • ECTS feature allows off-hook station to automatically dial preassigned lines or access codes by depressing DSS button:

NA	NA	NA
----	----	----

Station Message Waiting Option • ECTS feature turns on a status lamp on other ECTS stations:

NA	NA	NA
----	----	----

Station Rearrangement & Change Option • allows customer to move stations and change features:

NA	NA	NA
----	----	----

Station Ringer Cutoff Option • ECTS feature turns off station ringer:

NA	NA	NA
----	----	----

Trunk Verification Station Option • allows designed stations to make test calls to verify supervision and transmission:

NA	NA	NA
----	----	----

Hotel/Motel Features

Bed Status & Selection Option • capability to store and display the occupancy and cleaning status and the type number of each patient bed facilitating housekeeper management, main locating, and bed selection:

NA mo	NA prch	NA maint
-------	---------	----------

Communications Interface for Property Management Systems Option • provides an interface circuit that allows the PBX to function with a customer-owned property management system (PMS):

NA	NA	NA
----	----	----

Controlled Restriction Option • control the restriction of direct dialing of outgoing exchange networks; station-to-station calls; receiving calls; and toll restriction origination:

NA	NA	NA
----	----	----

Journal Printer Option • provides hard-copy printout of audit trail and demand functions associated with hotel/motel management features:

NA	NA	NA
----	----	----

Split Access to Outgoing Trunks Access Option • separate trunk groups for DOD that can be accessed by dialing the same access code:

NA	NA	NA
----	----	----

Applications Software

AT&T has installed its systems in numerous application environments; to date, AT&T has application packages for the

following industries: hotel/motel, health care, retail, energy and building management, office automation, military, and service.

Application Processor Software • used with AT&T 16-bit Application Processor.

Message Center Software:

\$170 mo	\$4,560 prch	\$600 maint
----------	--------------	-------------

Call Detail Recording & Reporting (CDRR) Software:

300	7,990	1,104
-----	-------	-------

Directory Software • required with either Message Center or CDRR:

100	2,665	372
-----	-------	-----

V & H Coordinates • specialized tables used for pricing telephone calls • required with CDRR:

NC	100	NC
----	-----	----

Terminal Change Management Software:

350	9,325	1,296
-----	-------	-------

Facilities Management Software:

400	10,655	1,464
-----	--------	-------

HARDWARE

Terms & Support

Terms • Dimension PBX models are available for direct purchase, or lease on a month-to-month (MTM) or 2-, 4-, and 6-year basis • lease rates include maintenance • maintenance contracts available.

Support • equipment installed by AT&T • service and maintenance based on policies established by AT&T.

Overview

The AT&T Information Systems PBX family includes computer-based systems designed for stored program activities using TDM/PAM analog switching of voice and data. The range of station support varies from 32 to approximately 7200. As user requirements change, the addition of cabinets with the appropriate configuration can be installed. Existing operation will not be altered unless requested by the customer.

All AT&T PBX family members support voice and data switching, as well as rotary and touch-tone telephones. AT&T also supplies its users with selected peripherals and electronic telephones, as requested.

Typical Dimension systems have at least 1 cabinet that contains 5 carriers. Each carrier connects to the TDM bus, which functions as a high-speed highway for data and voice within the system. Carriers used for stations or trunks can accommodate up to 16 circuit boards. Station boards provide 4 extension lines, trunk boards provide 2 trunk lines. One of the carriers is used for the system CPU, memory, Touch-Tone receivers, and other control functions, each of which is implemented on a circuit board. Each cabinet comes with its own power supply, and where required, a ventilation fan. In multicabinet systems the Control Cabinet will contain the system CPU, memory, Maintenance and Administration Panel, cassette tape drive for the operating system, and 4 carriers for stations and trunks. Supplemental Cabinets can be configured for a full 5 carriers. Systems can be equipped with 1 or 2 TDM buses, depending on system requirements. Prelude and Dimension 400 cannot have a dual-bus configuration.

Representative System Configurations

Dimension Prelude Configuration • 1 to 3 cabinet nonredundant system • 32K RAM memory.

10 Trunks/90 Stations:

NA mo	\$37,400 to \$45,500 approx prch	NA maint
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PRCH: purchase price; does not include installation cost. MO: 4-year monthly lease charge including maintenance for system components. MAINT: annual maintenance charge for purchased systems. NA: not available/applicable. NC: no charge. Prices effective as of October 1984.

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18 Trunks/155 Stations:	NA	64,300 to 78,300	NA
28 Trunks/230 Stations:	NA	95,400 to 116,200	NA
Dimension 400 Configuration • 1 to 2 cabinet nonredundant system • 36K to 128K RAM memory.			
15 Trunks/100 Stations:	NA	69,200 to 81,600	NA
25 Trunks/260 Stations:	NA	179,400 to 211,900	NA
36 Trunks/320 Stations:	NA	220,800 to 260,700	NA
Dimension 600 Configuration • 2 to 4 cabinet redundant system • 176K to 256K RAM memory.			
45 Trunks/390 Stations:	NA	263,300 to 360,800	NA
70 Trunks/580 Stations:	NA	391,500 to 536,600	NA
125 Trunks/740 Stations:	NA	499,200 to 684,500	NA
Dimension 2000/Custom Configuration • 5 to 75 cabinet redundant system • 128K to 512K RAM memory.			
85 Trunks/910 Stations:	NA	623,400 to 1,046,500	NA
140 Trunks/1,350 Stations:	NA	1,130,300 to 1,552,400	NA
195 Trunks/1,860 Stations:	NA	1,274,100 to 2,139,200	NA
Tape Unit • loads system software:	25	740 prch	37
Station Line Circuit Pack • 4 lines per board:	9	315	40
Trunk Line Circuit Pack • 2 lines per board:	13	470	60
Tie Trunk Circuit Pack • 2 circuits per board:	NA	NA	NA
Direct Inward Dialing (DID) Circuit Pack • 2 circuits per board:	NA	NA	NA
Paging Trunk Circuit Pack • 2 circuits per board:	NA	NA	NA
Touch-Tone Receiver/Sender Circuit Pack • processes tone signals into information needed for call completion.			
Receiver Pack:	12	390	55
Sender Pack:	12	430	60
Electronic Custom Telephone Service (ECTS) Common Equipment • handles call processing, feature operation for ECTS telephones:			
	NA	7,000 to 8,000 approx prch	NA
ECTS Steering Pack • 4 ECTS lines per board:	NA	275 prch	NA
Customer Administration Panel (CAP) • customer-initiated feature changes:			
	65	1,920	95
Maintenance And Administration Panel (MAAP) • customer-initiated feature changes, station moves, system inquiries of traffic statistics:			
	NA	NA	NA

□ Station Equipment—Voice/Data

Attendant Console • primary function to service incoming calls originated off customer premise and connect calls to the called (internal) station • places outgoing calls • provides information concerning call status and types of calls being handled • desktop unit • available with either Busy Lamp Field (BLF) only or Direct Station Selection (DSS) unit with BLF • available for purchase or lease.

Console with DSS/BLF:
 \$80 mo \$2,870 prch \$168 maint

Multibutton Electronic Telephone (MET) • used with ECTS • equipped with Touch-Tone pad, tone ringer, and volume control • available in 5-, 10-, 20-, and 30-button sets.

5-Button MET:	9	300	NA
10-Button MET:	10	315	NA
20-Button MET:	15	450	NA
30-Button MET:	19	520	NA

Standard 2500-Type Telephones

Single-Line:	\$3 mo	\$55 prch	\$9 maint
6-Button Key:	5	138	15
10-Button Key:	11	263	36
20-Button Key:	21	503	78

Message Waiting Telephones

Single Line:	NA mo	NA prch	NA maint
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Lightweight Headsets

Headset:	NA mo	\$160 prch	NA maint
Headset Adapter for Phone:	NA	150	NA

Speakerphone (Type 4A) • hands-free conversations • voice-switched • units must be collocated at least 3 feet apart for best sound:

	14	340	12
--	----	-----	----

Line Status Indicator • operate on ringing line current • used for identifying called stations, particularly in a call pickup group:

	NA	NA	NA
--	----	----	----

AUDICHRON Recorder/Announcer • used for the automatic wakeup service feature provided to hotel/motel industry • mounted in auxiliary cabinet in telephone equipment room:

	NA	NA	NA
--	----	----	----

Wake-up Service Remote Control Unit • telephone look-alike device that allows hotel/motel or hospital personnel to record messages on the AUDICHRON recorder/announcer:

	NA	NA	NA
--	----	----	----

AUTOVON Adjunct Box • used as an attachment to attendant console • has capacity of 30, 60, and 90 trunk keys with status lamp for each key except lamp test:

	NA	NA	NA
--	----	----	----

□ Data Communication Equipment

Data Switching • provides for switching data at speeds up to

AT&T-IS Dimension PBX Systems

Dimension Prelude, 400, 600SN, 600 & 2000/Custom

9600-bps asynchronous or synchronous • FP 8 required; Common Equipment:

NA mo	NA prch	NA maint
Data Port • connects Data Interface to Dimension • 2 Data Interfaces per port:		
NA	NA	NA

Data Interface • connects data device to Data Port • supports RS-232C or RS-366:

NA	NA	NA
----	----	----

Peripheral Interface Controller (PIC) • used to interface PBX to various communication links for Dimension and Horizon features • available for lease only:

45	NA	NA
----	----	----

500 Business Communications Terminal (BCT) • keyboard display CRT terminal with 13-inch (diagonal measurement) screen and detached typewriter-style keyboard • displays 2000 or 2560 characters; 80 characters per line at 24 or 32 lines • 7x9 dot matrix • normal/half/full intensity; blinking/underline • keyboard divided into 7 function groups: 12 edit; 8 programmable functions; 15 numeric and function; alpha; 10 cursor control; system function; 5 space, etc groups • BCT used with Applications Processor (AP16); can be located up to 5,000 feet from AP16 • price includes keyboard:

92	3,400	NA
----	-------	----

513 Business Communications Terminal (BCT) • EIA RS-232C-compatible asynchronous terminal designed with an enhanced character graphics set and keyboard functions for data only uses • supports speeds up to 19.2K bps • can be used either to access Applications Processor applications in an EIA mode or as a timesharing device:

NA	1,995	NA
----	-------	----

515 Business Communications Terminal (BCT) • integrated workstation, a CRT display terminal, and a telephone; all housed together • desktop workstation, provides simultaneous voice and data communication • features split-screen display windowing • has digital communications protocol (DCP) interfaces similar to the interface used by the Series 7000 digital voice telephones • telephone features are identical to the 7403D unit with the addition of the 7405D display module • contains 64 bytes of downloadable memory:

NA	2,995	NA
----	-------	----

Peripherals

Journal Printer • used for report generation by all PBX systems:

NA mo	NA prch	NA maint
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Model 443 Printer • 30-cps tabletop matrix printer used with Applications Processor (AP16) on System 85 • 132 print columns; 3- to 15-inch paper width; tractor feed • original and 5 copies • ASCII code • can be located up to 5,000 feet from AP16:

80	1,935	NA
----	-------	----

Model 445 Printer • 220-lpm matrix line printer used with Applications Processor (AP16) on System 85 • 132 print columns; 3- to 15-inch paper width; tractor feed • original and 5 copies • ASCII code • can be located up to 2,000 feet from AP16:

260	6,475	NA
-----	-------	----

Model 450 Printer • 55-cps bidirectional, character printer document quality printing; used with Applications Processor (AP16) on System 85 • 132 print columns at 10 cpi; 158 print columns at 12 cpi; 4- to 15-inch paper width; friction/optional tractor feed; 4- to 14-inch forms • original and 5 copies • ASCII code • tab, margin, and form control • can be located up to 5,000 feet from AP16:

165	5,350	NA
-----	-------	----

Model 460 Printer • 200-cps table-top matrix printer draft-quality printing; used with Applications Processor (AP16) on System 85 • 132 print columns at 10 cpi; 218 character-per-line condensed printing; 66 character-per-line expanded printing; 3- to 15-inch paper width • original and 5 copies • ASCII code • can be located up to 5,000 feet from AP16:

160	3,920	NA
-----	-------	----

Subsystems

Application Processor (AP16) • 16-bit minicomputer under control of AP version of UNIX operating system • contains 40M-byte disk, 9-track mag tape drive for Call Detail Recording and Reporting (CDRR), and 212AR modem for connection to RMATS-II • requires Local Area Data Set (LADS) to interface with Dimension and 500 BCT terminal for control • required to support Call Detail Reporting and Recording Directory, Facilities Management, Message Center and Terminal Change Management Services • accommodates up to 16 BCT terminals and 2 printers; additional printers supported through reduction in attached BCT terminals • available for lease only:

NA mo	\$108,600 to \$115,400 approx prch	NA maint
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Call Management System • integrates Automatic Call Distribution (ACD) and Management Information System (MIS) functions with PBX functions on System 85 • 144 agent positions split into a maximum of 8 different functional groups • up to 8 CRTs for split and system supervisors:

NA	NA	NA
----	----	----

COMM-STOR II/SMDR • communication storage unit manufactured by Sykes Datatronics, Inc • device interfaces with direct output version of PBX Station Message Detail Recording Option • receives call detail information from SMDR unit and stores up to 16,000 call records on diskette • reports can be listed on CRT or printed on printing terminal:

NA	NA	NA
----	----	----

Teleser SMDR Unit • accumulates call data records and processes into management reports • stores up to 28,000 call records • supports up to 500 stations.

Teleser Unit:

145	6,100	NA
-----	-------	----

Record System Software:

40	700	NA
----	-----	----

System Initialization Software:

15	600	NA
----	-----	----

Remote Alarm:

NC	280	NA
----	-----	----

Update/Replacement Software Cartridge:

NC	400	NA
----	-----	----

Remote System Update • updates rate tables, area codes:

NC	300	NA
----	-----	----

Force Administration Data System (FADS) • standalone terminal used to display call traffic data • displays attendant-related calls, Centralized Attendant Service (CAS) calls, Uniform Call Distribution (UCD)/Direct Department Calling (DDC) calls • contains 12-button keypad and 2 display fields:

NA	NA	NA
----	----	----

Sceptre Terminal • videotex terminal • attaches to television set or telephone • wireless remote keypad:

NA	900	NA
----	-----	----

System Maintenance & Diagnostics

System Reliability • main system functions stored on EPROM; restored upon power-up • diagnostic, error detection, and recovery routines stored in ROM • error-correcting memory • redundant CPUs on Dimension 600/2000/Custom • battery backup or uninterruptable power supplies available to keep system operational during power outage • power failure transfer connects designated trunks to stations automatically upon power outage.

System Diagnostics • Dimension continuously runs diagnostic routines on all system operations • alarm signal notifies attendant of minor or major outage in system • alarm lamps in equipment cabinets provide alert to major component malfunctions • system diagnostics can be queried remotely via Remote Maintenance and Testing Service (RMATS).

System Maintenance • normally performed by AT&T-IS personnel • Maintenance and Administration Panel (MAAP) used

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Dimension Prelude, 400, 600SN, 600 & 2000/Custom

for troubleshooting and querying system for internal performance; available for users, but normally used by AT&T technicians • most repairs corrected in field by replacing circuit boards • RMATS data collected by AT&T for diagnosis prior to making field visit.

System Management • calling details available as raw data for further processing (SMDR) or detailed management reports (CDRR) for management analysis • feature changes made via

CAP, MAAP, or System Management Terminal • moves and rearrangements made via CAP, MAAP, Customer Administration Control System (CACS) • activities associated with Applications Processor managed via 500 Business Communications Terminal (BCT) series display.

• END

AT&T-IS Systems 75 & 85

Digital PBX Systems

■ PROFILE

Function • stored program computerized branch exchange (PBX) systems for switching voice and data.

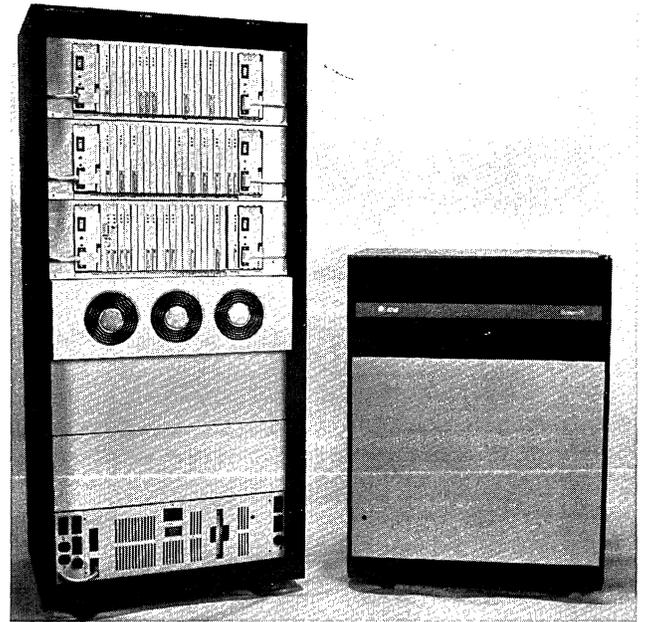
Applications Supported • office automation, word processing, dictation, facsimile, voice messaging, text messaging • health care • retailers • hotel/motel • banking • military • education • service sector • general business.

System Parameters • switching technology: digital switching using TDM/PCM • architecture: distributed processing tied to high-speed bus; nonblocking configuration available • common control: stored program • transmission: 4-wire internal switching • wiring plan: stations—uniform 4-pair; intermodule—fiber optic or T-1 • data switching: 64K bps synchronous, 19.2K bps asynchronous at a station.

Traffic Capacity • System 75—8500 CCS per system (8670-enhanced version), 5 to 8 CCS per line (voice), 36 CCS per line (data); System 85—5 to 8 CCS per line (voice), 36 CCS per line (data), up to 52,000 busy hour call attempts supported in highest System 85 release • grade of service: P.01 • simultaneous conversations: System 75—236 (241 in enhanced version); System 85—255 per system module, maximum per system 7,936 • nonblocking architecture: for data—yes; for voice—optional.

Trunks/Stations/Consoles • System 85 Release 1: up to 900 trunks; 300 to 900 stations; 12 attendant consoles • System 85 Release 2 Version 1: up to 2250 trunks; up to 7000 analog stations; up to 5000 digital stations; 28 attendant consoles • System 85 Release 2 Version 2: up to 7525 trunks, up to 8000 analog stations, up to 5000 digital stations; 40 attendant consoles • System 85 Release 2 Version 3: up to 6000 trunks, up to 32,000 analog stations; up to 10,000 digital stations; 40 attendant consoles • System 75: up to 200 trunks; from 40 to 800 stations; up to 6 attendant consoles; 7 attendant consoles can be used if the 7th console is for night operation • trunks supported: central office—one-way (in/out), 2-way; DID, FX; tie lines; OCC; Autovon; CCSA; ETN; EPSCS; T-1; Net 1000.

Voice Equipment • vendor supplied: 2500 Type telephones; Multibutton Electronic Telephone (MET) 5-button telephone; MET 10-button telephone; MET 20-button telephone; MET 30-button telephone; 20- to 40-button attendant console; 40- to 80-button attendant console; 7101 single-line analog voice terminals; 7103 single-line analog voice terminals; Touch-a-Matic 7104 single-line analog voice terminal with repertory dialing and 14-character LCD display; 7303 multiline appearance voice terminals with analog voice and digital controlled 3-pair wiring, 1-pair tip and ring voice, 1 control pair, and 1 power pair; 3 to 10

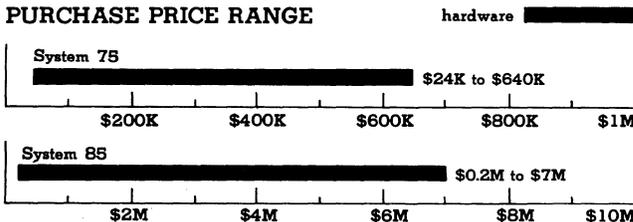


AT&T System 75

appearance call buttons; 7305 multiline appearance voice terminals with analog voice and digital controlled 3-pair wiring, 1-pair tip and ring voice, 1 control pair, and 1 power pair, optional 24 programmable feature buttons; 7403 (7203) digital voice terminal, 2-pair wires used per set and 1 additional pair needed for power if extra modules are added, 3 to 10 appearance call buttons, supports Digital Terminal Data Modules, Speakerphones, and Headset Adapters; 7404 digital voice terminal, 2-pair wires used per set, 6 multifunction buttons, asynchronous data transmission to 19.2K bps, optional messaging cartridge; 7405 (7205) digital voice terminal, 2-pair wires used per set and 1 additional pair needed for power if extra modules are added, optional 24 programmable buttons, supports 40-character Digital Display Module for messaging, Digital Terminal Data Modules, Function Key Modules, Speakerphones, and Headset Adapters; Digital Function Key module, used to add 24 extra programmable function buttons to those on the basic 7405 station; Digital Display Module, contains 8 programmable function keys and a 40-character alphanumeric display on the 7405 station for receiving messages; speakerphone and headset adapter, used with all 7000 voice terminals except the 7101, incorporates on/off switch, switchhook control, volume control, microphone and speaker in 1 unit • **equipment supported:** 2500 type telephones.

Data Equipment • vendor supplied: Applications Processor, 16-bit minicomputer running UNIX operating system; 3B5 Applications Processor, 32-bit minicomputer developed by AT&T running UNIX; 500 Business Communications Terminal (BCT); 510 Personal Terminal; 513 BCT asynchronous display terminal; 515 BCT integrated voice/data workstation; System Management terminal; Force Administration Data System (FADS); Sceptre Videotex terminal; 400 series printers; Distributed Communications Service (S-85); Peripheral Interface Controller (PIC);

PURCHASE PRICE RANGE



AT&T-IS SYSTEMS 75 & 85 PBX PURCHASE PRICE • bar graphs cover price ranges between "small" and "large" configurations for hardware products • **System 75** small configuration consists of 10 trunks and 40 stations; large of 120 trunks and 600 stations • **System 85** small configuration consists of 100 trunks and 450 stations; large of 2,250 trunks and 7,000 stations • maintenance and installation prices included.

AT&T-IS Systems 75 & 85

Digital PBX Systems

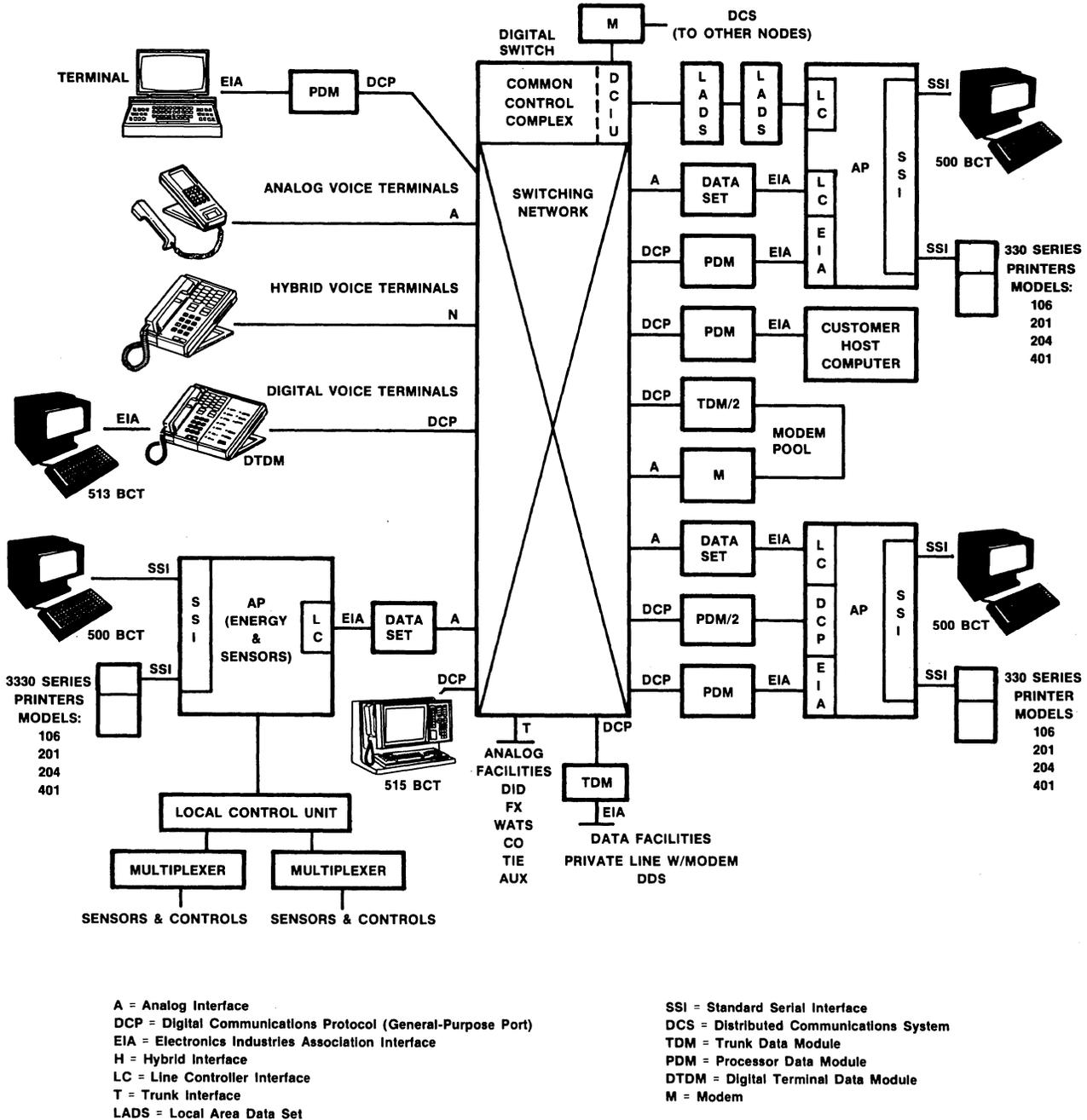


Figure 1 • System 85 Release 2 configuration.

Digital Terminal Data Module (DTDM); Processor Data Module (PDM); 3270 Data Modules; Information Systems Network (ISN) • **equipment supported**; 2780/3780 Remote Batch Terminals (RBT); Model 33/35 teletypes; IBM 3270 CRT emulators; microcomputers; minicomputers; line printers; magnetic tape; disks.

Distribution (UCD); Call Management System (CMS) • call detail recording; Call Detail Recording and Reporting (CDRR) • voice message systems: AUDIX • message center systems: Message Center using Application Processor; Leave Word Calling • centralized attendant service • electronic directory system: Directory option using Application Processor • energy management systems: Automated Building Management (ABM) • hotel/motel management systems: interfaces to most management systems • Premises Distribution System (PDS).

Subsystem Support • automatic call distribution: Uniform Call

AT&T-IS Systems 75 & 85 Digital PBX Systems

Communications/Networking • abbreviated dialing • off-network dialing • on-network dialing • dialed digit translation • automatic route selection (ARS) • tandem switching • satellite operation • automatic alternate routing (AAR) • access to ETN, CCSA, EPSCS, Autovon networks • interexchange code (IXC) conversion: generates correct OCC access code in Equal Access dialing area transmission rates: up to 1.544M bps (T-1) between nodes • protocols: X.25, SNA/SDLC, BSC, ASCII, DMI (Digital Multiplexed Interface) • asynchronous data speeds to 19.2K bps • synchronous data speeds to 56K bps • gateways: X.25, SNA, Information Systems Network (ISN).

First Delivery • System 75: second quarter 1984; System 75 Release 1 Version 2: first quarter 1986 (600 stations), second quarter 1986 (800 stations); System 85 Release 1: third quarter 1983; System 85 Release 2 Version 1: third quarter 1984; System 85 Release 2 Version 2: second quarter 1985; System 85 Release 2 Version 3: first quarter 1986.

Systems Delivered • System 75: approximately 1,000; System 85 Release 1: approximately 1,100; System 85 Release 2: approximately 40.

Installation Interval • System 75: 4 to 6 months ARO; System 85 Release 1: 4 to 6 months ARO; System 85 Release 2: 8 to 12 months ARO.

Comparable Systems • System 75: American Telecom Focus, AT&T Dimension 400, Ericsson Prodigy, Executone Eclipse, GTE Omni, Harris/Digital D1200, Hitachi DX, IPC Technologies 160 DPX III, ITT 3100, Mitel SX-200, NEC NEAX 2400, Northern Telecom Meridian SL-1MS, Rolm VSCBX and CBX II, Solid State Systems Jr. Exec., TIE/Communications Data Star • System 85: American Telecom Focus, Anderson Jacobson IOX, CXC Rose, Ditrans 580 DSS, Ericsson MD110, Executone Summit, GTE Omni SIII and SV, Harris/Digital D1200, InteCom IBX, Mitel SX-2000, NEC NEAX 2400, Northern Telecom Meridian SL-1/SL-100, United Technologies/Lexar UTX, Zitel PNX.

Environmental Specifications • System 85: cabinet dimensions: 30x24x72 inches (WxDxH), 750 pounds maximum cabinet weight; power requirements: 3-phase 120/208V 4-wire or single-pass 120/240V 3-wire 60-Hz power, 20-amp circuit breaker recommended, cabinet power approximately 1200 watts under full load; environment: relative humidity = 20% to 60%, ambient temperature = 65 to 85 degrees Fahrenheit • System 75: cabinet dimensions: 32x24x70 inches (WxDxH), 800 pounds maximum cabinet weight; 2-carrier cabinet, 30x24x42 inches (WxDxH), 400 pounds maximum cabinet weight; power requirements: 115V, 60 Hz, 50-amp circuit (20-amp circuit for 2-carrier cabinet and auxiliary cabinets); environment: relative humidity = 35% to 95%, ambient temperature = 40 to 110 degrees Fahrenheit • floor loading: System 85—120 pounds per square foot; System 75—65 pounds per square foot • minimum equipment room dimensions: System 85—8x10x8 feet (WxDxH), System 75—6x8x8 feet (WxDxH).

Vendor • AT&T Information Systems; 100 Southgate Parkway, P.O. Box 1955, Morristown, NJ 07960 • National Sales Center 1-800-247-1212 (toll free).

Canadian Distribution • see headquarters in U.S.

Distribution • nationwide through AT&T regional offices • Eastern Region: Parsippany, NJ • Southeastern Region: Tucker, GA • Western Region: Dallas, TX • Great Lakes Region: Chicago, IL • Pacific Region: Oakland, CA • the System 75 and 85 will be distributed by dealers only.

GSA Schedule • listed.

■ ANALYSIS

AT&T Information Systems has emerged as one of the fastest moving companies in the digital PBX marketplace. All this from a company many left for dead 18 months ago when divestiture broke apart the Bell System. It hadn't always been this way, particularly when considering how AT&T-IS got started and its first several products. The company's initial digital PBX offering, the System 85, received mixed reviews, ranging from disinterest to disappointment. In comparison with established digital PBX manufacturers, the System 85, in its first release, was indeed pale

by comparison. Subsequent releases of the System 85 have brought it into the arena as a full-fledged digital PBX with very large expansion capabilities and an impressive array of features and data communications support. But it has been the System 75 that has captured the interest and enthusiasm of the telecom industry.

AT&T shook up the industry when it announced the System 75 on April 16, 1984. This small, single-cabinet system could support up to 400 stations and 200 trunks, and sold for as low as \$500 per port—an extremely competitive price for so powerful a switch. Customers lined up for miles to get in on the early release units, of which there were only about 500 allocated for 1984 delivery. Major customers of AT&T bought out the early ship units almost overnight, and orders for more systems came so quickly that AT&T found itself with an enormous backlog of orders but no product available. As a result, product emphasis in AT&T's manufacturing facility in Denver shifted quickly to the System 75. These developments brought out speculation that the days of the System 85 were numbered; rumors circulated around the industry that the highly sophisticated switching architecture of the System 75 was, in fact, the direction AT&T was planning to go with its digital PBX product development efforts. Indeed, many users held off system purchases until higher-density port circuit cards became available, giving the System 75 a capacity approaching 600 or 700 stations. Never in the history of AT&T (or the industry, for that matter) had a single product generated such sudden and active interest. To date, the System 75 has been ordered in record numbers, exceeding all AT&T predictions.

AT&T chose the 1985 International Communications Association (ICA) Conference in Dallas to announce its latest products. On Tuesday, May 7, AT&T finally responded to the hundreds of calls for an expanded System 75 with Release 1 Version 2, an enhanced model that has a maximum of 800 stations, double the system's current capacity. This system's CPU call handling capability was doubled from 1,800 to 3,600 calls per hour, although the internal traffic capacity was virtually unchanged. Data handling capacity was also expanded from 200 to a maximum of 800 data module end points. Prior to these announcements, the System 75 could not reside within an AT&T Electronic Tandem Network (ETN), a high-performance premises-based switching network using a uniform dialing plan and sophisticated call routing techniques. Version 2 of the System 75 will now have Automatic Alternate Routing (AAR) in addition to Automatic Route Selection (ARS) which will permit the System to function within an ETN. These 2 announcements alone have answered the prayers of hundreds of telecom professionals clamoring for more System 75 performance.

Highlights of the Announcements:

System 75 Expansion—The System 75 Release 1 Version 2 boosts station configurations from 400 to 800 voice terminals. Trunk limit is still 200. Call handling was doubled from 1,800 per hour to 3,600 per hour. Digital data end points were increased from 200 to 800, and the capacity for 20 DS-1 circuit packs for T-1 digital line support is available. A synthetic speech capability was added for user prompting with the Leave Word Calling feature. Call routing capabilities for ARS were increased, and Automatic Alternate Routing, an ETN requirement, was added. Other system capacities were increased, including call coverage paths (200 to 300), call pickup groups (200 to 300), leave word calling message storage (1,000 to 2,000), and pooled modem groups (1 to 5, for maximum of 160 modems). Internal time slots remained the same, at 512, while the total number of simultaneous conversations increased slightly, from 236 to 241. Total system traffic handling increased from 8,500 CCS to 8670 CCS, a potential problem for larger systems with heavy data requirements. For data management requirements, the System 75 has a new Data Line Card (DLC) circuit pack that provides 8 RS-232C ports. There is also a Digital Multiplexed Interface (DMI) card that provides up to 23 data channels and 1 signaling channel for PBX-to-host connectivity at 1.544M bps. The larger line sizes are made possible by double-density station circuit boards, with 16 stations per board. AT&T says both 8-line and 16-line boards can coreside in the same switch. The company said

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the cost for a field upgrade from Version 1 to Version 2 will cost approximately \$8,000. The enhanced System 75 will be available in 600-line configurations during the first quarter of 1986; 800-line models will be available by mid-year.

Premises Distribution System (PDS)—AT&T announced the general availability of its multifunction Premises Distribution System, which utilizes both twisted pair and fiber optic cabling schemes. In addition, 3 major computer vendors—Hewlett-Packard, Wang Laboratories, and Xerox Corporation—announced their support of PDS for office communications. Another company—Steelcase, Inc, a manufacturer of office furniture—announced it will support PDS in the design of office furniture systems and will develop an education program on PDS for architects and other building industry professionals. PDS is designed to support voice, data, graphics, and video over a uniformly designed network.

Information Systems Network (ISN) Enhancements—ISN is a packet-switched local area network. Enhancements include support for SNA/SDLC and BSC communications, an interface to AT&T's STARLAN personal computer LAN, an interface to Ethernet, networking capabilities for ISN, and several user administration features.

7404 Digital Voice Terminal—The latest addition to AT&T's 7000 Series of terminals is the 7404, a low-cost unit that provides simultaneous voice and data communications for only about \$700. Voice is digitized in the station and multiplexed with data over 2 twisted pairs to the switch, which can be either a System 75 or 85. A cartridge slot enables the addition of features simply by inserting a feature cartridge. An RS-232C connector is included.

3270 Data Modules—AT&T announced 3 new data modules that permit 3270 terminals to be switched to IBM cluster controllers via a System 75 and 85. The 3270T converts Coax A protocol coming from the terminal to DCP protocol for communications with the System 75 or 85. The 3270A is functionally the same as the 3270T and adds support for asynchronous terminals. The 3270C unit connects the System 75/85 to an IBM cluster controller and appears as another 3270 terminal to the controller.

System 75 has been widely rumored as the eventual replacement for the System 85. AT&T has, in the past, strongly denied this possibility. The latest announcements still have the System 75 as a single-cabinet system, but with double its former capacity. System 75 architecture has the ability to support much larger configurations, if AT&T decides to go in that direction. Nonetheless, they still steadfastly maintain the need for a 2-system PBX product line. This may well have to change in the near future, in light of current digital PBXs. The NEC NEAX 2400, which is modularly expandable from a single-module system to its full capacity with no major hardware changes, is an example of the type of system AT&T will have to field in the future. System 75 is the more technically superior system, and will most likely be the way AT&T goes. But let us not forget System 85, the AT&T flagship.

AT&T brought out the latest versions of System 85 on November 9, 1984. Prior to this announcement, the System 85, even in its Release 2 form, could support only about 7,000 analog ports and 5,000 hybrid/digital station ports. With a number of major PBX manufacturers announcing very large (over 10,000 line) systems earlier in the year, AT&T unveiled its Release 2 Versions 2 and 3 products. While Version 2 provided specific data enhancements, network enhancements, and support for a new voice messaging system, Version 3 broke through the 7,000-line ceiling and raised the System 85's ultimate size to 32,000 analog ports, 10,000 digital stations, and up to 6,000 trunks. Unfortunately, this upper-end configuration will not be available until the first half of 1986, which means AT&T might lose a few very large accounts to Northern Telecom (Meridian SL-100), NEC Telephones (NEAX 2400), Ericsson (MD 110), or GTE (Omni SV). AT&T also announced the availability of its No.5 ESS (Electronic Switching System) digital central office equipment for certain very large system applications where as many as 100,000 lines could be

supported, if required. Release 2 Version 2 of the system 85 and its companion offerings will be available by the middle of 1985.

Highlights of the November Announcements:

System 85 Expansion—Increased voice-only station maximum from 7,000 to 32,000; electronic multifunction station maximum from 5,000 to 10,000; integrated voice/data station maximum from 5,000 to 8,000; add-on data modules from 5,000 to 10,000; trunk circuits from 2,250 to 6,000; and internal traffic handling capacity from 20,000 busy hour calls to 45,000. System feature capacities were also increased, i.e., authorization codes from 9,000 to 90,000; speed-dial lists from 500 to 10,000.

Network Feature Enhancements—The System 85's role as a major Electronic Tandem Network (ETN) switch was boosted with such improvements as 1) increased number of network nodes in a Distributed Communications System (DCS) from 12 to 20; 2) increased number of Automatic Alternate Routing (AAR) patterns from 255 to 640; 3) improved queuing on AAR/Automatic Route Selection (ARS) patterns; and 4) interexchange access (IXC), which provides the necessary intelligence to select the carrier of preference when dialing long distance calls, based on customer-programmed details to the switch; an enhanced SMDR will record the carrier selected, as well as the appropriate cost.

More Powerful Applications Processor—The 3B5 AP will provide greater performance than the current AP-16. The new AP will use the WE32000 32-bit CPU, rather than the current 16-bit unit. Users will have greater disk storage capacities, increased terminal connectivity, and expanded message center/directory services.

System Reliability & Maintainability—System 85 received additional functions for more efficient monitoring of system operations, faster diagnosis of system faults, and easier location of specific components that have failed. New features tied in with Remote Maintenance and Testing Service (RMATS).

Centralized System Management—Based on the new 3B5 AP, users will have increased ability to administer features and services on up to 20 separate systems, including Systems 75/85, Dimension 600/2000 systems with Feature Package 8 Issues 1 and 3, an Information System Network (ISN), Audix voice messaging system, and other Application Processors.

Enhancements for Applications Processor-16—The AP-16 will support the new System 85 features in the areas of Terminal Communications Management/Facilities Management (TCM/FM) and Call Detail Recording and Reporting (CDRR).

AUDIX Voice Message System—Acknowledging the importance of voice mail to its office automation strategy, AT&T announced its own proprietary voice mail system, called the Audio Information Exchange, or AUDIX. Available on System 85 with Release 2 Versions 2 and 3, as well as Dimension 600 and 2000 with FP 8, the system will support up to 4,000 users, 200 hours of message storage, 32 interface ports to the associated PBX, and simple touch-tone commands for system activation. Up to 4 separate AUDIX systems can be supported by a System 85, but the ability to network systems is not available yet. System prices will range from approximately \$140,000 to \$380,000. Availability is slated for early 1985 for Dimension and mid-1985 for System 75/85.

Messaging Statement of Direction—AT&T issued its own Statement of Direction as to its intentions for integrating various message function in one system. Called Unified messaging, the goal is to establish a "Universal mailbox" that is compatible with systems like AUDIX, Leave Word Calling (LWC), Message Center, and Electronic Document Communications (EDC).

Data Features—Data transport speeds supported include 64K bps synchronous, 19.2K bps asynchronous. AT&T stated it felt these speeds entirely sufficient for the majority

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of today's data users. A new Modular Data Module (MDM) was announced that will provide RS-449 and V.35 interfaces to the System 85. AT&T reiterated its support for its Digital Multiplexed Interface (DMI) specification for connecting computers to the System 85. Their comments were that DMI is "closer to the ISDN (integrated systems digital network) standard" than the competition, meaning the Computer-to-PBX Interface (CPI) standard, developed by Northern Telecom and endorsed by several major PBX and computer vendors.

Automatic Call Distribution (ADC) Enhancements—AT&T enhanced its Call Management System (CMS) to provide greater system capacities and improved management reporting. The system integrates the call processing features of Enhanced Uniform Call Distribution (EUCD) found in Dimension FP 8 Issue 3, and System 85 Release 2 Version 3 with call management information provided by an AP-16.

Both the System 75 and 85 are bus-oriented systems, and use time-division multiplexed (TDM) switching with the voice signal converted to a digital stream by pulse code modulation (PCM) techniques. Both systems make extensive use of distributed processing to more efficiently delegate operating functions to specific areas of the system. The System 75 has a single 16-bit microprocessor in control of overall system operations, with 8-bit microprocessors embedded in every port card. The System 85 uses 1 of 2 different main processors. In Release 1, the 301 CC processor is used, and in all Release 2 Systems, the more powerful 501 CC unit is used. Both CPUs are 16-bit devices, and address memory built around 64K RAM components. The System 75 uses high-density 256K memory boards.

Special functions and applications in both systems are handled by Applications Processors (AP). The System 75's more sophisticated internal design made it possible for certain functions to reside within the main cabinet, rather than in a separate cabinet as in the System 85. An AP connects to a switch via a Digital Communications Interface Unit, which communicates with the switch at speeds of 9600 bps. Two Applications Processors are available, depending on the system and the application desired. The AP-16 uses a 16-bit microprocessor with up to 3 million bytes of memory, and the newer 3B5 AP uses the 32-bit WE 32000 CPU plus at least 8 million bytes of memory. Applications supported on both APs include Message Center, Call Detail Recording and Reporting, Directory, Terminal Change Management, Facilities Management, Electronic Document Communications, Terminal Emulation, Call Management System, and Automated Building Management. The 3B5 also supports Centralized System Management, which can manage operations on several different systems and APs.

Voice communication features on both the System 75 and 85 are extensive. Well over 200 features can be provided. Standard 2500-type telephones, stylish analog voice terminals with single-button access of features, "hybrid" voice terminals that handle voice signals in analog fashion but transmit control signals in digital form, and fully digital voice/data terminals are part of the array of station equipment available to the user. Four different CRT-type terminals are also available: the 500 Business Communications Terminal (BCT), which communicates directly with an AP; the 510 Personal Terminal, an integrated voice/data unit; the 513 BCT, an asynchronous terminal that has a standard RS-232C interface; and the 515 BCT, an integrated voice/data terminal that integrates the 500 BCT with a telephone.

The real reason for the System 75 and 85 is data communications, and in this category both perform well. Data speeds of 19.2K-bps asynchronous and 64K-bps synchronous are supported at a station. Conversion equipment is available to connect the systems into BSC, SNA/SDLC, TTY, and X.25 networks. Modem pooling is available, and the usual data switching features—data privacy, auto-call setup, auto-call answering—are standard. An interface is available into AT&T's new local area network, the Information Systems Network (ISN). Both systems can connect to 1.544M bps T-1 data links, and have submultiplexing and supermultiplexing capabilities to optimize these high-speed facilities. Statistical data on data communications performance is available to effectively

manage the information flow within the switches.

Network communications in both systems is substantial. Call routing features ensure that calls will be completed over the most economical facility. Either system can fit easily into large-scale networks like ETN, CCSA, or EPSCS. A high level of networking is possible, particularly with the latest versions of System 85 Release 2. AT&T literally invented networking, and the System 75 and 85 reflect this expertise.

There has been considerable controversy in the industry on the issue of blocking and nonblocking systems. Simply defined, a blocking system is one in which a group of stations is assigned a limited number of trunks for incoming and outgoing calls. Under this arrangement, a situation can occur when these trunks become fully utilized and a busy signal will be heard. Conversely, a nonblocking system is one in which every station has a trunk assigned to it, and the switching matrix is designed so that a busy condition can **never** occur. As can be seen, the nonblocking system is preferred, but not practical because it is more expensive and cannot always be cost-justified.

With the original System 85 announcement, AT&T introduced a new term and technique, **essentially nonblocking**. The System 75 and 85 both have essentially nonblocking features in addition to blocking and nonblocking. The essentially nonblocking system significantly reduces the occurrence of a busy signal. The cost of an essentially nonblocked system is relatively greater than a blocked system, but significantly less than a nonblocked system. It should also be noted that the System 75 and 85 are never totally nonblocking. The customer should be cognizant of the total number of lines needed and traffic utilization for essential operation before deciding on the system requirements. In most cases, the PBX should be engineered for fully nonblocking service to data users, and blocking for regular voice users. Systems using integrated voice/data terminals should be engineered based on the amount of data traffic they are expected to generate.

Currently, there are over 1,000 System 85s in the field, most of which are using Release 1 software. It is likely that these users will eventually upgrade to the more powerful Release 2 components, if their needs extend beyond a mostly voice configuration. Installation intervals for the System 85 range from about 6 to 12 months, depending on the size of the system and the Release desired. For the System 75, the interval ranges from 3 to about 8 months, depending to a large extent on who the customer is, and the degree of commitment (translated: dollars) the customer wants to make in the product. There are currently over 1,000 System 75s installed, and early installations have garnered very favorable responses from users.

AT&T may have inadvertently sealed the fate of the System 85 by introducing its larger System 75. Before System 75 Version 2, the crossover point from System 75 to 85 was about 300 to 350 stations. Now that limit has been pushed up to about 700 stations. This means that the System 75 has far greater applicability in the under-700-line marketplace (which has about 90 percent of the total PBX installed base) than before, and its low price will make it an extremely tough competitor. System 75 has already proven itself in the field, and its larger size will help fatten AT&T's pockets significantly during 1986. It is likely that users who are planning an upgrade during the latter half of 1985 will hold out for System 75. This will probably also result in the cancellation of some System 85 orders in favor of the 75. Strong competition in the large-scale PBX marketplace will make it tough going for the System 85, and a vigorous marketing effort for System 75 at the low end may force AT&T to either lower System 85 prices substantially, or phase it out altogether.

Rumors have been circulating for several months (denied by AT&T, of course) of a smaller version of the System 75, the System 25. It will handle under-100-line installations, and is said to be a response to the surprisingly sophisticated and powerful Northern Telecom Meridian DV-1, an information controller that supports multiple applications processors as well as simultaneous data and voice communications. Based on the success of the DV-1, and other similar products, the Telenova 1 and David Systems Information Manager, the new down-sized System 75 will probably be announced in the third quarter of 1985, with production units available in the first quarter of 1986 to help

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compete with these new low-end systems. In the PBX marketplace, 1986 will indeed be a pivotal year for AT&T-IS, and could be the beginning of the end for System 85 and the turning point for System 75.

Another way for AT&T to retain its users is to develop circuit boards that fit in **both** the System 75 and 85. Currently, the System 75 uses higher-density memory packs (256K chips) than the System 85 (64K chips). It is likely that AT&T will upgrade the memory cards in the System 85 to the 256K-based units, and when this is done, the boards should be designed interchangeable with the System 75s.

The System 85 is upward-compatible with certain Dimension analog PBXs, provided the system software is the right level. Users will still have to replace their Dimension hardware, but AT&T has developed a series of upgrade plans that should make the transition a bit less painful.

AT&T's new local area network, the Information Systems Network (ISN), will become an increasingly important factor in AT&T's marketing, and will complement the System 75 and 85, particularly with large users who want to jump onto the leading edge of office automation technology. Since the ISN uses 4-pair wiring, the same as both the System 75 and 85, the products are a natural fit. AT&T's new Personal Computer, as well as its entire 3B computer line, will be marketed more strenuously as part of a comprehensive information management solution. AT&T is not shy about its intentions—particularly in light of the IBM acquisition of Rolm Corporation. It wants as big a piece of the lucrative office marketplace as possible, and will compete vigorously to get it.

Strengths

Up until about 2 years ago, AT&T was a rather large question mark. Where was its digital switch? Was it going to develop a local area network? What about computers? Could the communications giant compete in a deregulated marketplace?

Although it still has a long way to go in reestablishing itself as the omnipotent presence it once was, predivestiture, the company is beginning to regain its market share, its products are performing as claimed, and new products and services are appearing with methodical regularity. AT&T is definitely the company to beat.

Faced with reduced payrolls, and the prospect of still more staff reductions, the company continues to forge ahead. Probably no other company in the history of American business has had so many difficult obstacles to overcome as AT&T. Its remarkable progress to date is testimony to the inherent strength of the organization, its belief in itself and its products, and its enormous cadre of resources.

The System 75 is a revolutionary product for AT&T. It works extremely well, perhaps better than any other product of its type AT&T ever developed. Its price is very competitive, and it handles a wide variety of business applications. The new larger version provides ever greater marketing opportunities for the company.

With its expanded System 75 and 85, AT&T finally has a PBX product line that effectively competes with virtually every player in the market. If AT&T can speed up production and deliveries of these systems, it will grab up an even bigger market share than most experts now predict.

Limitations

Although AT&T operates under a "no standard" way of configuring its systems, it does today have a uniform nationwide pricing schedule and will provide individual component prices, if asked. This is certainly a major turnaround for the company, and will help improve AT&T's image as a marketing-driven organization.

The System 75 is advertised as a single-cabinet system. This is not usually the case. It is true that all **essential** electronics reside in the main cabinet; however, when communication networking and feature options are incorporated, additional cabinets are required. Therefore, System 75 will typically be a multicabinet system.

Before the enhanced version of System 75 was announced, the system had nonblocking capabilities. Unfortunately, the larger

station size did not bring with it a commensurate increase in traffic handling, resulting in a switch that will introduce blocking at approximately 500 stations. Users with heavy data applications should discuss this situation with their AT&T-IS technicians, since data equipment should be provided with nonblocked access to outside facilities.

System 75 still does not presently have a redundant feature for common control and module control. The distributed processor concept is viable, but the essential control should have a back-up for proper fail-safe conditions. This is an important user consideration.

Another concern is that AT&T has developed the complete design of System 75 around the Intel 8086 and 8051/52 microprocessor chips. These devices are excellent, but Intel is now 30 percent owned by IBM which also intends to own 100 percent of Rolm. If a supply squeeze were to occur and the resources of Intel channeled, it could cause a severe supply problem for AT&T unless it is covered by second sources that can supply the quantity necessary for mass production. This situation may never arise; however, it is a point that should be brought to the user's attention.

System 85 seems to have all the attributes of a successful PBX system. The shortcomings of Release 1 were definitely lessened by Release 2 and its latest enhancements. However, System 85 Release 2 is still a relatively **untested** machine. Production quantities are not yet up to full capacity as of this writing. The final determination of the product will be established once the system is released in production quantities.

One of the most significant limitations of the System 75 and 85 has been their availability. Extraordinarily long installation intervals ARO have turned many potential users away from the products, although many did place their names and their money on the line when System 75 was introduced. When it is possible to get a Northern Telecom SL-1, Rolm CBX, or NEC NEAX 2400 in under 4 months, especially for a 500- to 1,000-line fully equipped system, it's pretty tough to hold out for AT&T. For a number of years, AT&T had users hold off making an equipment purchase until their products were available. This strategy certainly didn't endear AT&T to its users, who were frustrated with the firm's monopolistic habits. Of course, most of that has changed today. Users are more sophisticated, and will not wait for AT&T if their needs are **right now**. It appears AT&T might try this tactic again with its newest System 75 and System 85 upgrades, particularly since the first wave became available mid-1985, and the big system and System 75 enhancements won't appear until well into 1986. AT&T will fare much better if it pulls out all the stops in Denver and boosts production.

It has been an interesting period of time for AT&T Information Systems. Not only has it been in a strange and unfamiliar marketing arena since the divestiture, it has been selling products that compete with its older Dimension family. Systems 75 and 85 now encompass the entire analog Dimension family except the Horizon. AT&T promotional literature and consultants are still claiming that the older PBX systems will not be left out of the product line. It will be interesting to see how AT&T handles the dilemma of having both digital and analog PBX systems competing for the same market.

SOFTWARE

Terms & Support

Terms • with the exception of optional features, all standard software is bundled into the PBX system price.

Support • PBX system software is supported under AT&T Information Systems • field developed software is supported by the individual dealer that authors the program.

Software Overview

PBX software controls operations, conducts self-test functions, and implements features. It should be noted that features of the AT&T-IS PBX family are software driven and targeted at 3 areas: System Features; Attendant Features; and Station Features. System software consists of the Operating System, Self-Test, and Configuration Tables.

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The operating system defines major parameters and capabilities. The distribution of calls and methods of route selection and optimization are also controlled by the operating system.

The self-test provides online testing of the PBX system performance. Error table printouts are available upon request. System fault error codes are stored in the PBX memory and made available to local or remote access.

The configuration tables contain information that is unique to each customer installation. These tables may be changed or moved. The tables are used to define station characteristics and control assignments.

Diagnostic software diagnoses problems not found by the self-test programs. They are used by the field service representative to further aid them in the repair of the system.

Features Overview

Feature Packages are the primary vehicles used by AT&T for addressing customer needs. The Feature Package chosen for Systems 75 and 85 is the FP-8, Issue 3. FP-8 is the Deluxe Intercity with Electronic Tandem Network and ECTS program. It incorporates all the features of the earlier FP-7 and FP-10.

General System Features

Standard Features • Attendant Console: incoming calls all processed by attendant console • Distinctive Ringing: station ringing cycles signal type of call • Flexible Numbering of Stations: stations can be numbered with either 3 or 4 digits • Foreign Exchange (FX) Service: access to FX trunks • Intercept Treatment: calls to vacant or unassigned stations receive distinctive signal • Line Lockout with Warning: stations left off-hook after predetermined length of time are first sent a howler tone, followed by release from the PBX • Listed Directory Number (LDN) Service: access to local CO trunks • Multiple LDN: access to more than one local trunk group with indication at console • Night Service: after hours calls handled either by connecting trunks directly to stations or by dialing a special code to answer an incoming call • Off-Premises Stations: connection for stations not located in same building as PBX • Power Failure Transfer: prearranged stations are connected to trunks for service in a power outage • Remote Access to PBX Services: outside callers can dial special trunk, enter authorization code, and transact calls like an internal station • Remote Maintenance and Testing Service (RMATS): system to provide real-time diagnostics of system for both user and system supplier • Rotary Dial Calling: dial telephones supported • Tie Trunk Service: access to tie trunks • Toll Terminal Service: access to special trunks for long-distance calling in hotel/motel • Touch-Tone Calling: tone dial telephones supported • Touch-Tone to Dial Pulse Conversion: converts tone signals to rotary dial pulses for connection to rotary dial central offices • Trunk Answer from Any Station: night service feature, users answer incoming calls by dialing special code • WATS Service: access to WATS trunks, both oncoming and outgoing • Wide Frequency Tolerant Power Supply: internal power source able to accept variable-power levels from commercial-power sources.

Call Management System (CMS) Option • routes incoming calls to agent positions based on agent available for a call:

NA mo	NA prch	NA maint
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Centralized Attendant Service (CAS) Option • routes incoming LDN calls from multiple system locations to centralized attendant positions:

NA	NA	NA
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Code Calling Access Option • interface to customer-provided coded signaling system:

NA	NA	NA
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Customer Administration Center System (CACS) Option • system for handling customer-controlled administrative activities, such as moves and feature changes:

NA	NA	NA
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Direct Department Calling (DDC) Option • permits incoming trunk calls to bypass attendant and terminate directly at preselected group of stations:

NA	NA	NA
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Direct Inward Dialing (DID) Option • permits incoming trunk calls to bypass attendant and terminate directly on designated stations:

NA	NA	NA
----	----	----

Energy Communications Service Adjunct (ECSA) Option • controls activity of various energy-consuming devices via PBX station lines:

NA	NA	NA
----	----	----

Enhanced Uniform Call Distribution (EUCD) Option • provides additional features over standard UCD:

NA	NA	NA
----	----	----

Facilities Administration & Control Option • provides detailed information on system facilities activities:

NA	NA	NA
----	----	----

Force Administration Data System (FADS) Option • provides traffic data on both CAS and UCD operations:

NA	NA	NA
----	----	----

Loudspeaker Paging Option • interface to customer-provided or AT&T-provided paging system:

NA	NA	NA
----	----	----

Music-On-Hold Access Option • interface to customer-provided music source:

NA	NA	NA
----	----	----

Radio Paging Access Option • interface to customer-provided radio paging system:

NA	NA	NA
----	----	----

Recorded Telephone Dictation Access Option • interface to customer-provided telephone dictation system:

NA	NA	NA
----	----	----

Reserve Power Option • independent power source for temporary power during a short-term outage:

NA	NA	NA
----	----	----

Speed Calling Option • provides directory of frequently called numbers accessed by special dial code:

NA	NA	NA
----	----	----

Station Rearrangement & Change Option • in conjunction with CACS, permits user-controlled station moves and feature changes:

NA	NA	NA
----	----	----

Uniform Call Distribution (UCD) Option • routes incoming calls to designated stations according to preset pattern:

NA	NA	NA
----	----	----

Restriction Features

Standard Features • Class of Service: group of features and restrictions assigned to a station • Code Restriction: denies selected station lines completion of dialed outgoing exchange network calls to selected offices and area codes • Data Privacy: station user will deny other potential users the ability to override or gain access to the used line; restrictions released when station placed on-hook • Data Restriction: station or group denies other users' ability to gain access to the station or group; attempted bridge-on is routed to a tone • Fully Restricted Station: denies the ability to place or receive anything but station-to-station calls • Inward Restriction: stations prevented from receiving incoming Common Control Switching Arrangement (CCSA), tie trunk, and exchange network calls; either direct dialed or attendant completed • Originating Restriction: prohibits station line from originating calls • Outward Restriction: call attempts are routed to the intercept tone; station can not use CO, FX, CCSA trunks • Station-to-Station Restriction: internal calls only are restricted • Termination Restriction: stations cannot receive calls at any time

MO: month-to-month lease charge including maintenance. PRCH: one-time right-to-use fee. MAINT: annual maintenance charge. NA: not available/applicable. NC: no charge. Prices effective as of May 1985.

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Toll Restriction: prohibits users of particular trunks from dialing any number except specified office codes and area codes • Miscellaneous Trunk Restriction: denies dial access from preselected station lines to preselected trunk groups.

Authorization Code Option • requires station user to dial special access code prior to dialing desired facility:

NA mo NA prch NA maint

Call Routing Features

Standard Feature • Route Advance routes outgoing calls to alternate facilities when the first-choice trunk group is busy:

NA mo NA prch NA maint

Automatic Alternate Routing Option • automatic routing of tie trunks over up to 4 alternate trunk groups:

NA NA NA

Automatic Alternate Routing (AAR) Conditional Routing Option • limits number of satellite links in an end-to-end private network routing pattern; System 85 only:

NA NA NA

AAR/ARS Pattern Queuing Option • calls placed via AAR/ARS patterns are queued on all available trunks in the routing pattern rather than the first choice trunk group:

NA NA NA

Automatic Overflow to DDD Option • optional routing of private network calls via off-net facilities from a point on the network where all on-net routes are busy or none are provided:

NA NA NA

Automatic Route Selection Option • provides automatic routing of outgoing calls over alternate customer facilities based on the Direct Distance Dialing (DDD) number; incorporates the functions of and replaces the code restriction and route advance features:

NA NA NA

Interexchange Code Access (IXC) Option • completes outgoing calls to user's choice of interexchange carrier; outpulsing capability of 24 digits; important when user's service area converts to Equal Access:

NA NA NA

Queuing Option • holds outgoing trunk or network calls in an ordered sequence until an idle trunk is available in an all-busy trunk group; off-hook and callback available:

NA NA NA

Call Accounting Features

Standard Feature • Automatic Identification Outward Dialing (AIOD); calling station or trunk is identified to permit individual billing on toll calls.

Centralized Station Message Detail Recording (CSMDR) Option • records station calling details for multiple Dimension PBXs:

NA mo NA prch NA maint

Call Detail Recording & Reporting (CDRR) Option • using Applications Processor, records calling data and outputs detailed management reports:

NA NA NA

Station Message Detail Recording (SMDR) Option • provides station or attendant identity, starting time, duration, and trunk group used for outgoing and/or incoming calls:

NA NA NA

Data Features

Standard Features • Data Privacy: denies other station's ability to override or gain access to data line while in use • Data Restriction: denies access to station or trunk group while data is being transmitted • Data Call Answering: permits automatic answering of incoming data calls to designated data stations • Data Call Preindication: alerts system that a call in progress will be transferred to data mode • Data Call Setup: permits users to

designate specific data call parameters using digital telephone or asynchronous ASCII terminal • Simultaneous Voice and Data: multiplexes voice and data signals over single pair of wires.

Digital Communications Protocol (DCP) Option • supports integrated voice and data communications • used by terminals to communicate with System 75/85 • consists of T-1-compatible 64K-bps voice segment and 64K-bps data segment multiplexed onto a single pair of wires:

NA mo NA prch NA maint

DS-1 Interface Option • provides connection to 1.544M-bps data channels for up to 24 voice/data communications paths:

NA NA NA

Host Access Option • permits use of System 75/85 trunk groups by computer facilities to obtain improved computer traffic data:

NA NA NA

Information System Network (ISN) Interface Option • provides connection to collocated ISN using 8M-bps fiber link:

NA NA NA

Modem Pooling Option • provides sharing of modem facilities by System 75/85 users for better resource utilization:

NA NA NA

Network Features

Advanced Private Line Termination (APLT) Option • maximum of 99 trunk groups that provide access to and termination from private line networks:

NA mo NA prch NA maint

Autovon Interface Option • provides access to Autovon network; support precedence/nonprecedence calls:

NA NA NA

CCSA Access Option • access from the inward dialing from the CCSA network, outward dialing from the PBX without attendant assistance:

NA NA NA

Distributed Communications System (DCS) Option • provides capability to link multiple System 75/85 switches in a network that can be managed as a single network entity:

NA NA NA

ETN Access Option • provides ability to configure switches in an Electronic Tandem Network (ETN) that utilizes a uniform dialing plan:

NA NA NA

Extension Number Portability Option • users within a uniformly numbered network can move their existing station number and DID number to another switch also in the network:

NA NA NA

Facilities Restriction Level (FRL) Option • class of service information for a station that determines which facilities it can access:

NA NA NA

Inter-PBX Call Transfer Option • calls transferred to and from a Main and Satellite PBX system:

NA NA NA

Main/Satellite Option • allows multilocation PBX users to concatenate their attendant positions at 2 locations:

NA NA NA

Tandem Tie Trunk Switching Option • allows tie trunk-to-tie trunk, tie trunk-to-CCSA, and tie trunk-to-exchange network connections through the switching system dialed directly by the remote PBX station user:

NA NA NA

Traveling Class Mark (TCM) Option • class of service (FRL) information about a station user attempting to complete a call over an ETN that determines the facilities the call can use at a distant switching node:

NA NA NA

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Uniform Numbering Plan Option • permits users at a Satellite or Main PBX to place calls over tie trunks using a uniform dialing plan:

NA NA NA

Attendant Console Features

Standard Features • Alphanumeric Display for Console: LED displays provide call information and status • Attendant Control of Trunk Group Access: restriction of station access to specific trunk groups • Attendant Direct Station Selection (DSS) with Busy Lamp Field (BLF): single-button connection of calls to stations, visual display of busy condition of station • Attendant Lockout: prevents attendant from reentering connected station call • Attendant Transfer: calls can be transferred by attendant • Attendant Call Waiting: extending call to a busy station sends special tone to user alerting of a waiting call • Attendant Verification of Busy Stations: attendant can check on status of a station line • Calling Number Display to Attendant: displays either station number calling or type of incoming trunk call • Class of Service Display to Attendant: displays station class of service to attendant • Direct Trunk Group Selection: attendant can directly access trunk group by depressing specific button on console • Hospital and Hotel/Motel Console: special versions of standard console with feature activation buttons for specific functions • Interposition Calling and Transfer: calls between attendants can be arranged, as well as call transfer • Night Console Position: console arranged to handle night service • Privacy: automatic splitting of attendant from incoming call while talking with called station • Serial Call: attendant can establish a series of station calls from a single incoming call, with the original call always returning to the attendant after completing each call • Splitting: incoming call on hold while attendant talks with station • Straightforward Outward Completion: attendant dials call for station user, then releases • Switched Loop Operation: calls coming into console handled on one of several loops, which can be reused for next call • Through Dialing: attendant passes dial tone through to station user, who then dials a call • Timed Reminder: unanswered calls extended from console return to console for further handling after predetermined time • Trunk Group Busy/Warning Indicators: LED indicator that tells when all trunks in a group are in use (busy) or when a predetermined number of trunks in a group are busy (warning) • Trunk Identification by Attendant: trunk type in use on a call identified by display • Trunk-to-Trunk Connections: attendant can connect incoming or outgoing trunk call with outgoing trunk call • Two-Party Hold: attendant can put call on hold that uses 2 facilities for call.

Attendant Conference Option • attendant can establish a connection between a maximum of 6 stations and the attendant:

NA mo NA prch NA maint

Attendant Release Loop (ARL) Option • permits incoming trunk calls to an unanswered station to be held off-loop whenever the station is ringing or the Attendant Call Waiting is provided for the call:

NA NA NA

Controlled Restriction • attendant-controlled restrictions of station users to outgoing exchanges, station-to-station calling, call receiving, and call origination:

NA NA NA

Intercept Treatment Recorded Announcement Option • calls that cannot be completed are routed to an audio announcement message:

NA NA NA

Message Waiting Service Option • remotely lights a lamp on a station to indicate message waiting:

NA NA NA

Multiple LDN, DID & Non-DID Option • allows up to 4 CO directories to be linked to the system:

NA NA NA

Timed Recall on Outgoing Calls Option • outgoing trunk calls from selected stations are automatically transferred to attendant after a finite period of time:

NA NA NA

Visually Impaired Attendant Service Option • special signals to augment attendant console:

NA NA NA

Station Features

Standard Features • Call Forwarding: calls routed to alternate stations if called station is busy or if it is unanswered • Call Hold: calls can be placed on hold • Call Park: calls placed on hold within system for retrieval at another station • Call Pickup: stations within a designated group can answer another ringing phone by dialing a code • Call Waiting: busy station notified of a waiting call by special tone • Calling Number Display to Station: using adjunct display incoming station calls identified to called station • Dial Access to Attendant: stations can dial attendant by dialing "0" • Single-Digit Dialing: access to specific system functions by dialing a single digit (FP 9/11 only) • Station Hunting: calls to busy stations routed to alternate stations • Station-to-Station Dialing: internal calls dialed without attendant assistance • Threeway Conference Transfer: incoming and outgoing calls can be transferred to other stations or bridged to make threeway conference.

Electronic Custom Telephone Service Option • specialized features activated via 5-, 10-, 20-, or 30-button electronic feature telephones; except Prelude and FP 9:

NA mo NA prch NA maint

Automatic Callback Option • a station calling a busy station is automatically connected to the called line when both lines are idle at the same time:

NA NA NA

Automatic Intercom Option • provides talking path between 2 ECTS stations with automatic signaling of the called station:

NA NA NA

Common Audible Ringing Option • allows ECTS station tone ringer to be activated when any 1 of 2 or more specified line appearances on this station has a terminating call:

NA NA NA

Custom Intercom Option • abbreviated 2- or 3-digit code for frequently called stations:

NA NA NA

Dial Intercom Option • ECTS user can depress intercom access button, go off-hook, and dial a code to call one of a maximum of 27 other ECTS stations:

NA NA NA

Exclusive Hold Option • allows an ECTS station user to hold a call, replace the handset without losing the call, or place a call on another line:

NA NA NA

Executive Override Option • specified user can break into a conversation in progress:

NA NA NA

Hold Option • allows an ECTS user to place the other party of a conversation in a hold status by depressing a button:

NA NA NA

Hot-Line Service Option • allows stations to automatically call a preassigned number when station user goes off-hook:

NA NA NA

Incoming Call Preference Option • ECTS feature automatically selects a line access button that has a call in the ringing state:

NA NA NA

Last Extension Called Option • ECTS feature allows user to automatically call the PBX extension that was last dialed:

NA NA NA

Last Line Preference Option • ECTS feature allows user to be connected to last line connected prior to off-hook:

NA NA NA

Line Ringing Option • ECTS feature provides a different ring

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tone for a specific line that appears on the station:

NA	NA	NA
----	----	----

Line Status Indication Option • ECTS feature provides indication of call status for each line-access button:

NA	NA	NA
----	----	----

Manual Exclusion Option • ECTS feature allows the exclusion of the answering position on all other internal stations:

NA	NA	NA
----	----	----

Manual Intercom Option • ECTS feature allows a maximum of 15 ECTS stations to access common intercom paths:

NA	NA	NA
----	----	----

Manual Originating Line Service Option • automatically routes call to attendant when the station goes off-hook:

NA	NA	NA
----	----	----

Manual Terminating Line Service Option • all terminating calls must be completed by attendant:

NA	NA	NA
----	----	----

No Line Preference Option • ECTS feature requires user to manually select a station line access button for each call:

NA	NA	NA
----	----	----

Personal Central Office Line Option • ECTS communication channel link between station and dedicated trunk circuit via PBX:

NA	NA	NA
----	----	----

Priority Hold Option • ECTS feature allows user to hold a call, replace the handset, and place another call:

NA	NA	NA
----	----	----

PBX Line Access Option • ECTS user can access a PBX line with all features:

NA	NA	NA
----	----	----

Station Busy Indicator Option • ECTS feature allows one ECTS station to see switchhook status of another ECTS station:

NA	NA	NA
----	----	----

Station Direct Station Selection (DSS) Option • ECTS feature allows off-hook station to automatically dial preassigned lines or access codes by depressing DSS button:

NA	NA	NA
----	----	----

Station Message Waiting Option • ECTS feature turns on a status lamp on other ECTS stations:

NA	NA	NA
----	----	----

Station Rearrangement & Change Option • allows customer to move stations and change features:

NA	NA	NA
----	----	----

Station Ringer Cutoff Option • ECTS feature turns off station ringer:

NA	NA	NA
----	----	----

Trunk Verification Station Option • allows designed stations to make test calls to verify supervision and transmission:

NA	NA	NA
----	----	----

Applications Software

AT&T has installed its systems in numerous application environments; to date, AT&T has application packages for the following industries: hotel/motel, health care, retail, energy and building management, office automation, military, and service.

Application Processor Software • used with AT&T 16-bit Application Processor.

Message Center Software:

	\$170 mo	\$4,560 prch	\$600 maint
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Call Detail Recording & Reporting (CDRR) Software:

	300	7,990	1,104
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Directory Software • required with either Message Center or CDRR:

	100	2,665	372
--	-----	-------	-----

V & H Coordinates • specialized tables used for pricing telephone calls • required with CDRR:

NC	100	NC
----	-----	----

Terminal Change Management Software:

350	9,325	1,296
-----	-------	-------

Facilities Management Software:

400	10,655	1,464
-----	--------	-------

Electronic Document Communications Software • electronic mail software:

NA	NA	NA
----	----	----

Terminal Emulation Software:

NA	NA	NA
----	----	----

Call Management System Software • used for Uniform Call Distribution (UCD) or Automatic Call Distribution (ACD) management information:

NA	NA	NA
----	----	----

Application Processor Software • used with AT&T 3B5 32-bit Application Processor.

Centralized System Management Software • used to handle operations management for multiple System 85 configurations or very large single systems • includes Terminal Change Management, Facilities Management, Traffic Management, Cost Management, and Adjunct Processor Management modules:

NA	NA	NA
----	----	----

Voice Messaging Software • AUDIX system; integrated with System 85 using specialized CPU and interface components:

NA	NA	NA
----	----	----

HARDWARE

Terms & Support

Terms • the PBX models are available for direct purchase or lease on a month-to-month (MTM) or 2-, 4-, and 6-year basis • lease rates include maintenance • maintenance contracts available.

Support • equipment installed by AT&T • service and maintenance based on policies established by AT&T.

Overview

Both the System 75 and 85 use TDM/PCM switching over multiple high-speed busses. The systems are software controlled and provide a large number of features and diagnostics for efficient system administration. The System 75 is designed as a low-end machine for applications up to 700 lines, after which the System 85 should be selected. The System 75 cannot be field upgraded to the System 85; a complete swapout of machines is required. Once in the System 85, however, a user can grow to the current design limit of approximately 7,000 stations with no component replacement required. Recent announcements will increase the capacity of the System 85 to approximately 32,000 analog stations although this capability will not be available until 1986.

The System 75 is a single-cabinet system, regardless of capacity. There are 8 models which comprise the System 75. All models but 1A and 1B support an integrated Application Processor (AP) option. The AP provides the same functions as those offered by the System 85. The models are divided into 2 groups: Models 1A, 1B, 2A, and 2B are housed in small system cabinets that can support 1 control carrier and 1 port carrier; models 3A, 3B, 3C, and 3D are housed in a larger cabinet that can support 1 control carrier and up to 4 port carriers. The system has a Control Carrier, a rack with 20 board slots into which are inserted circuit boards for the following functions: CPU, memory subsystem, Application Processor Interface, tape control, network control, tone detection, system clock, maintenance control, and up to 9 port cards. Each 4 Port Carrier has 20 board slots for circuit cards that handle the following: analog lines, CO trunks (also WATS, FX, OCC trunks), DID trunks, digital phone lines, pooled modems, tie trunks, hybrid telephone lines, and auxiliary trunks (paging, dial dictation, etc). Circuit boards on the Basic system have 8 analog circuits per board; the new Enhanced (Release 1 Version 2) model has 16

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analog circuits per board. Digital and hybrid station cards have 8 circuits per board; CO and DID trunk cards have 8 circuits per board. The system processor is a 16-bit Intel 8086. Memory is based on 256K RAM components and has a total of 2M to 4M of real storage. Information is handled over the system's 2 high-speed time-division busses. A total of 236 simultaneous conversations (241 with Version 2) is possible over the busses, with 39 time slots reserved for system use. The system architecture is distributed, with additional functions handled by Intel 8051/52 microprocessors resident in each port circuit board. System software is in a UNIX-derived operating system called ORYX-PECOS, written in the C language. All system functions are resident in a single cabinet, and the System 75 can be integrated within any network configuration, such as an ETN or CCSA. It can connect to the 16-bit Application Processor, if required, although it supports several functions normally provided through an AP. All connections to the System 75 are via uniform 4-pair wiring, although in most cases only 2 pairs are actually required.

The System 85 is a large-scale system and has a minimum of 2 cabinets. The first cabinet houses the Common Control Complex, which includes the system processor, memory, a tape system, a Data Communications Interface Unit, and input/output channels. Additional cabinets house port circuit cards and represent the system element called the Communications Switching Module. Critical components can be duplicated throughout the System 85, providing a high degree of redundancy, if required. Each port cabinet houses 4 port carriers, which support up to 16 port circuit cards. Port cards accommodate the same types of equipment and facilities as the System 75, and have an 8-bit microprocessor on each board. Cards can support up to 8 analog stations, 4 digital stations, 4 CO trunks, 2 tie trunks, or 4 auxiliary circuits, depending on the card. Each cabinet has its own power supply and cooling fans. The system processor can be 1 of 2 devices: the 16-bit 301 CC, used on System 85 Release 1, which addresses up to 1 million words of memory; or the 16-bit 501 CC, a higher-speed unit that can address up to 8 million words of memory. The 501 CC is used exclusively on Release 2 System 85s. In terms of processing power, the 301 CC handles up to 20,000 busy hour call attempts, whereas the 501 CC can support in excess of 45,000 busy hour call attempts. A cache memory is available on larger System 85s to increase the overall throughput of the CPU. Memory is based on 256K RAM devices with a total capacity for the System 85 of 8 million words. The operating system is based on UNIX. The Data Communications Interface Unit (DCIU) is a separate device, in its own cabinet, that provides a high-speed, packetized data stream between the System 85 controller and Applications Processors. The Communications Switching Module (CSM) provides the network for all internal connections, both voice and data. Each module supports up to 1,536 ports and 255 simultaneous full-duplex conversations. The Time Slot Interchange (TSI) performs the switching functions for completing calls over the system's available time slots. Larger multiple module systems require the Time Multiplexed Switch (TMS), which interconnects modules. Up to 192 switching modules can be interconnected via the TMS into a system supporting up to 32,000 analog station lines. All connections to the System 85, like the System 75, are via 4-pair uniform wiring.

Three other primary hardware components can be used in System 75/85 configurations: the Applications Processor-16, the 3B5 Applications Processor, and the Audix Voice Message System Processor. The AP-16 uses a 16-bit CPU that can address up to 3 million bytes of memory. Up to 16 terminals can be connected; as many as 30 printers can be connected. The operating system is based on UNIX. The newest application processor is the 3B5 AP, based on the AT&T Technologies-developed WE 32000 32-bit CPU. It is designed for more sophisticated applications, particularly in very large System 85s. A minimum of 8 million bytes of memory is required, but the system's virtual storage addressing techniques provide a logical storage capacity of approximately 4 billion bytes. The system's configurability is highly flexible, and will support a wide variety of I/O devices. Both APs can be housed in the same type of cabinet. The Audix voice message system is a unique product compared to the previous APs. A 2-cabinet system, Audix is designed to interface with both System 85 and dimension PBXs with specific software levels. The 2 cabinets contain the system processor,

software, control cards, connections to the PBX for transmitting voice messages, fixed and removable hard disk drives for voice storage, and power supplies.

The System 85 can have switching modules located as far as 13,000 feet away from the main switch. Remote Modules can distribute switching power at distant locations rather than installing an entirely new system. The connection between the main and the remote is accomplished via a fiber optic link. It is possible to configure up to 30 remote modules. The System 85, Release 2 Version 3 can also support Remote Groups, which are port interfaces that can be located as far away as 100 miles from the main switch. Connected via T-1 lines, each Remote Group cabinet can house up to 6 port interfaces.

□ Representative System Configurations

System 75 Configuration • a single-cabinet nonredundant system.

13 Trunks/40 Stations:		
NA mo	\$51,200 prch	\$3,261 maint
<hr/>		
21 Trunks/120 Stations:		
NA	86,500	5,358
<hr/>		
27 Trunks/200 Stations:		
NA	183,400	10,040
<hr/>		
152 Trunks/650 Stations:		
NA	553,500	30,700

System 85 Configuration • a multicabinet, nonredundant system.

100 Trunks/450 Stations:		
9,900	270,000 to 360,000	NA
<hr/>		
400 Trunks/900 Stations:		
23,400	560,000 to 720,000	NA
<hr/>		
1200 Stations & 10% Data Switching:		
60,000	1,100,000	NA

□ System Components

Analog Station Circuit Pack • 8 lines per board • System 85:

\$31 mo	\$1,176 prch	\$126 maint
---------	--------------	-------------

Hybrid Station Circuit Pack • 4 lines per board • System 85:

23	882	60
----	-----	----

Digital Station Circuit Pack • 4 lines per board • System 85:

17	630	63
----	-----	----

Trunk Line Circuit Pack • 4 lines per board • System 85:

21	798	63
----	-----	----

Tie Trunk Circuit Pack • 4 lines per board • E & M 2 wire or 4 wire • System 85:

29	1,092	63
----	-------	----

Attendant Console Circuit Pack • 4 consoles per board • System 85:

29	1,092	63
----	-------	----

Auxiliary Trunk Circuit Pack • 4 lines per board • paging, dial dictation interfaces • System 85:

31	1,176	63
----	-------	----

Direct Inward Dialing (DID) Circuit Pack • 4 lines per board • System 85:

29	1,092	63
----	-------	----

Analog Station Circuit Pack • 8 lines per board • System 75:

30	1,457	48
----	-------	----

MO: 4-year monthly lease charge including maintenance for system components. PRCH: purchase price; includes installation cost. MAINT: annual maintenance charge for purchased systems. NA: not available/applicable. NC: no charge. Prices effective as of May 1985.

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Digital PBX Systems

Analog Station Circuit Pack • 16 lines per board • System 75:

100	5,798	120
-----	-------	-----

Hybrid Station Circuit Pack • 8 lines per board • System 75:

28	1,242	42
----	-------	----

Digital Station Circuit Pack • 8 lines per board • System 75:

38	1,607	51
----	-------	----

Trunk Line Circuit Pack • 8 lines per board • System 75:

8	1,237	60
---	-------	----

Tie Trunk Circuit Pack • 4 lines per board • System 75:

29	1,132	48
----	-------	----

Auxiliary Trunk Circuit Pack • 4 lines per board • System 75:

29	1,132	48
----	-------	----

Direct Inward Dialing (DID) Circuit Pack • 4 lines per board • System 75:

33	1,237	60
----	-------	----

Pooled Modem Circuit Pack • System 75:

NA	NA	NA
----	----	----

Expansion Memory • 1M bytes • System 75:

NA	3,470	81
----	-------	----

Expansion Memory • 2M bytes • System 75:

NA	6,815	120
----	-------	-----

Speech Synthesis • generates voice prompts for feature activation, messaging • System 75:

NA	3,865	252
----	-------	-----

Tone Clock • generates specific system tones • System 75:

NA	930	24
----	-----	----

EIA Data Line Card • provides up to 8 RS-232C interfaces • System 75:

NA	2,100	102
----	-------	-----

Application Processor/Distributed Communications System (AP/DCS) Interface • connects System 75 to AP-16 • System 75:

NA	7,555	396
----	-------	-----

System Administration Terminal (SAT) • interface to System 75 for customer-controlled administration functions:

45	1,540	225
----	-------	-----

System Management Terminal (SMT) • interface to System 85 for customer-controlled administrative functions:

92	3,400	225
----	-------	-----

□ Station Equipment—Voice/Data

Multibutton Electronic Telephone (MET) • used with ECTS • equipped with Touch-Tone pad, tone ringer, and volume control • available in 5-, 10-, 20-, and 30-button sets.

5-Button MET:

\$9 mo	\$300 prch	NA maint
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10-Button MET:

10	315	NA
----	-----	----

20-Button MET:

15	450	NA
----	-----	----

30-Button MET:

19	520	NA
----	-----	----

Attendant Console • primary function to service incoming calls from off premises and connect appropriate internal station • place outgoing calls • provide information concerning status and types of calls handled • desktop unit.

System 75:

42	1,728	72
----	-------	----

System 75 Selector Console Unit • adds direct station selection (DSS) to System 75 console:

23	903	36
----	-----	----

System 85:

82	3,150	225
----	-------	-----

Model 2500 • conventional single-line Touch-Tone telephone • includes volume control and is available in 8 colors:

3	65	9
---	----	---

Model 2500 with Message Waiting & Recall • same as standard 2500 set but with M/W light and special system recall button:

5	97	10
---	----	----

Model 7101 • single-line voice terminal with handset and Touch-Tone pad • includes message indicator • volume control • 2 fixed feature buttons (recall and disconnect) • message waiting lamps:

6	170	24
---	-----	----

Model 7103 • single-line voice terminal with handset and Touch-Tone pad • includes message indicator • volume control • 4 fixed feature buttons (recall and disconnect) • 10 optional feature buttons:

8	270	25
---	-----	----

Model Touch-a-Matic 7104 • single-line voice terminal with handset and Touch-Tone pad • 14-character LCD display • speed dialing for 16 numbers • built-in speaker for amplifying conversations • 16 programmable feature/speed dial buttons:

10	295	27
----	-----	----

Model 7203 • multiappearance hybrid voice terminal with handset and Touch-Tone pad • includes message indicator • volume control • 6 fixed feature buttons (recall, disconnect, conference, drop, transfer, and hold) • 10 user-defined buttons • optional 24-button Digital Function Key Module (DFKM):

13	440	36
----	-----	----

Model 7205 • multiappearance hybrid voice terminal with handset and Touch-Tone pad • includes message indicator • volume control • 6 fixed feature buttons (recall, disconnect, conference, drop, transfer, and hold) • 34 user-defined buttons; 10 can be assigned to features or multiple appearances, the remainder are available for features only • optional 20-button Digital Call Coverage Module (DCCM) and 24-button DFKM:

18	785	39
----	-----	----

7300 Speakerphone • used with all 7200 series terminals:

6	258	24
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Model 7303 • multifunctional hybrid voice terminal with handset and Touch-Tone pad • same as 7203 but with speakerphone capability • available with System 75 and System 85 Release 2 Version 2:

NA	409	36
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Model 7305 • multifunctional hybrid voice terminal with handset and Touch-Tone pad • same as 7205 but with speakerphone capability • available with System 75 and System 85 Release 2 Version 2:

NA	680	39
----	-----	----

Model 7403 • multiappearance, digital voice terminal with handset and Touch-Tone pad • includes message indicator • volume control • 6 fixed feature buttons (recall, disconnect, conference, drop, transfer, and hold) • 10 user defined buttons • optional feature cartridges:

16	735	37
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Model 7404 • multiappearance digital voice terminal with handset and Touch-Tone pad • includes message indicator • volume control • 6 programmable feature buttons • 4 fixed feature buttons (hold, transfer, conference, drop) • integral Digital Data Module for asynchronous full-duplex operation • selectable data speeds up to 19.2K bps • automatic speed matching to distant end points • integral RS-232C interface • cartridge slot for optional feature cartridges:

Basic Unit:

15	727	57
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AT&T-IS Systems 75 & 85 Digital PBX Systems

Messaging Cartridge:

NC	65	NC
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Model 7405 • multiappearance digital voice terminal with handset and Touch-Tone pad • includes message indicator • volume control • 6 fixed-feature buttons (recall, disconnect, conference, drop, transfer, and hold) • 34 user-defined call appearance/feature buttons; 10 can be assigned to features or multiple appearance, the remainder are available for features only • optional DCCM for 20 additional call appearances • optional DFKM for 24 additional feature buttons • optional Digital Display Module (DDM) for 40-character alphanumeric display and 8 display mode select and function buttons • optional data Terminal Data Module (DTDM) to accommodate data terminal equipment:

20	880	45
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Digital Call Coverage Module (DCCM) • option provides 20 additional call appearances for 7204 and 7405 voice terminals:

13	490	NA
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Digital Function Key Module (DFKM) • option provides 24 additional feature buttons for 7203, 7403, 7205, 7405 voice terminals:

13	490	NA
-----------	------------	-----------

Digital Display Module (DDM) • optional 40-character alphanumeric display panel with 8 display mode select and function buttons for 7403 and 7405 voice terminals:

19	635	39
-----------	------------	-----------

Power Supply • used with each Digital Display Module:

2	85	39
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Data Equipment

500 Business Communications Terminal (BCT) • workstation designed for direct connection into Applications Processor • communicates with AP at 56K bps • assumes operational characteristics of application running in AP • 25-line x 80-character display using 7x9 character matrix • detachable keyboard • 4K bytes of ROM, 60K bytes of RAM for user program, with 16K RAM for screen refresh.

Basic Terminal:

\$76 mo	\$2,825 prch	\$195 maint
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Keyboard:

16	575	66
-----------	------------	-----------

510 Personal Terminal • asynchronous terminal with 9-inch touch screen display • integrated voice/data terminal • data speeds up to 19.2K bps • built-in speakerphone • VT-100 compatibility • 513 BCT emulation • 2 pages of data memory • multiple screen windows • detachable 72-key keyboard • training/directory/security plug-in cartridges • full diagnostics • Centronics parallel port • auto-log-in feature.

Basic Model 510 • includes introduction cartridge:

NA	1,830	156
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Keyboard with Garage:

NA	100	25
-----------	------------	-----------

Directory Cartridge:

NA	75	NC
-----------	-----------	-----------

Security Cartridge:

NA	75	NC
-----------	-----------	-----------

513 Business Communications Terminal (BCT) • EIA RS-232C-compatible asynchronous terminal designed with an enhanced character graphics set and keyboard functions for data only • used with a PDM/DTDM on the 7403 or 7405 digital voice terminals to interface with System 75/85 DCP • supports speeds up to 19.2K bps • can be used either to access Application Processor (AP) applications in an EIA mode or as a timesharing device:

NA	1,995	NA
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515 Business Communications Terminal (BCT) • integrated workstation, CRT display terminal and a telephone housed

together • desktop workstation provides simultaneous voice and data communication • features split-screen display windowing • digital communications protocol (DCP) interface similar to the interface used by the Series 7000 digital voice telephones • telephone features are identical to the 7403 unit with the addition of the 7405 display module with dedicated S-channel messages • contains 64 bytes of downloadable memory:

NA	2,995	NA
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Data Communications Interface • modules interface user-supplied terminal equipment (DTE) and data circuit terminating equipment (DCE) • data modules perform transmit/receive functions • proprietary Digital Communications Protocol (DCP) • equipped with EIA RS-232C interface • supports half- or full-duplex asynchronous (10-bit start/stop) or synchronous transmission at 300, 1200, 2400, 4800, 9600, or 19.2K bps • transmitted and received over 4-wire twisted pair DCP link:

NA	NA	NA
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Digital Terminal Data Module (DTDM) • accommodates terminal (DTE) • attaches to 7403 or 7405 digital voice terminals by snapping on right edge of voice terminal or attached to DFKM on 7405:

35	800	NA
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Modular Processor Data Module (MPDM) • standalone or rackmount unit interfaces data terminal equipment (DTE) with System 75 or 85 • contains switches for operating parameter selection (including data rates) and diagnostic testing (self test, local/remote loopback) • status indicator lamps • up to 8 PDM modules on System 85; 1 on System 75 • PDM equipped with RS-232C interface connected to DCE:

40	961	57
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Standalone Housing:

7	244	3
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Multiple Rackmount • accommodates 8 PDMs:

25	865	NA
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Modular Trunk Data Module (MTDM) • standalone or rackmount unit interfaces modem connected to analog line or data service unit (DSU) connected to DDS facility with System 75 or 85 • contains switches or operating parameter selection (including data rates and diagnostic testing) • status indicators • up to 8 TDM circuit modules per rackmount unit • TDM equipment with RS-232C interface connected to DTE:

35	968	57
-----------	------------	-----------

Standalone Housing:

7	244	3
----------	------------	----------

Multiple Rackmount • accommodates 8 TDMs:

25	865	NA
-----------	------------	-----------

Local Area Data Sets (LADS) • standalone or rackmount unit interfaces Application Processor (AP) with Data Communication Interface Unit (DCIU) • data rates from 2400 to 19.2K bps • contains RS-232 interface • standalone price:

40	930	NA
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Digital Service (DS-1) • high-speed, high-volume digital communications trunking system available for System 85 Release 2 • DS-1 format multiplexes 24- to 64K-bps digital channels onto a 1.544-MHz T1 carrier • DS-1 Interface feature allows system to access this high-speed, high-volume data communication networking service:

NA	NA	NA
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DS-1 Channel Division Multiplexer (CDM) • connects System 85 to nonswitched T-1 facilities for dedicated channels:

NA	NA	NA
-----------	-----------	-----------

DS-1 Channel Expansion Multiplexer (CEM) • doubles the capacity of T-1 channel • compresses 48 voice channels onto T-1 facility:

NA	NA	NA
-----------	-----------	-----------

D4 Channel Bank • interface to provide voice-grade connections between analog PBXs via T-1 channels • available in

AT&T-IS Systems 75 & 85 Digital PBX Systems

either 24- or 48-channel versions.

24 Channels:

NA	NA	NA
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48 Channels:

NA	NA	NA
----	----	----

DS-1 Digital Multiplexed Interface • high-speed digital communications interface • provides 23 data channels, 1 signaling channel:

NA	2,540	78
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Model 3270 Data Modules • support switching of IBM 3270-type terminals to cluster controllers through System 75 and 85 • converts Coax A protocol to AT&T DCP protocol • full-duplex synchronous transmission • ASCII terminal emulation • analog voice connections for simultaneous voice and data transmission • maximum distance from PBX 5,000 feet.

3270T • connects 3270 terminals to System 75/85 • supports native 3270 mode • includes auxiliary jack for voice terminal • connects to System 75/85 via standard twisted pair:

NA	785	NA
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3270A • same functions as 3270T plus ASCII emulation capability • 3270 terminal can be made to emulate ASCII terminal for special applications:

NA	995	NA
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3270C • connects System 75/85 to IBM cluster controller • circuit pack supports up to 2 cluster controllers • data module housing provides for 4 circuit packs, supporting up to a total of 8 cluster controllers • functions as 3270 terminal to cluster controller.

Circuit Pack:

NA	1,600	NA
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Module Housing:

NA	800	NA
----	-----	----

Model 4271 Protocol Converter • converts asynchronous ASCII signal to 3270 BSC:

NA	NA	NA
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Model 4276 Protocol Converter • converts asynchronous ASCII signal to SNA/SDLC:

NA	NA	NA
----	----	----

Model 5274 Protocol Converter • converts 3271 BSC to SNA/SDLC:

NA	NA	NA
----	----	----

Model 5776 Protocol Converter • makes a 3780-type device emulate an IBM 3776-2 terminal:

NA	NA	NA
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Distributed Communications System (DCS) • network of 2 to 20 switches linked to allow some attendant, station/user, and system feature transparency between switches • transparency can be provided for approximately 100,000 stations • uses 2 types of interfaces between each pair of switches; DCIU data link and tie trunks:

NA	NA	NA
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□ Peripherals

Model 443 Printer • 30-cps tabletop matrix printer used with AP • 132 print columns; 3- to 15-inch paper width tractor feed • original and 5 copies • ASCII code • can be loaded up to 5,000 feet from AP:

\$80 mo	\$1,935 prch	NA maint
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Model 445 Printer • 220-lpm matrix line printer used with AP • 132 print columns; 3- to 15-inch paper width; tractor feed • original and 5 copies • ASCII code • can be loaded up to 2,000 feet from AP:

280	6,475	NA
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Model 450 Printer • 55-cps bidirectional character printer; document quality printing; used with AP • 132 print columns at 10 cpi; 158 print columns at 12 cpi; 4- to 15-inch paper width;

friction/optional tractor feed; 4- to 14-inch forms • original and 5 copies • ASCII code • tab, margin, and form control • can be located up to 5,000 feet from AP:

165	5,350	NA
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Model 460 Printer • 200-cps tabletop matrix printer; draft quality printing; used with AP • 132 print columns at 10 cpi; 218 character-per-line condensed printing; 66 characters per line expanded printing; 3- to 15-inch paper width • original and 5 copies • ASCII code • can be located up to 5,000 feet from AP16:

160	3,920	NA
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Disk • 160M bytes for use with an AP:

NA	NA	NA
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Tape Drive • 9-track, 1600-bpi tape drive used with AP:

NA	NA	NA
----	----	----

High Capacity Mini Recorder • used for program load into the AP • used as auxiliary disk backup • standard feature with AP:

NA	NA	NA
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□ Subsystems

Application Processor • 16-bit minicomputer under control of AP version of UNIX operating system • contains 40M-byte or 160M-byte disk, 9-track mag tape drive for Call Detail Recording (CDR), and 212 AR modem for connection to RMATS-II • requires Local Area Data Set (LADS) to interface with System 75/85 and 500 BCT terminal for control • required to support CDR Directory, Facilities Management, Message Center, and Terminal Change Management Services • accommodates up to 16 BCT terminals and 2 printers; additional printers supported through reduction of attached BCT terminals • available for lease:

\$3,300 mo	\$110,000 prch	\$12,000 maint
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3B5 Applications Processor • 32-bit minicomputer under control of UNIX-based operating system • 8M bytes of main memory • 160M-byte disk drive • 9-track tape drive • variable I/O configurations • same applications as AP-16 • required for Centralized System Management option:

NA	170,000 to 180,000	NA
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Audix Voice Messaging System • voice mail system • connects to System 85 via DCIU for control functions • up to 32 message channels between Audix and PBX • up to 4,000 users supported • up to 200 hours of voice messages • up to 2 removable disk drives, each with 80M bytes unformatted • up to 7 fixed-disk drives, each with 340M bytes of unformatted storage • supported on System 85 Release 2 Versions 2 and 3, Dimension PBX running FP 8/Issue 3/List 7:

NA	140,000 to 380,000	NA
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Force Administration Data System (FADS) • standalone terminal used to display call traffic data • displays attendant related calls, Centralized Attendant Service (CAS) calls, Uniform Call Distribution (UCD)/Direct Department Calling (DDC) calls • contains 12-button keypad and 2 display fields:

NA	NA	NA
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Call Management System • integrates Automatic Call Distribution (ACD) and Management Information System (MIS) functions with PBX functions • requires AP-16, hard disk, HCMR, 3M bytes of memory, link to PBX DCIU • 144 agent positions, 255 trunks, 30 agent groups (splits), and 60 trunk groups maximum supported • up to 8 CRTs for split and system supervisors (System 85 only):

NA	NA	NA
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Premises Distribution System (PDS) • internal wiring distribution system that supports voice, data, graphics, and video • includes cables, adapters, electronics, and protective devices • combines twisted-pair and fiber optic cables • universal 8-pin modular jack.

Work Location A • twisted pair only, includes connectors:

NA	90 to 150	NA
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Work Location B • twisted pair and fiber optic, includes connectors:

NA	125 to 250	NA
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AT&T-IS Systems 75 & 85 Digital PBX Systems

□ System Maintenance & Diagnostics

System Reliability • main system functions stored on EPROM; restored upon power-up • diagnostic, error detection, and recovery routines stored in ROM • error-correcting memory • redundant CPUs on System 85 Release 2 • redundant critical electronics on all models • battery backup or uninterruptible power supplies available to keep system operational during power outage • power failure transfer connects designated trunks to stations automatically upon power outage.

System Diagnostics • Systems 75 and 85 continuously run diagnostic routines on all system operations • alarm signal notifies attendant of minor or major outage in system • alarm lamps in equipment cabinets provide alert to major component malfunctions • system diagnostics can be queried remotely via Remote Maintenance and Testing Service (RMATS).

System Maintenance • normally performed by AT&T-IS

personnel • System Administration Terminal (System 75) or System Management Terminal (SMT) used for troubleshooting and querying system for internal performance • most repairs corrected in field by replacing circuit boards • RMATS data collected by AT&T for diagnosis prior to making field visit.

System Management • calling details available as raw data for further processing (SMDR) or detailed management reports (CDRR) for management analysis • feature changes made via System Administration Terminal or System Management Terminal • moves and rearrangements made via SAT, SMT, or Customer Administration Control System (CACS) • activities associated with AP-16 or 3B5 Applications Processor managed via 500 Business Communications Terminal (BCT) series display • Centralized System Management, based on 3B5 AP, available in large System 85 configurations.

• END

Centrex

Central Office-Based Communications Service

■ PROFILE

Function • stored program central office-based communications service for switching voice and data.

Applications Supported • general business • healthcare • banking • military • government • education • service sector.

System Parameters • switching technology: depending on serving central office (C.O) either analog using TDM/PAM or digital using TDM/PCM • architecture: centralized processor tied to high-speed bus; nonblocking • common control: stored program • transmission: 4-wire internal switching • wiring plan: stations—2-pair for single-line phones up to 50-pair for 20-button key sets • data switching capability: up to 9600-bps asynchronous using modems.

Traffic Capacity • 36 CCS per line for stations, both voice and data • grade of service: P.01 • simultaneous conversations: unlimited • nonblocking architecture.

Trunks/Stations/Consoles • trunks: unlimited; stations: unlimited; consoles: unlimited, but most systems will have at least 1 console with upper limit usually 10 to 20 percent less than comparable PBX systems • trunks supported: central office—one-way (in/out), 2-way; FX; tie lines (2-wire, 4-wire E&M); OCC; Autovon; Common Control Switching Arrangement (CCSA); Enhanced Private Switch Controlled System (EPSCS) • attended and unattended operation.

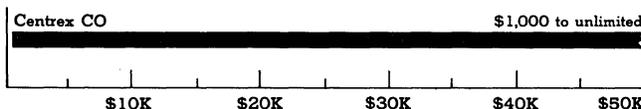
Voice Equipment • vendor-supplied: analog telephones, both rotary (500 type) and touch-tone (2500 type) • nonvendor equipment supported: rotary and touch-tone telephones (500/2500 types); paging systems; dial dictation systems; automatic dialers; speakerphones; equipment supported will vary with individual operating telephone companies (telcos) • electronic feature telephones: available in certain telcos and through equipment vendors specializing in feature phones • digital telephones: anticipated availability by mid-1985 in certain telcos.

Data Equipment • vendor-supplied: limited distance data sets and modem pooling planned for first quarter 1985 deployment in certain telcos • nonvendor equipment supported: asynchronous terminals; PCs using modems • data rates: 9600 bps using modems • modems: all types (check with telco); modem pooling available in certain areas early 1985 • multiplexers: all types (check with telco) • protocol converters: most types (check with telco) • data modules: limited distance data set (early 1985 introduction) • interface supported: RS-232C • printers: not provided with Centrex • data storage: not provided with Centrex • data terminals: ASCII, TTY computers: minicomputers, personal computers.

Subsystem Support • automatic call distributors: ESS/ACD call detail recording; automatic identified outward dialing (AIOD) standard feature; station message detail recording (SMDR) optional • voice message systems: optional in certain telcos •

LEASE PRICE RANGE

hardware & software



CENTREX MONTHLY LEASE PRICING bar graph covers price ranges between small Centrex configurations of 100 stations to virtually unlimited size systems.

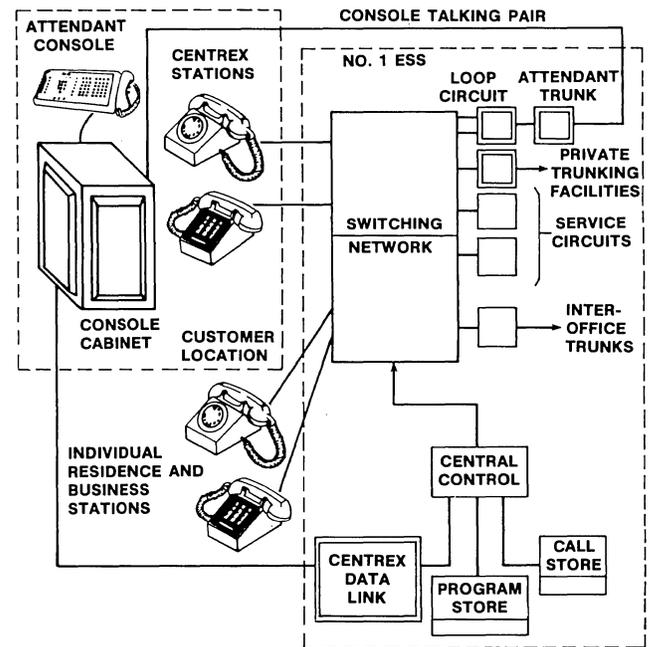


Diagram of Number 1 ESS Centrex. Photo Courtesy of AT&T.

message center systems: not available • centralized attendant service: optional • energy management systems: not available • hotel/motel management systems: not available.

Communications/Networking • abbreviated dialing • off-network dialing • on-network dialing • dialed digit translation • route optimization: automatic route selection (ARS); flexible route selection (FRS) • tandem switching • transmission rates: 9600 bps • protocols: check with telco • asynchronous to 9600 bps • synchronous to 9600 bps • T-1 interface: check with telco • gateways: check with telco.

First Delivery • 1958.

Systems Delivered • 5.5 million installed Centrex lines service approximately 12,000 companies; many companies have multiple installations.

Installation Interval • depending on system size, approximately 8 to 24 weeks; additional lines within 1 to 4 weeks, depending on number of lines installed.

Comparable Systems • any telephone system that supports direct inward dialing (DID) and station message detail recording (SMDR) • Centrex supports all system line sizes.

Environmental Specifications • not required since all Centrex switching equipment is located in telco central offices.

Vendor • all Bell Operating Companies (BOC); independent telephone companies.

Distribution • nationwide through Bell Operating Companies and independent telcos.

Service/Support/Training • provided by BOC or independent telco.

Centrex

Central Office-Based Communications Service

■ ANALYSIS

There are few business communications users, if any, who have not heard of Centrex. It is the most widely used communications service available, next to the PBX, in terms of installed base. Approximately 12,000 businesses use Centrex nationwide, many with multiple systems. This translates into about 5.5 million installed Centrex lines.

Centrex was developed in the 1950s and has several common features: direct inward dialing (DID), station-to-station dialing, direct outward dialing (DOD), and automatic identified outward dialing (AIOD). DID permits incoming calls to be completed to the desired station without operator intervention. Station-to-station dialing and direct outward dialing facilitates call origination by station users. AIOD provides a detailed readout of long distance calls placed by each individual Centrex station.

While these features are commonplace today, especially with electronic PBX systems, they were unique back in the late 1950s, when Centrex first appeared. After World War II, the Bell System began a concerted push to stimulate the use of dial telephone service for making local and long distance calls. Initially, large business users were the targeted audience for this effort, and a new service was needed to stimulate dial service.

Since large users typically had numerous switchboards to handle telephone calls, Bell Telephone Laboratories explored methods of reducing the number of operators required by these large users. Another consideration was the amount of floor space required for operator positions and switching equipment, which, in those days, was step-by-step electromechanical technology.

The new service, as envisioned by Bell Labs, would have several unique features to satisfy these needs. First, the service would conform to the nationwide 7-digit numbering plan (3-digit exchange plus 4-digit line number). Second, calls could be completed directly to a station without operator handling. And third, outgoing calls, whether to another extension or to the public network, could be dialed directly. To help reduce the amount of floor space, the switching equipment would be located in the telephone company central office, rather than the customer's premises. The service would also provide a detailed record of all outgoing long distance calls dialed.

After a successful trial of DID in 1957 at AT&T Corporate Headquarters in New York City, a recommendation was made to pursue development of the new service. The first installations of DID systems were in 1958 at E.I. DuPont and the Air Force Academy.

Two types of Centrex evolved in the early years. Since the development of the central-office-based service was rather difficult, DID systems based on existing step-by-step switching equipment became an effective alternative. This product was known as Centrex-CU (for customer location of the switch), and competed with Centrex-CO, which was the central office (C.O.) product. Centrex-CU began to disappear in the 1960s and early 1970s as Centrex-CO systems became more efficient and sophisticated. Interestingly, the concept of Centrex-CU has resurfaced as a major feature of today's PBX systems.

Today, most Centrex service originates from ESS (Electronic Switching System) central offices, which has helped the service keep pace with, but not supersede, the PBX industry. After AT&T's divestiture, the Bell Operating Companies had responsibility for Centrex, and could either turn it into a revenue maker or let it disappear. Based on the amount of activity the BOCs have spent on Centrex to date, it appears Centrex will indeed be competitive with PBX systems. This is an interesting paradox, since the BOCs are owned by 1 of the 7 regional holding companies (Ameritech, Bell Atlantic, US West, etc) and each regional company has formed separate equipment subsidiaries to sell PBX systems in competition with the BOCs.

On the regulatory scene, Centrex has had its share of difficulties. As it is considered an **exchange service**, it is subject to access surcharges levied as a result of the divestiture proceedings. For Centrex users, additional charges of anywhere from \$2.00 to \$8.00 per line would have been disastrous. Speculation was that Centrex users would disconnect their service en masse with rate hikes like that. Fortunately, most of these increases have either

been delayed by legal maneuvering or nullified by Centrex rate reductions by the BOCs to compensate for access charges. More problems have come in the form of charges that Centrex enhancements like integrated voice/data switching constitute an **enhanced service**, which allegedly violates the provisions of the divestiture. Centrex will most likely survive these problems, and remain an alternative to PBX service.

Centrex operating features are based in the telephone company central office. The use of ESS central offices has made possible the development of enhanced features that makes Centrex competitive with PBX systems. These features are typically grouped into **generics**. Basic Centrex service today usually includes DID, DOD, AIOD, station-to-station dialing, call transfer, conference calling, station hunting, toll restriction, and access to special circuits (FX, WATS, OCC, etc). Enhanced Centrex features include call forwarding, call waiting, call pickup, touch-tone, station message detail recording (SMDR), automatic route selection (ARS), and automatic call distribution (ACD) service. There are currently about 200 features available with Centrex, although not in all service areas.

The latest developments in Centrex are in customer administration and data communications. One of the largest components of Centrex charges is the cost for moves, rearrangements, and feature changes. Centrex users have been trying for years to have the same administrative capabilities as PBX users, and they are finally getting their wish. Data communications has traditionally been a matter of connecting modems to Centrex lines. This method works well up to 9600 bps, but it requires additional Centrex lines, plus enough intelligence for the modem or auto-dialer to dial the correct access codes.

Centrex users have already begun using the customer administration feature, which uses a terminal to interface with the central office. This will make it much easier to handle the numerous administrative activities a Centrex user is faced with daily. One method, known as the Advanced Communications Package, provides real-time processing of SMDR data, a message center facility, Centrex station rearrangement and feature changes, facility control and administration, and electronic feature telephone functions. The work is performed by an AT&T 3B computer, working in conjunction with the central office. The important benefit in this approach is that the central office is permitted to switch calls, which it is designed to do, and the adjunct computer handles the specialized functions, which it, too, is designed to do. Result: better overall system performance and functionality at a reasonable price.

Integrated voice and data communications will become available in certain areas of the country early next year, with widespread availability by the end of 1985. Speeds of 9600 bps will be supported and the feature will use modem pooling (based in the C.O.) and limited distance data sets on the user's desk to provide the necessary interfaces. Both the voice and data signals will be sent over the same pair of wires, and will not require the use of additional Centrex lines dedicated to data. Initially, the limited distance data set will take the form of an additional unit on each user's desk. New telephone sets integrating the data features will appear during 1985, and will eliminate the need for multiple units.

Additional features for Centrex will be based on Local Area Signaling Services (LASS), to be made available nationwide to telcos early in 1985. Some of these features will include selective call forwarding, distinctive ringing, and calling number display (on a separate display unit).

The product strategy for Centrex is to make it as PBX-like as possible, without losing its unique characteristics. Pricing will become more a function of actual costs, which means the telcos and equipment suppliers will have to cooperate more closely to keep Centrex competitive. Centrex is still an expensive service, even though the telcos have made efforts to keep it cost-effective. Price-stability tariffs have been filed by many telcos, and new service packages, like Advanced Communications, will have the telcos again adjusting tariffs to keep their product competitive with PBXs. Users with several locations in a city traditionally have been hit with mileage charges when trying to connect their distant offices into the main Centrex system. The idea is to have a uniform numbering scheme for all locations in the city and its

Centrex

Central Office-Based Communications Service

surrounding areas. A new capability called City-Wide Centrex, to be available late in 1985, will eliminate these problems by networking Centrex systems in an area. The service will be based on No. 1A ESS central office technology, and will provide a uniform numbering plan for all locations such that all calls will be treated as intra-Centrex calls. This will eliminate special access codes, tie lines, and other more costly arrangements.

Another interesting area for Centrex users is add-on equipment to provide specialized features and services not offered by telcos (or not available for a prolonged interval). This could become a very lucrative marketplace for a few companies, provided their equipment is cost-effective and performs as advertised. For example, a recent start-up company, David Systems, of Sunnyvale, California, announced the Information Manager, an adjunct system that handles either circuit-switched or packet-switched communications traffic. It uses proprietary electronic telephone sets that can be programmed to activate Centrex features. It can handle simultaneous voice and data transmissions, and can function as a gateway for specialized products like local area networks value-added networks.

Perhaps the most significant enhancement to Centrex will come in the form of support for the Integrated Services Digital Network (ISDN). An ISDN will provide end-to-end digital capabilities for the development and deployment of specialized data services. While the standard is still under development, most of its major components are known to equipment manufacturers, who have begun introducing pieces of ISDN into their product lines. ISDN support is a natural for ESS-based Centrex, since the C.O. will play a pivotal role in the realization of ISDN. Indeed, the future of Centrex looks promising.

□ Strengths

Centrex popularity is based on several important factors. The technology is continually being updated for the telcos, which translates to improvements for the end user without the user having to make large investments in the technology. Users don't have to invest in floor space, since Centrex is located entirely in the C.O. Additional costs for environmental support—air conditioning and electrical wiring—are the telcos' responsibilities. Centrex downtime is minimal, and since the service is continually monitored in the C.O., potential problems are usually corrected before the user is ever aware of them. Centrex is virtually unlimited in size, which means a firm with 20 stations or half a million can be served. If customers need to cut back on service, there is no problem since all switching equipment is in the C.O. The service is nonblocking at any line size, which will prove extremely beneficial for data users, particularly when integrated voice/data service is used. Centrex is maturing into a full-featured service that will compete with the PBX on almost any level. Its networking capabilities are formidable, and the quality of the service is excellent. Pricing is becoming more competitive, especially when telcos adjust tariffs to ensure price stability and compensate for government-mandated rate adjustments. Users realize that Centrex is an important telecommunications product, and have formed Centrex user organizations to voice their needs to both telcos and regulatory bodies.

□ Limitations

When Centrex was in its heyday, back in the 1960s and early 1970s, its popularity was unmatched. However, the development of more sophisticated PBX systems left Centrex standing out in the cold for awhile. Its features, while suitable for most users, were perceived as dated. Its overall costs were on the rise and rate increases for circuits and other special features made many users take a closer look at the new crop of PBXs. That, of course, is beginning to change, but the perception remains. Data communications support is primitive compared with the latest digital PBXs, but usable nonetheless. A major limitation of Centrex today is the BOCs' inability to effectively market the service. The BOCs will first have to stem the tide of users defecting to PBX systems, then work hard to make Centrex an attractive alternative to PBXs.

■ SOFTWARE

□ Terms & Support

Terms • all software is bundled into Centrex system price with the exception of optional features.

Support • Centrex system software is supported by operating telephone companies.

□ Software Overview

Centrex is a central office service, and all software for system features is resident in the C.O. Features are generally grouped in "generics," which build capabilities upon each successive generic offering.

Most of today's stored-program PBX systems have significantly more features than Centrex, but this trend is gradually changing. With the threat of users abandoning Centrex in favor of digital PBXs, most telcos are aggressively developing new enhancements for Centrex.

Very high levels of software support are standard with Centrex, since the service is constantly monitored as part of the ongoing activities in a telco central office.

Customer control of feature activation/change has been lacking for many years in Centrex, and with the trend toward customer administration of telephone systems, there has been substantial push to include this capability. It is now becoming available in many areas of the country.

□ Features Overview

Centrex can be provided in virtually any type of telco central office, but the feature mix will vary with the technology of the C.O. For example, a Centrex served by a step-by-step (SXS) office will not have the features available from a No. 1 ESS (Electronic Switching System) office, simply because the SXS office is "wired-logic," which is limited typically to the ability to switch calls, support attendant positions, and handle station-to-station calling and DID, and the ESS office is a stored-program computer system, which can handle a much larger array of features.

□ Centrex System Features

Standard Features • direct inward dialing (DID): incoming calls from the switched network completed directly to station, bypassing attendant • attendant console: calls on listed directory number (LDN) of firm answered at console; other features supported • access to dial dictation systems: support for interface to customer-provided central dictation system • paging access: interface to customer-provided paging system; access by station users and/or attendant • touch-tone dialing • night service: calls after hours can be answered at specific locations or answered by dialing a universal access code on any phone • single-digit access to system services: access to specific telephones or services by 1- to 4-digit access codes.

Automatic Call Distribution Option • incoming calls routed to group(s) of agents in predetermined sequence so as to evenly distribute traffic loads:

NA mo

Customer Controlled Administrative Changes • certain routine administrative activities, such as programming call pickup groups, call forwarding, call restrictions, changing station numbering, etc. performed locally by customer using terminal:

NA

Integrated Voice/Data Switching • support for simultaneous voice and data communications over same communications line:

NA

Restriction Features

Standard Features • class of service: access by stations to selected features and outgoing call facilities • inward restriction: incoming DID calls routed to alternate answering point, usually attendant • manual lines: outgoing calls originated by attendant • toll restriction: calls blocked from completion that require prefix of

MO: monthly lease price, including maintenance. NA: not available. Prices effective as of November 1984.

Centrex

Central Office-Based Communications Service

0 or 1 • restricted station: limited to internal calls (station-to-station) only.

Area Code Restriction Option • toll restricts calls based on area code:

_____ NA mo

Code Restriction Option • toll restricts calls based on area code and exchange (NXX) code:

_____ NA

Authorization Code Option • requires dialing a special code before system will process call.

Call Accounting Features

Standard Features • automatic identified outward dialing (AIOD); outgoing toll calls over AT&T switched network identified and summarized by individual Centrex extension.

Message Detail Recording Option • records all outgoing toll calls generated, and identifies trunk facility group call completed over:

_____ NA mo

Call Routing Features • access to WATS, FX, OCC services; connects to specialized circuits with dial access • tie line access: connects to dial tie lines for connections to other PBX/Centrex systems.

Automatic Route Selection Option • multiple trunk groups supported in specific trunk patterns for efficient routing of calls; requires dialing only one access code for all long distance (not tie lines) calls:

_____ NA

Trunk Queuing Option • prioritizes all outgoing long distance calls; when trunk group is busy, call can be held in a waiting pattern and then connected to the most economical trunk available:

_____ NA

Data Features

Standard Features • data switching: speeds up to 9600 bps supported using modems in dial-up basis.

Integrated Voice/Data Switching • using dedicated module to interface terminal to phone line, provides support for simultaneous voice and data transmission over a single Centrex line:

_____ NA mo

Network Features

Standard Features • tandem tie line support: connects multiple tie lines into unified network; functions as intermediate switching point between other PBX/Centrex systems in network • multilocation service: multiple Centrex systems served from one central office • support for specialized networks like Autovon, EPSCS, CCSA: Centrex interfaces can permit system to support specialized dialing requirements of these networks • off-net dialing: calls over network can be completed to distant stations not on the network • on-network dialing: calls on the network can be dialed with a minimum of digits, or with a universal numbering plan • satellite operation: Centrex functioning as separately located extension of main system, usually without attendant positions • centralized attendant service (CAS): multiple Centrex or PBX systems can have incoming calls from all locations answered at central switchboard location.

Attendant Console Features

Standard Features • attendant conference: up to 6 calls can be conferenced by attendant • attendant transfer of calls: incoming and outgoing calls can be transferred internally by attendant • call hold: attendant can place calls on hold position • call splitting: incoming calls put on hold while call is being processed by attendant • switched-loop operation: all calls answered on special circuits called loops, which are reused for each call • trunk group busy identification: attendant can identify which trunk groups are busy • trunk group busy verification: attendant can dial code and verify busy status of circuits, as well as circuits outage • busy

lamp field: unit that provides visual indication of station busy status • night service: attendant can establish night service arrangements • station busy verification: attendant can determine status of station • recall: calls extended to an idle station will recall to attendant after specific amount of time • system alarm indication: light on console that signals a system malfunction • calls waiting indication: light on console that alerts attendant on the number of calls waiting to be answered • position busy: attendant can remove console from call-handling activities; usually used in multiple-console systems • paging access: attendant can dial a code or depress a predesignated button on console to access customer-provide paging system.

Station Features

Standard Features • call hold: stations can place call on hold by dialing a code • call transfer: incoming and outgoing calls can be transferred by stations • call conferencing: stations can add third party to existing call • direct outward dialing: outside calls dialed without attendant assistance • hunting: calls to busy station directed to alternate • dial access to specialized trunk facilities: direct dialing to WATS lines, tie lines, FX lines, OCC lines • paging access: dial access to paging system • station-to-station calling: dial access to other stations without attendant assistance.

Advanced Station Features Option • call forwarding busy: programmable feature where calls to busy station routed to alternate station • call forwarding don't answer: programmable feature where calls to an unanswered station switch to alternate station after predetermined number of rings • call waiting: station on a call can answer a second call after being alerted to the incoming call by special tone • call pickup: calls to stations in a pickup group can be answered by other stations by dialing special code • touch-tone calling.

Application Software

Centrex has traditionally been installed in general business and government operations. Special software has been developed to permit Centrex to "fit" into such installations as hotels and hospitals.

■ HARDWARE

Terms & Support

Terms • Centrex service is available on a month-to-month lease basis • lease rates include maintenance • installation charges are separate items • station equipment can be purchased or leased from numerous sources, including: 1) unregulated equipment subsidiaries of the 7 Regional Holding Companies (Bell Atlantic, NYNEX, BellSouth, Ameritech, etc); 2) AT&T Information Systems; or 3) equipment vendors.

Support • installation, training, and maintenance support for Centrex, excluding station equipment, is provided by the operating telco.

Overview

Centrex hardware is located exclusively in the telco central office. The only equipment typically located on the customer's premises is a data cabinet used with the Centrex console. Station equipment is now the province of the user, since it was declared premises equipment during the divestiture of AT&T and not the responsibility of the local telco. The telco is responsible for providing telephone service only, and Centrex is typically classified as a **service**; thus, it remains in the telco's product line.

Most Centrex service today is provided by ESS (Electronic Switching System) central offices, particularly No. 1 ESS. ESS has brought about a substantial increase in the number of available features for Centrex users, but even these features are pale in comparison with today's powerful digital PBX systems. Growing customer demands and pressure in the form of regulatory gyrations have spurred the development of more sophisticated (for Centrex) features.

Representative System Configurations

Centrex typically has a high percentage of key telephone equipment (anywhere from 60% to as high as 95%) compared to

Centrex

Central Office-Based Communications Service

PBX systems. There is no requirement to configure local C.O. trunks, since each Centrex station line is in fact a local C.O. line. Specialized facilities, such as FX, WATS, OCC, and tie lines are priced separately. Differences in Centrex rates have been based on the generic feature package selected. Since most users today have the higher generic levels installed, the configurations listed are priced accordingly.

Small System • 140 stations; 90 key telephones, 50 single-line telephones; 1 attendant console; 10 out-WATS lines:
\$1,985 to \$2,390 mo NA prch

Medium System • 965 stations; 845 key telephones, 120 single-line telephones; 3 attendant consoles; 15 tie lines; 20 out-WATS lines; SMDR; ARS:
16,665 to 20,475 NA

Large System • 1,785 stations; 1,470 key telephones, 315 single-line telephones; 3 attendant consoles; 35 tie lines; 20 out-WATS lines; 25 OCC lines; SMDR; ARS:
35,770 to 37,860 NA

Centrex Common Equipment • provides basic Centrex features and number groups in central office:
250 to 400 NA

Centrex Station Line:
8 to 17 NA

Touch-Tone on Centrex Station Line:
2 to 4 NA

FX/WATS/OCC Trunk Termination • 1 circuit per line charge:
22 to 30 NA

Tie Trunk (2-Way) Termination • 1 circuit per line charge:
32 to 37 NA

Tie Trunk (1-Way) Termination • 1 circuit per line charge:
32 to 37 NA

Automatic Route Selection (ARS) Common Equipment • provides facilities to handle multiple trunk groups in various call-routing patterns; overflow to DDD if all special trunks are busy included:
110 to 175 NA

ARS Pattern • determines sequence of outgoing trunks selected based on dialed call:
4 to 8 NA

ARS 3-Digit Translation Pattern • completes call routing based on first 3 digits (usually area code) dialed:
4 to 8 NA

ARS 6-Digit Translation Pattern • completes call routing based on first 6 digits (area code and NXX exchange) dialed:
10 to 18 NA

Message Detail Recording (MDR) Common Equipment • records call details on outgoing calls by station and trunk group:
100 to 150 NA

MDR Facility Charge • cost for providing MDR on individual trunks/trunk groups:
2 to 4 NA

Dial Dictation Access • provides interface to customer-provided central dictation system • access usually on special trunk dialing code, or can be on extension line:
17 to 30 NA

Paging Access • provides interface to customer-provided paging system • access usually by attendant but can be by station, too:
15 to 30 NA

Station Equipment—Voice/Data

Costs for equipment, with exception of attendant console, are based on AT&T Information Systems standard rates. Equipment can be obtained from any supplier, provided it complies with FCC regulations.

Attendant Console • primary function to service incoming calls on listed directory number (LDN) and connect to desired internal Centrex station • provides information concerning status of calls being handled:
\$250 to \$300 mo NA prch

Standard 2500-Type Telephones

Single-Line:
\$3 mo \$55 prch

6-Button Key:
5 138

10-Button Key:
11 263

20-Button Key:
21 503

Lightweight Headsets

Headset:
NA mo \$160 prch

Headset Adapter for Phone:
NA 150

Speakerphone (Type 4A) • hands-free conversations • voice-switched • units must be collocated at least 3 feet apart for best sound:
14 340

Line Status Indicator • operates on ringing line current • used for identifying called stations, particularly in a call pickup group:
NA NA

Data Communications Equipment

Normal data communications with Centrex using modems supporting speeds up to 9600 bps • integrated voice/data support in development; expected delivery early 1985.

Limited Distance Data Set • interface at telephone set to connect data terminal to Centrex for simultaneous voice/data switching • speeds up to 9600 bps:
NA mo NA prch

Peripherals

System Management Terminal • used for administration of Centrex features, station rearrangements:
NA mo NA prch

System Management Printer • used for hard-copy output of system operational data; such as traffic statistics, feature changes, extension number readouts, etc:
NA NA

Subsystems

Automatic Call Distribution (ACD) • handles large volume of incoming calls, distributes to agents in prearranged pattern or based on which agent has been idle the longest.

Common Equipment:
NA mo NA prch

Agent Station:
NA NA

Supervisor Station:
NA NA

Supervisor CRT Terminal • provides control facilities for ACD system management:
NA NA

MO: monthly lease price, including maintenance. NA: not available. PRCH: purchase price. Prices effective as of November 1984.

Centrex Central Office-Based Communications Service

Force Administration Data System (FADS) Common Equipment • provides statistical data on ACD operations, agent activities:

NA NA

FADS System Terminal • primary supervisory interface with FADS:

NA NA

FADS System Printer:

NA NA

Station Message Detail Recording (SMDR) • captures data on all outgoing calls from station users • provides raw data on call details to customer-provided call detail recording (CDR) system for processing into management reports.

SMDR Common Equipment:

NA NA

Data Output Connector (RS-232C):

NA NA

■ SYSTEM MAINTENANCE & DIAGNOSTICS

System Reliability • virtually 100% unless there is local outage in C.O., which is not likely to be sustained due to extensive backup facilities provided.

System Diagnostics • handled in telco C.O. • extensive array of diagnostics to keep system operating.

System Maintenance • provided by telco • station equipment problems must be referred to equipment manufacturer or distributor.

System Management • until recently, all handled by telco • trend toward permitting customer access to Centrex features by on-site terminal.

• END

Commercial Software Telemanagement Software Systems

CADETS, TEMS, TRAMS, IDS, NODE/1

■ PROFILE

Function • Telecommunications Applications Support Center (TASC): CADETS cost allocation and control; TEMS inventory and work order processing; wire and cable management; TRAMS: a centralized trouble reporting system; IDS: online directory and publishing; NODE/1: network optimization and design facility • Network Data Management System (NDMS): monitors and analyzes communications information.

Computers/Operating Systems Supported • CADETS: IBM System/360, System/370, 30XX Series, and compatible systems using OS; DEC VAX using VMS • TEMS: DEC VAX using VMS; AT&T-IS 3B5 Series using UNIX Version 5.

Languages Supported • COBOL.

Special Features • CADETS: various translation options are available • TEMS: interfaces with Commercial Software's other products.

Installations • CADETS: 33 • TEMS: 15.

Comparable Systems • Communications Design Com-Net, CP National TSS, Creative Management Systems CMS-2000, DMW Group Telecost, TOP, Networker, Teletrack, Telco Research General Cost Allocation.

Vendor • Commercial Software, Inc; 370 Lexington Avenue, New York, NY 10017 • 212-557-0356.

Canadian Distribution • contact U.S. headquarters.

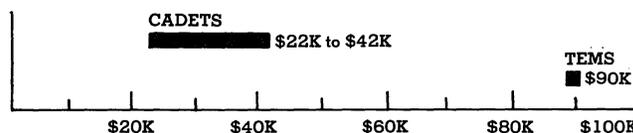
GSA Schedule • unlisted.

■ ANALYSIS

A major concern in the telecommunications environment today is the cost-effective design and management of networks. There is a sometimes overwhelming multitude of telecommunications equipment and service choices to be made by a manager. Large organizations have come to realize that management of their telecommunications functions is essential. Networks must be efficiently maintained and modified to accommodate changes in operation costs, traffic volumes, applications, locations or equipment. Commercial Software, Inc has developed the Telemanagement Applications Support Center (TASC) system and Network Data Management System to cover every aspect of telecommunications management.

CADETS, a part of TASC, consists of 3 subsystems which translate call detail records, process the priced calls to produce a series of reports showing the allocation of telephone usage and equipment costs, and analyze the traffic patterns and network usage.

PURCHASE PRICE RANGE Software License Purchase



COMMERCIAL SOFTWARE INC SOFTWARE SYSTEMS PURCHASE PRICING bar graphs cover software license purchase prices • CADETS pricing starts at \$22K for basic system; additional modules can be added to upper price range • TEMS is available for single price.

Effective management of a large telecommunications system requires the creation and maintenance of an extensive number of records. While recordkeeping activities had previously been assumed by the Bell operating companies, recent changes in telecommunications regulations and technology have shifted recordkeeping responsibilities from vendors to users. TEMS (Telecommunications Equipment Management System) automates recordkeeping activities associated with a large telecommunications system. TEMS provides detailed information about installed equipment and services, and provides the information needed to evaluate rate increases, analyze competitive proposals, and review deployment of certain types of equipment.

The ability to monitor and analyze communications information, from a single PBX or a network of PBXs, is becoming more and more critical to communications managers. Historically, the stumbling block in providing this capability has been finding a means of extracting and capturing a network data management system (NDMS) to satisfy this need. Commercial Software's NDMS is a minicomputer-based system which provides communications managers with the ability to centrally control, manage, and analyze their telecom networks by integrating the following components: Call Collector II (CCII); polling subsystem; alarm processing subsystem; and a transparency function.

□ Strengths

A savings in the cost to design and manage a telecommunications network is a strength universally provided by the Commercial Software products. TEMS provides a savings in both time and money by automating work orders, equipment inventory, recordkeeping, equipment cost allocation, and checking of vendor bills and service and equipment tapes. The system is menu-driven, interactive, and allows the manager to make decisions and select various functions.

CADETS and TEMS provide a decided strength in that they are specifically designed to withstand the changes in telecommunications technology. TEMS allows the flexibility of controlling a table of special lines such as WATS and private lines which allows the user to easily cope with services in the constantly changing industry. CADETS withstands change in 3 important ways. Vendor independence is provided by the ability to process usage detail from most existing telephone systems and the flexibility to respond to new offerings in a timely manner. CADETS is a flexible system that allows the user to configure the system to contain the translation and report programs needed. A variety of call pricing/tariffing options are provided to allow calls to be tariffed at a discount, premium, or equivalent Bell rate by call type, duration, distance, location or time of day. Additionally, the system is equipped with the ability to separate and flag abuse calls. CADETS also supports the ability to add network locations, recording locations, equipment, FX lines, and the like without requiring the need for additional programming or any interface to CSI.

□ Limitations

CADETS takes a lot of time to implement extensively customized systems for a customer. A lengthy turnaround time can also be expected when setting up new databases.

NODE/1, the telephone switch and network optimization facility uses statistical telephone usage information rather than actual call usage information as does a competitor. Because of this, the costing and optimization information is not as accurate as it could be although it is still accurate enough to assist in economical deployment decisions.

Commercial Software Telemanagement Software Systems

CADETS, TEMS, TRAMS, IDS, NODE/1

■ OVERVIEW

□ Terms & Support

Terms • the components of TASC are acquired through purchase or a license agreement • the CADETS basic system is offered at a set price with an additional charge for specific modules; the TEMS system is available for a set purchase price.

Support • a 90-day warranty is provided for free; maintenance is included in the purchase fee • additional annual maintenance is offered at 10 percent of the purchase price • for CADETS, there is a recurring cost for the V&H coordinates tape provided by CCM/McGraw-Hill which averages from \$1,000 to \$1,500 a year with a one-time charge of \$350 • also included in the purchase price is 5 days of training and documentation.

□ Component Summary

Telecommunications Equipment Management System (TEMS) prepares and tracks communications work orders, controls equipment inventory, provides a basis for reconciling vendor bills, and allocates equipment costs. TEMS is a multifunction software package that is designed to automate the paperwork and recordkeeping involved in running a large telecommunications system handling over 3,000 lines. The 6 basic functions provided by TEMS are: Record Keeping; Work Order Preparation; Work Order Tracking; Equipment Inventory Control; Vendor Billing Reconciliation; and Equipment Cost Allocation. The preparation of work orders is a complex task because there are so many interrelationships among the lines and equipment being ordered. TEMS reduces this complexity by taking the analyst through each ordering activity step-by-step and by providing the detailed information needed in a form that is immediately usable. Work order preparation is supported by the following options: create, issue, revise, cancel or print the work order. TEMS provides equipment inventory control at the lowest level of detail—the feature level. This is done through 3 activities: update inventory; price inventory; and report on inventory. Vendor bill reconciliation, the ability to compare the inventory records against the vendor's monthly station and equipment billing tape to check for misbilling, is provided automatically for Centrex users, or manually in the form of equipment summaries. Because the inventory information maintained by the system includes costs and department numbers, TEMS is able to allocate actual costs for telecommunications equipment to user departments. A magnetic tape summary of the costs for each line and department number is generated.

TEMS is an online, interactive system that uses menus and prompts to guide users through the necessary sequences for performing individual tasks. All documentation is available in hard copy form or on-screen. Using TEMS, the department successfully creates and maintains complete telecommunications records for all types of equipment it orders. These may include any combination of telephone systems, such as Centrex, Dimension, interconnect PBXs, and other equipment including modems, data equipment, and personal computers. Automatic access to these records enables TEMS to support 7 essential categories, including: Locations Information, Inventory, Equipment Codes, Vendor Prices and Codes, Departments, Word Orders, and Special Lines. **Locations Information** maintains separate, or shared, information for each location of different types of telephone systems used. **Inventory** allows TEMS to maintain a record of every item in inventory for both lines and equipment, including type of item, list of features associated with the item, button designations for instruments, floor plan location, department the item is assigned to, and key system. **Equipment Codes** gives TEMS the ability to specify equipment codes and descriptions for each inventory item type and feature. These codes are used throughout the system. **Vendor Prices and Codes** allows the system to support a multivendor catalog for each location, maintaining a separate price list for each vendor. These lists contain one-time charges as well as on-going charges. Through **Departments**, TEMS keeps a list of all the department codes (or cost centers) within the corporation with their corresponding descriptions. It uses this for validation purposes, to print department names on work orders and reports, and to allocate costs. **Work Orders** provides for work orders (or customer service requests), once prepared, to be

maintained by TEMS in the system. Work order status is monitored and inventory records are automatically updated after its completion. Through **Special Lines** TEMS allows the telecommunications department to control a table of special circuits such as WATS and private lines.

TEMS:

\$90,000 prch

CADETS consists of 3 subsystems: the Kernel Subsystem; Cost Allocation Subsystem; and Traffic Analysis Subsystem. The **Kernel Subsystem** is the core of CADETS and is a prerequisite for the other subsystems. Its main function is to translate the call detail recordings that are generated by various PBXs, price the calls, and prepare input to the reporting modules and/or a pre-existing billing system. The **Cost Allocation Subsystem** processes the priced calls to produce a series of reports showing the allocation of telephone usage and equipment costs at the various levels within the corporation. The **Traffic Analysis Subsystem** consists of a number of independent programs that summarize and report network usage statistics.

Three key types of information are maintained in the various CADETS databases: extension information, tariff information, and network information. These databases are easily updated by the user to reflect changes in the network.

CADETS Basic System:

	22,000
Cost Allocation:	14,000
Location Exception Reports:	3,000
Traffic Analysis Reports, Each Choice of 13 Available:	2,000
Traffic Analysis Reports, Choice of 3:	5,000
Telephone System Translates, Choice of 1 1:	2,000
Telephone System Translates for SL-1:	4,000
Direct Station Equipment Allocation:	2,000
Direct OCC Allocation:	2,000

Interactive Directory System (IDS) provides operator assistance using up-to-date directory information. With IDS, the phone numbers of personnel and departments within an organization can be quickly and easily located. In addition to the routine personnel directory information needed by telephone operators (i.e., name, number, and department), IDS provides the capability to maintain supplemental personnel information for reporting or other administrative purposes. IDS provides several inquiry strategies for locating personnel or department information within an organization and provides convenient paging capabilities.

IDS:

NA

Network Optimization Design and Engineering (NODE/1) is a telephone switch and network optimization facility which runs on personal computers. Using statistical telephone usage information and descriptions of the network and/or switch configurations, NODE/1 supports the interactive engineering, costing, and optimization of the telecommunications system and assists the user in making the most economical deployment decisions.

Network Optimization Design & Engineering (NODE/1):

NA

PRCH: purchase price for software license. NA: not available; price not disclosed by vendor. Prices effective as of May 1985.

Commercial Software Telemangement Software Systems

CADETS, TEMS, TRAMS, IDS, NODE/1

The **Wire and Cable Management System** supports a comprehensive physical inventory of in-plant wiring for single or multiple locations, where multiple locations can be defined either as a building complex or campus environment. This inventory tracks all cross-connections within a plant at the mainframe, closets, all intermediate points, and between cables. In addition, it maintains records of PBX and closet capacities. Once this inventory is established, wire and cable installation orders are prepared on the system and the information from the order is used to automatically update and maintain the cable inventory.

Wire & Cable Management System:

NA

The **Trouble Reporting and Management System (TRAMS)** interfaces with an existing inventory system to generate trouble orders and track and report trouble information. This allows the telecommunications manager to control, track, and analyze problems within a network, involving problems with instruments, lines, cables, PBXs, and such. TRAMS interfaces with CSI's TASC products and provides 3 primary functions: trouble order preparation; trouble order tracking; and trouble order completion.

Trouble Reporting & Management System:

NA

Network Data Management System (NDMS) monitors and analyzes communications information, whether from a single PBX or a network of PBXs. It is a feature which is becoming more important to managers. NDMS is a minicomputer-based system which provides telecommunications managers with the ability to centrally control, manage, and analyze the efficiency and effectiveness of their network through integration of the following components: Call Collector II (CCII); Polling Subsystem; Alarm Processing Subsystem; Transparency Function; Reporting/Inquiry Subsystem.

The Call Collector II is a microprocessor-based device attached to a PBX to collect incoming and/or outgoing telephone call information. Information captured by the CCII is then transmitted to a host computer for centralized processing and analysis. The CCII can store up to 17,000 call detail records containing information such as the originating extension, number called, date and time, call duration and type, and trunk line.

The Polling Subsystem polls and retrieves call detail information and stores the information in a host computer for centralized processing and analysis. The Alarm Processing Subsystem

analyzes, displays, and reports on alarm data. The Transparency Function provides the ability to remotely access a CCII or PBX for maintenance, update, or status inquiry purposes.

The Reporting/Inquiry Subsystem provides the communications manager with the necessary tools with which to monitor and manage the network by providing the features to inquire or report on the activity within a network.

NDMS/PC:

NA

Reports Summary

The Trouble Reporting and Management System (TRAMS) provides 2 trouble order tracking reports. The Pending Trouble Order Status report lists all pending trouble orders reported to the desk as of a particular date. This can be used as a tool for contacting users and ascertaining completion information. This report can be printed by department and trouble classification. The Trouble Orders to Hold report lists all trouble orders which have not yet been issued to vendors, and can be used on a daily or more frequent basis to ensure that all equipment trouble is reported. Additional reports include: Resolved Trouble Orders as of a particular date; Unresolved Trouble Orders as of a specific date; and Cost of Repairs for Period Ending on a specific date.

TEMS provides a number of reports to support the monitoring of the status and control of work orders. These include the Pending Work Order Status Report, the Summary of Pending Changes Report, and the Summary of New Lines Pending Installation Report. TEMS provides inventory reports, and cost allocation reports are also generated for a single item, or a range, or all items.

CADETS provides the Call Category Summary Report which groups calls by type and is used to determine the relative cost of each category. For example, the total cost of credit card call activity may justify the introduction of in-bound WATS numbers for remote access to the network. In the same way, a high number of third-party collect calls may indicate excessive abuse of the network.

The CADETS Network Usage Report provides managers with a global network-consolidated, overview of their usage pattern. Managers can determine which network locations are responsible for what percentage of network versus nonnetwork activity.

• END

CXC Corporation Rose Distributed Digital PBX System

■ PROFILE

Function • stored program computerized branch exchange for switching voice and data.

Applications Supported • office automation: facsimile, test and voice messaging • healthcare • banking • service sector • general business • education.

System Parameters • switching technology: digital switching using proprietary per-line switching technology with PCM; packet switching and circuit switching • architecture: distributed processing tied to high-speed bus (intranode); coaxial local area network (internode); nonblocking at each node • common control: stored program implemented in VLSI circuits • transmission internal: 4-wire switching; coaxial local area network (internode); maximum LAN speed 50M bps • wiring plan: stations—uniform 2-pair; internode—coaxial cables, 2 required • data switching capability: 128K bps synchronous, 19.2K bps asynchronous per station • dynamic bandwidth allocation: time slots allocated based on port demand; submultiplexing, supermultiplexing.

Traffic Capacity • 36 CCS per port within node, voice, or data • grade of service: P.01 • simultaneous conversations: 512 per node • nonblocking for voice and data.

Trunks/Stations/Consoles • 192 ports per node; supports trunks, analog stations, digital stations, consoles • maximum limits per node: 96 trunks; 96 analog stations; 192 digital stations; 4 consoles; not attained simultaneously • maximum configuration using multiple nodes: 12,288 ports with 64 single or 32 fully redundant nodes • attended and unattended operation • trunks supported: central office—one-way (in/out), 2-way; DID; FX; WATS; OCC; tie lines.

Voice Equipment • vendor supplied: analog and digital telephones • nonvendor equipment supported: rotary (500 type) and Touch-Tone (2500 type) telephones • electronic feature telephones: Personal Teleterminal • digital telephones: Personal Teleterminal, Rose Digital Telephone • attendant console: Rose Attendant Console with CRT/keyboard.

Data Equipment • vendor supplied: Personal Teleterminal, digital telephone • nonvendor equipment supported: asynchronous and synchronous terminal devices • data rates: synchronous to 128K bps; asynchronous to 19.2K bps; half- and full-duplex • aggregate data rate: 33M bps over broadband local area network; 10M bps over baseband Ethernet local area network; 33M bps within node • modems: all types but not required • multiplexers: all types • protocol converters: X.25 • data modules: integrated with Personal Teleterminal • interfaces supported: RS-232C, RS-449, V.35 • printers: most serial or character printers using RS-232C • data storage: hard disk, diskette tape subsystems • data terminals: ASCII, TTY,



asynchronous/synchronous • computers: minicomputers, personal computers.

Subsystem Support • station message detail recording (SMDR) • voice message system • text message system.

Communications/Networking • abbreviated dialing • off-network dialing • on-network dialing • dialed digit translation • route optimization • tandem switching • satellite operation • transmission rates: maximum bandwidth internode 33M bps; maximum bandwidth internode 50M bps • protocols: X.25, ASCII • asynchronous to 19.2K bps; synchronous to 128K bps • T1 interface • gateways: X.25, Ethernet, IEEE 802, IBM LAN.

First Delivery • 1984.

Systems Delivered • over 10.

Installation Interval • 3 to 4 months ARO (single node); 5 to 6 months ARO (multinode).

Environmental Specifications • temperature: 50 degrees to 80 degrees Fahrenheit (normal); whisper fans required when temperature exceeds 90 degrees Fahrenheit • humidity: 30 to 60 percent (normal) • power: 115/230 VAC at 47-63 Hz; 8 amperes fully loaded (node) • air conditioning: not required • dimensions: 29x22x29 inches (WxDxH) • weight: 270 pounds (fully loaded); 320 pounds (fully loaded with backup battery) • floor loading: 80 pounds per square foot • minimum equipment room dimensions: 6x8 feet (WxD), and 8 inches (H); separate equipment room not mandatory.

Vendor • CXC Corporation; 2852 Alton, Irvine, CA 92714 • 714-660-1801.

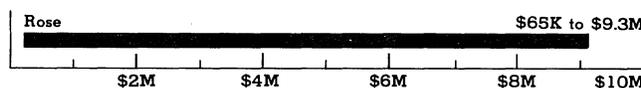
Distribution • nationwide through licensed distributors, primarily independent telephone companies and equipment subsidiaries of vested Bell Operating Companies • Centel Business Systems • Western Union Telegraph Co • PACCOM, Inc.

Service/Support/Training • service, support, and training by licensed distributor or subcontractor • warranty one-year parts and labor from CXC; maintenance contracts available through distributor • local and remote maintenance.

■ ANALYSIS

As if the digital PBX market wasn't already crowded, a brand new system, called the Rose, was formally unveiled to the industry in

PURCHASE PRICE RANGE hardware & software



CXC ROSE PURCHASE PRICING bar graph covers systems ranging from "small" to "large" configurations • initial shipments limited to about 2,000 ports, with larger multinode systems available later in 1985 • small configuration consists of single node with 100 ports; 30 digital stations; 50 analog stations; 1 console • medium system consists of 10 nodes with 1,800 ports; 60 percent digital stations; 2 consoles • large system consists of 30 nodes with 5,000 ports; 70 percent digital stations; 3 consoles • upper limit of single broadband LAN system is 64 nodes for a total of over 12,000 ports.

CXC Corporation Rose Distributed Digital PBX System

May 1984. Its presence was known for quite awhile before that, however. The manufacturer, CXC Corporation, was founded in 1981 to develop a business system that could handle a number of office functions, included among these, telephone switching. The design mandate, however, was to develop a fully distributed switching architecture, in which there would be no dependence on a single central processing unit, and software that would provide a high level of connectivity with various office systems available.

The uniqueness of the Rose architecture filtered to the industry in the early 1980s, and captured a lot of interest, particularly with the growing interest in fully integrated voice/data switching systems, of which the InteCom IBX was a primary example. Other major manufacturers, Rolm, Northern Telecom, AT&T, etc, either had or were about to announce their own voice/data switches, but the perception within the industry was that these systems had an **add-on** voice/data capability, rather than a design exclusively for that purpose. The IBX was the first of what was referred to as a "third-generation" switch, which included a distributed architecture and more powerful data communications support.

Although the InteCom system advertised a distributed architecture, it still had a large 32-bit superminicomputer as its central controller, which meant a failure of the CPU was the end of the switch. Thus, an **almost** fully distributed switch. CXC Corporation has come up with a fully distributed switching architecture in the Rose, at least more so than any other current example on the market, with, perhaps, the exception of the Zitel PNX, which has a similar architecture.

The Rose architecture is built around a number of techniques that are unique to a voice/data switching system. These special distinctions include:

- Fully distributed switching architecture that relies on multiple microprocessors at various operational levels, and no dedicated central processing unit.
- High-speed broadband local area network (LAN) for communications between nodes; token ring technologies.
- Information distributed throughout node and between nodes in 8K-bit modular increments.
- Optional Ethernet baseband packet-switched LAN for internode signaling and text messaging.
- Packet switching for signaling, text, and data communications.
- 192K-bps digital capabilities at each station.
- Fully nonblocking for voice and data at each node.

A single broadband LAN can connect up to 64 Distributed Communications Nodes (DCN), which support up to 192 ports each. A port can be designated either analog or digital, depending on the type of service required. Up to 4 attendant consoles can be connected in a node. Each port is allocated up to 192K bits in transmission bandwidth. Nodes are about the size of 2 medium suitcases side-to-side, and can be located in a normal office environment, if desired. Most likely users will install nodes within a separate equipment room, and expenses normally associated with sophisticated PBX equipment, particularly for environmental control, should be somewhat less.

Each circuit board supports either 16 digital lines or 8 analog lines in a combination of stations and trunks. Up to 12 circuit cards can be connected in a node. A disk/tape subsystem is provided as memory backup for nodes. Internode connections are handled either via the broadband LAN or an optional Ethernet link. Voice and data communications are circuit switched, and text and signaling information can be packet switched within the system.

Allocation of the system's bandwidth is an interesting process. Voice, data, and compressed video are handled in 8K-bit increments, which represent the building block of the Rose's internal architecture. A voice channel, for example, is digitized according to standard PCM formats of 64K bits, which require 8 blocks of 8K bits. The system's overall bandwidth is dynamically allocated for individual requirements, which means a

compressed video signal, requiring 512K bits, can be generated via 64 8K blocks. Other applications are satisfied with the appropriate 8K-bit multiple, as determined by the system. A special-purpose VLSI chip is designed into each port to handle the allocation of 8K channel blocks. The chip can packetize data, if required, which eliminates the need for PAD (packet assembly/disassembly) switches. Each node is fully nonblocking.

Station equipment has a new design, integrating messaging features with a speakerphone which the company says eliminates the familiar "barrel effect" found in typical units. Called Personal Teleterminals, the units have from 2 to 8 lines, alphanumeric keyboard, RS-232C, an 80-character LCD display, programmable function keys, and speakerphone, depending on the model. A single-line digital telephone is available in lieu of the traditional analog 500/2500 sets. The attendant console doesn't look like a console in the traditional sense; it features a color CRT, detachable keyboard with specialized function keys, integrated voice/data capabilities, and multiple display windows for efficient system operation. It can also function as a voice/data workstation.

Aside from its unique design and system architecture, the Rose is entering what many observers would call treacherous waters. The PBX marketplace is already crowded, and the major manufacturers are slugging it out on a daily basis for market share. Just how much of this lucrative marketplace can be CXC's is hard to tell, given all the variables, but with the company's current lineup of distributors it is likely to get a 3 to 5 percent market share within 2 years. Designing and bringing a totally new PBX/office automation system to market is an extremely formidable and risky task, but CXC stands to win the bet, particularly since it has obtained over \$34 million in venture funding and has distributorship agreements with such firms as Western Union, Centel Business Systems, PACCOM, and several Regional Bell Holding companies worth well over \$100 million. If the company delivers the product on schedule, and can minimize software development problems of the type that plagued the Mitel SX-2000, it should achieve its manufacturing and sales goals.

Based on the recent acquisition of Rolm Corporation by IBM, there is likely to be a major shakeout of PBX manufacturers over the next 3 to 5 years. Some of the vendors are already hooking up, either through stock purchases, cross-licensing of equipment designs, or technology exchanges, with major computer manufacturers for survival through the 1980s and beyond. It is likely CXC will be one of these firms, too, and will become part of one of their major stockholders, such as Western Union or Centel. It's also possible one of the divested Bell holding companies that takes a strong interest in the CXC product will buy the company.

Strengths

Aside from its uniqueness, which will probably not sell that many systems, the major factor in favor of the Rose is its price, which is projected to be comparable, for voice and data, to the current crop of voice/data PBXs in voice-only mode. This means an expected cost per line of between \$600 and \$800. Of course, the final decision rests with each distributor, but the current condition of the marketplace is such that an opportunity to provide integrated voice and data communications at voice-only prices is too good to resist. The new Personal Teleterminals are expected to cost the same or less than their counterparts at the competition, yet provide a greater feature mix.

CXC has designed a system that appears, on the surface, to provide what the market has been wanting for several years: a high-performance nonblocking digital PBX with ease of configuration and growth, and an affordable price tag.

The fact that companies like Centel, PACCOM, and Western Union, as well as several RBOCs, have signed on to distribute the Rose says good things about the product, even before it reaches its stride. The risk, for an end user, to install a Rose is minimized with the knowledge that Centel Business Systems or Western Union is behind the product.

Limitations

Assuming the Rose successfully gets into production and its

CXC Corporation Rose Distributed Digital PBX System

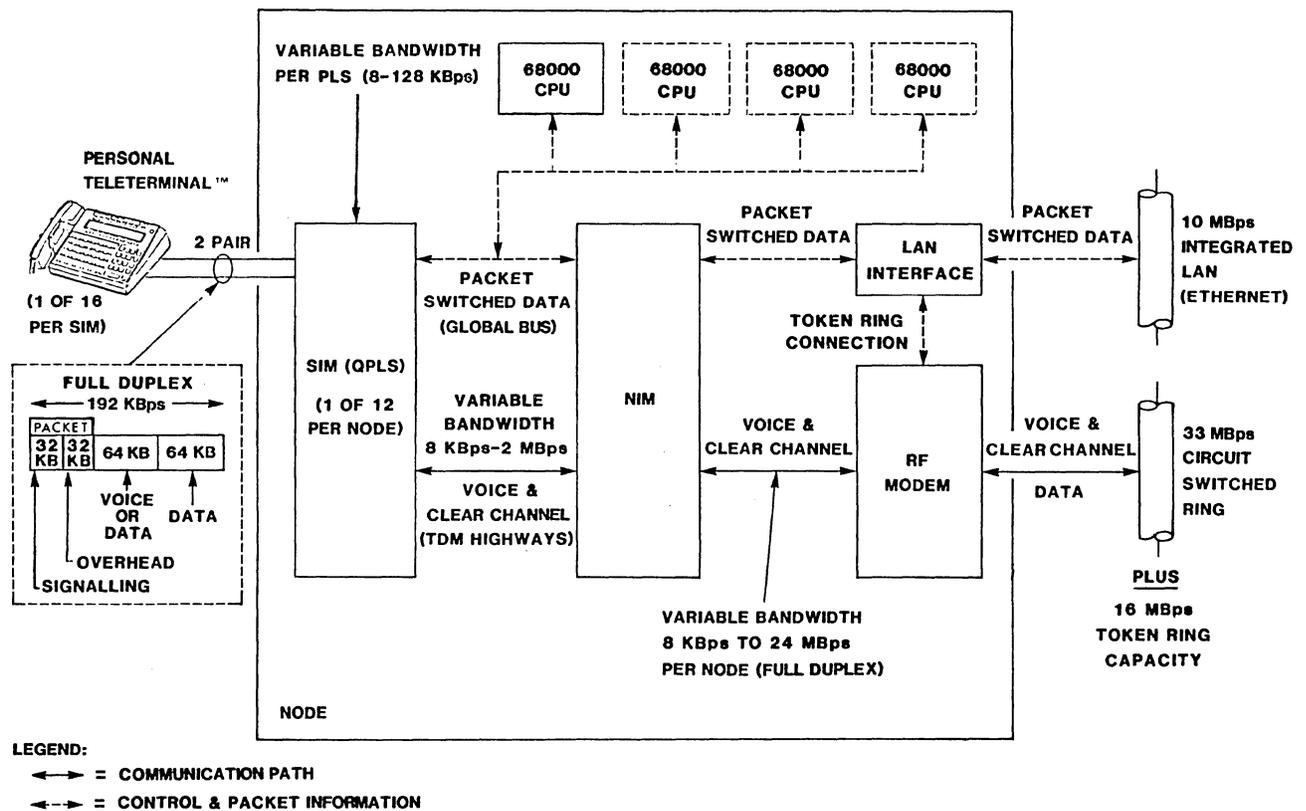


Figure 1 • Rose System Block Diagram

distributorship network works as planned, there are really few limiting factors with the system. The major questions are whether the software will perform as planned, whether the next release, scheduled for early 1985 will appear and if the company can keep up with the anticipated demand. The proprietary VLSI chips are manufactured by a single company, International Microelectronic Products, Inc, itself a relatively new firm. CXC should have a second source of chips, particularly if the Rose takes off. There are only about 15 or so systems installed to date, but this could change rapidly as favorable reports from the field come in.

Although a Rose node occupies a small cabinet, large systems with many nodes will require quite a bit of floor space. The company says the system's distributed nature permits locating nodes where they are required, thus eliminating long cable runs associated with more traditional systems. That concept is acceptable if users **want** to spread nodes all over their offices. The idea makes a lot of sense if the offices are spread out over a multibuilding campus setting. Most telephone systems, however, are located in a central place, specifically for ease of operations and maintenance. Assuming history repeats itself and old habits don't die, this could cause space problems for Rose users. Only 192 ports can be supported in a single cabinet that requires slightly over 6 square feet of floor space. For smaller installations this will work out fine, but in larger facilities with several thousand lines, a centrally located Rose will require anywhere from 20 to 40 cabinets. Comparably equipped systems such as the NEC NEAX 2400, will require about half as many cabinets, because the maximum port capacity is 3 to 4 times as great per square foot of space. Telecom and MIS managers used to having all their systems located in a single area may have second thoughts about spreading equipment around, particularly from a security perspective.

■ SOFTWARE

□ Terms & Support

Terms • with the exception of optional features, all standard software is bundled into the Rose system price • end-user prices will vary based on distributor markups, overhead, installation maintenance, and training costs.

Support • Rose system software is supported by CXC Corporation and the distributor • field developed software is supported by the individual dealer that authors the program.

□ Software Overview

Rose software controls operations, conducts self-test functions, and implements features. It should be noted that Rose features are software driven and targeted at specific areas: System Features; Attendant Features; Station Features; Data Features; and Networking Features.

System software conforms to the 7-layer ISO Open Systems Architecture model, which defines a modular system structure that can interface to a wide variety of communications protocols and networks with minimal impact on the product base. A common operating system is provided, which supports multiple nodes with a wide variety of configurations, particularly with respect to devices such as telsets, terminals, applications software, storage devices, and peripherals.

The operating system defines major parameters and capabilities. The distribution of calls and methods of route selection and optimization are also controlled by the operating system.

Self-test provides online testing of Rose system performance. Error table printouts are available upon request. System fault

CXC Corporation Rose Distributed Digital PBX System

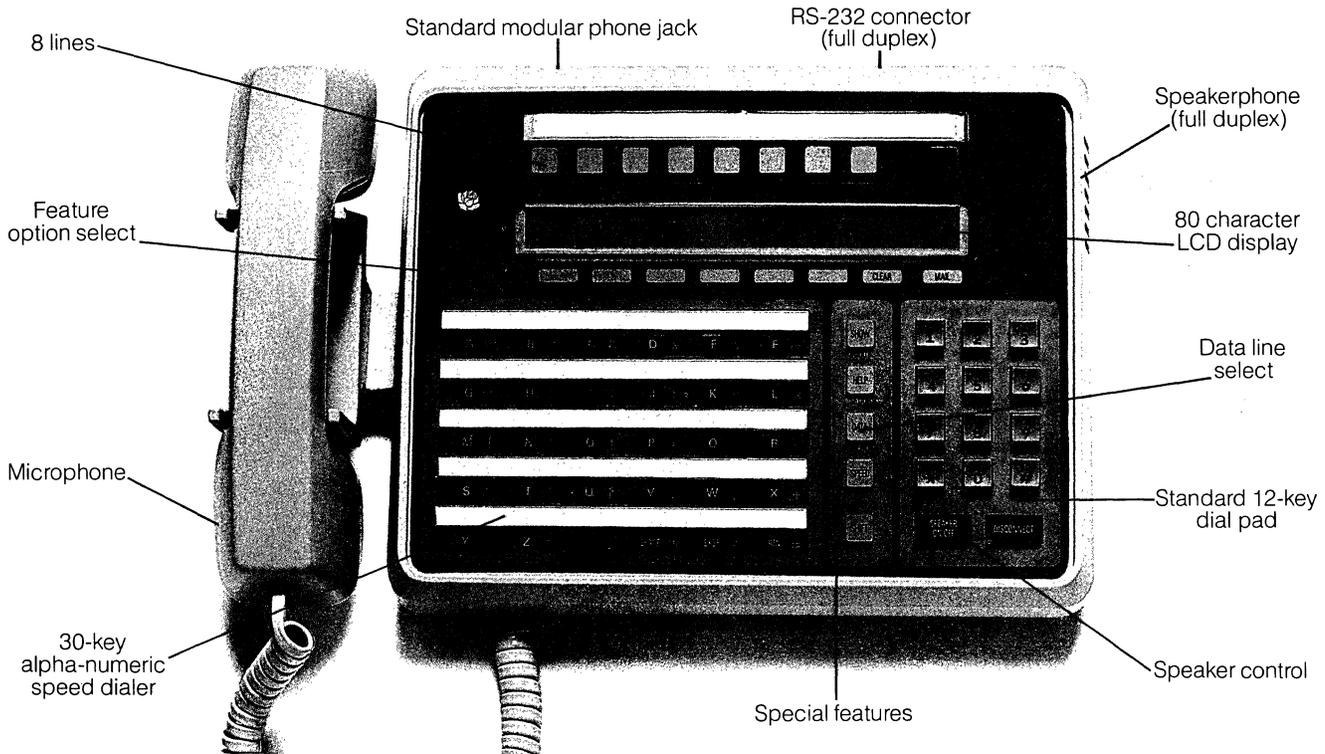


Figure 2 • Personal Teleterminal

error codes are stored in memory and made available to local or remote access.

The configuration tables contain information that is unique to each customer installation. These tables may be changed or moved. The tables are used to define station characteristics and control assignments.

Diagnostic software diagnoses problems not found by the self-test programs. They are used by the field service representative to further aid them in the repair of the system.

CXC has developed an extensive array of features that are standard with the Rose, but the manufacturer encourages development of specific applications as determined by each licensed distributor.

□ Features Overview

Feature Releases are the primary vehicles used by CXC for addressing customer needs. Release 1 includes approximately 200 features for station users, network management, and data communications. Release 2, scheduled for early 1985, builds upon Release 1 with additional data communications, network, and messaging support.

General System Features

Standard Features • Attendant Console: incoming calls all processed by attendant console • Distinctive Ringing: station ringing cycles signal type of call • Flexible Numbering of Stations: stations can be numbered with either 3 or 4 digits • Foreign Exchange (FX) Service: access to FX trunks • Intercept Treatment: calls to vacant or unassigned stations receive distinctive signal • Line Lockout with Warning: stations left off-hook after predetermined length of time are first sent a howler tone, followed by release from the Rose • Listed Directory Number (LDN) Service: access to local CO trunks • Multiple LDN: access to more than one local trunk group with indication at console • Night

Service: after hours calls handled either by connecting trunks directly to stations or by dialing a special code to answer an incoming call • Off-Premises Stations: connection for stations not located in same building as Rose • Power Failure Transfer: prearranged stations are connected to trunks for service in a power outage • Remote Access to Rose Services: outside callers can dial special trunk, enter authorization code, and transact calls like an internal station • Remote Maintenance and Testing Service (RMATS): system to provide real-time diagnostics of system for both user and system supplier • Rotary Dial Calling: dial telephones supported • Tie Trunk Service: access to tie trunks • Touch-Tone Calling: tone dial telephones supported • Touch-Tone to Dial Pulse Conversion: converts tone signals to rotary dial pulses for connection to rotary dial central offices • Trunk Answer from Any Station: night service feature, users answer incoming calls by dialing special code • WATS Service: access to WATS trunks, both oncoming and outgoing • Wide Frequency Acceptance Power Supply: internal power source able to accept variable power levels from commercial power sources.

Automatic Call Distribution (ACD) Option • routes incoming calls to agent positions based on agent available for a call:

NA prch

Centralized Attendant Service (CAS) Option • routes incoming LDN calls from multiple system locations to centralized attendant positions:

NA

Code Calling Access Option • interface to customer-provided coded signaling system:

NA

PRCH: purchase price. NA: not available; price not disclosed by vendor. NC: no charge; feature activated by programming system. Prices effective as of December 1984.

CXC Corporation Rose

Distributed Digital PBX System

Customer Administration System Option • system for handling customer-controlled administrative activities, such as moves and feature changes:

_____ NA

Direct Department Calling (DDC) Option • permits incoming trunk calls to bypass attendant and terminate directly at preselected group of stations:

_____ NA

Direct Inward Dialing (DID) Option • permits incoming trunk calls to bypass attendant and terminate directly on designated stations:

_____ NA

Facilities Administration & Control Option • provides detailed information on system facilities activities:

_____ NA

Force Administration Data System (FADS) Option • provides traffic data on both CAS and UCD operations:

_____ NA

Loudspeaker Paging Option • interface to customer-provided paging system:

_____ NA

Music On-Hold Access Option • interface to customer-provided music source:

_____ NA

Radio Paging Access Option • interface to customer-provided radio paging system:

_____ NA

Recorded Telephone Dictation Access Option • interface to customer-provided telephone dictation system:

_____ NA

Reserve Power Option • independent power source for temporary power during a short-term outage:

_____ NA

Speed Calling Option • provides directory of frequently called numbers accessed by special dial code:

_____ NA

Uniform Call Distribution (UCD) Option • routes incoming calls to designated stations according to preset pattern:

_____ NA

Restriction Features

Standard Features • Class of Service: group of features and restrictions assigned to a station • Code Restriction: denies selected station lines completion of dialed outgoing exchange network calls to selected offices and area codes • Data Privacy: station user will deny other potential users the ability to override or gain access to the used line; restrictions released when station placed on-hook • Data Restriction: station or group denies other users ability to gain access to the station or group; attempted bridge-on is routed to a tone • Fully Restricted Station: denies the ability to place or receive anything but station-to-station calls • Inward Restriction: stations prevented from receiving incoming Common Control Switching Arrangement (CCSA), tie trunk, and exchange network calls; either direct dialed or attendant completed • Originating Restriction: prohibits station line from originating calls • Outward Restriction: call attempts are routed to the intercept tone; station cannot use CO, FX, CCSA trunks • Station-to-Station Restriction: internal calls only are restricted • Termination Restriction: prohibits users of particular trunks from dialing any number except specified office codes and area codes • Miscellaneous Trunk Restriction: denies dial access from preselected station lines to preselected trunk groups.

Authorization Code Option • requires station user to dial special access code prior to dialing desired facility:

_____ NA prch

Call Routing Features

Standard Features • Route Advance routes outgoing calls to

alternate facilities when the first-choice trunk group is busy:

_____ NA prch

Automatic Alternate Routing Option • automatic routing of tie trunks over up to 4 alternate trunk groups:

_____ NA

ARS Pattern Queuing • calls placed via ARS patterns are queued on all available trunks in the routing pattern rather than the first choice trunk group:

_____ NA

Automatic Overflow to DDD Option • optional routing of private network calls via off-net facilities from a point on the network where all on-net routes are busy or none are provided:

_____ NA

Automatic Route Selection Option • provides automatic routing of outgoing calls over alternate customer facilities based on the Direct Distance Dialing (DDD) number; incorporates the functions of and replaces the code restriction and route advance features:

_____ NA

Interexchange Access Option • completes outgoing calls to user's choice of interexchange carrier; outpulsing capability of 24 digits; important when user's service area converts to Equal Access:

_____ NA

Queuing Option • holds outgoing trunk or network calls in an ordered sequence until an idle trunk is available in an all-busy trunk group; off-hook and callback available:

_____ NA

Call Accounting Features

Standard Features • Station Message Detail Recording: provides detailed information about outgoing call activity; station identity, trunk used, call duration, called number, and additional data as required; data processed into management reports • Traffic Data Recording: system accumulates statistical data on internal usage of system features, trunks, trunk groups, routing patterns, etc; information made available for processing into management reports.

Data Features

Standard Features • Data Privacy: denies other stations ability to override or gain access to data line while in use • Data Restriction: denies access to station or trunk group while data is being transmitted • Data Call Answering: permits automatic answering of incoming data calls to designated data stations • Data Call Preindication: alerts system that a call in progress will be transferred to data mode • Data Call Setup: permits users to designate specific data call parameters using digital telephone or asynchronous ASCII terminal • Packet Switching without PAD: information packetized at a line card and distributed over system without packet assembler/disassembler (PAD) requirement • Simultaneous Voice and Data: multiplexes voice and data signals over single pair of wires.

Ethernet Gateway Option • interface for connection to coaxial-based Ethernet-type local area network:

_____ NA prch

X.25 Gateway Option • interface for connection to packet-switched communications networks:

_____ NA

DS-1 Interface Option • provides connection to 1.544M bps data channels for up to 24 voice/data communications paths:

_____ NA

Data Terminal Interface (DTI) Option • support for communications interfaces between Rose and various standard terminal protocols: ASCII, TTY, BSC, SNA/SDLC:

_____ NA

Modem Pooling Option • provides sharing of modems for better resource utilization:

_____ NC

CXC Corporation Rose

Distributed Digital PBX System

Network Features

Autovon Interface Option • provides access to Autovon network; support precedence/nonprecedence calls:

_____ **NC prch**

CC3A Access Option • access from the inward dialing from the CCSA network, outward dialing from the PBX without attendant assistance:

_____ **NC**

ETN Access Option • provides ability to configure switches in an Electronic Tandem Network (ETN) that utilizes a uniform dialing plan:

_____ **NC**

Facilities Restriction Level (FRL) Option • class of service information for a station that determines which facilities it can access:

_____ **NC**

Inter-PBX Call Transfer Option • calls transferred to and from a Main and Satellite PBX system:

_____ **NC**

Main/Satellite Option • allows multilocation PBX/Rose users to concatenate their attendant positions at 2 locations:

_____ **NC**

Tandem Tie Trunk Switching Option • allows tie trunk-to-tie trunk, tie trunk-to-CCSA, and tie trunk-to-exchange network connections through the switching system dialed directly by the remote PBX station user:

_____ **NC**

Traveling Class Mark (TCM) Option • class of service (FRL) information about a station user attempting to complete a call over an ETN that determines the facilities the call can use at a distant switching node:

_____ **NC**

Uniform Numbering Plan Option • permits users at a Satellite or Main PBX to place calls over tie trunks using a uniform dialing plan:

_____ **NC**

Attendant Console Features

Standard Features • Color CRT Display with keyboard for Console display • provides call information and status, time, date, various management/messaging functions • Attendant Control of Trunk Group Access: restriction of station access to specific trunk groups • Attendant Lockout: prevents attendant from reentering connected station call • Attendant Transfer: calls can be transferred by attendant • Attendant Call Waiting: extending call to a busy station sends special tone to user alerting of a waiting call • Attendant Verification of Busy Stations: attendant can check on status of a station line • Calling Number Display to Attendant: displays either station number calling or type of incoming trunk call • Class of Service Display to Attendant: displays station class of service to attendant • Data Transmission: handles simultaneous voice/data up to 19.2K bps asynchronous • Direct Trunk Group Selection: attendant can directly access trunk group by depressing specific button on console • Interposition Calling and Transfer: calls between attendants can be arranged, as well as call transfer • Multiple Field Display: console CRT supports multiple windows or fields on same display • Night Console Position: console arranged to handle night service • Privacy: automatic splitting of attendant from incoming call while talking with called station • Programmable Soft Keys: specific function keys on keyboard that are software-programmable • Serial Call: attendant can establish a series of station calls from a single incoming call, with the original call always returning to the attendant after completing each call • Splitting: incoming call on hold while attendant talks with station • Straightforward Outward Completion: attendant dials call for station user, then releases • Switched Loop Operation: calls coming into console handled on one of several loops, which can be reused for next call • Through Dialing: attendant passes dial tone through to station user, who then dials a call • Timed Reminder: unanswered calls extended

from console return to console for further handling after predetermined time • Trunk Group Bus/Warning Indicators: CRT displays when all trunks in a group are in use (busy) or when a predetermined number of trunks in a group are busy (warning) • Trunk Identification by Attendant: trunk type in use on a call identified by display • Trunk-to-Trunk Connections: attendant can connect incoming or outgoing trunk call with outgoing trunk call • Two-Party Hold: attendant can put call on hold that uses 2 facilities for call.

Attendant Conference Option • attendant can establish a connection between a maximum of 6 stations and the attendant:

_____ **NC prch**

Controlled Restriction • attendant-controlled restrictions of station users to outgoing exchanges, station-to-station calling, call receiving, and call origination:

_____ **NC**

Intercept Treatment Recorded Announcement Option • calls that cannot be completed are routed to an audio announcement message:

_____ **NC**

Message Waiting Service Option • remotely lights a lamp on a standard telephone or Personal Teleterminal to indicate message waiting:

_____ **NC**

Multiple LDN, DID & Non-DID Option • allows up to 4 CO directories to be linked to the system:

_____ **NC**

Timed Recall on Outgoing Calls Option • outgoing trunk calls from selected stations are automatically transferred to attendant after a finite period of time:

_____ **NC**

Station Features

Standard Features • Call Forwarding: calls routed to alternate stations if called station is busy or if it is unanswered • Call Hold: calls can be placed on hold • Call Park: calls placed on hold within system for retrieval at another station • Call Pickup: stations within a designated group can answer another ringing phone by dialing a code • Call Waiting: busy station notified of a waiting call by special tone • Calling Number Display to Station: using Personal Teleterminal display incoming station calls identified to called station Data Interface (Personal Teleterminal) • RS-232C built in Dial Access to Attendant: stations can dial attendant by dialing "0" Display (Personal Teleterminal) • LCD with 80 characters for message information • Single-Digit Dialing: access to specific system functions by dialing a single digit • Station Hunting: calls to busy stations routed to alternate stations • Station-to-Station Dialing: internal calls dialed without attendant assistance • Three-way Conference Transfer: incoming and outgoing calls can be transferred to other stations or bridged to make 3-way conference.

Personal Teleterminal Option • specialized features activated via multibutton digital feature telephones:

_____ **NC prch**

Automatic Callback Option • a station calling a busy station is automatically connected to the called line when both lines are idle at the same time:

_____ **NC**

Automatic Intercom Option • provides talking path between 2 Teleterminals with automatic signaling of the called station:

_____ **NC**

Common Audible Ringing Option • allows Teleterminal tone ringer to be activated when any 1 of 2 or more specified line appearances on this station has a terminating call:

_____ **NC**

Custom Intercom Option • abbreviated 2- or 3-digit code for frequently called stations:

_____ **NC**

CXC Corporation Rose Distributed Digital PBX System

Dial Intercom Option • Teleterminal user can depress intercom access button, go off-hook, or use optional speakerphone, and dial a code to call Teleterminal another Teleterminal:

NC

Exclusive Hold Option • allows an Teleterminal user to hold a call, replace the handset without losing the call, or place a call on another line:

NC

Executive Override Option • specified user can break into a conversation in progress:

NC

Hot-Line Service Option • allows Teleterminal stations to automatically call a preassigned number when station user goes off-hook:

NC

Incoming Call Preference Option • Teleterminal feature automatically selects a line access button that has a call in the ringing state:

NC

Last Number ReCall Option • Teleterminal allows user to automatically redial the Rose extension that was last dialed:

NC

Last Line Preference Option • Teleterminal feature allows user to be connected to last line connected prior to off-hook:

NC

Line Ringing Option • Teleterminal feature provides a different ring tone for a specific line that appears on the station:

NC

Line Status Indication Option • Teleterminal feature provides indication of call status for each line-access button:

NC

Manual Exclusion Option • allows the exclusion of the answering position on all other internal stations:

NC

Manual Intercom Option • allows multiple Teleterminals to access common intercom paths:

NC

Messaging (Personal Teleterminal) Option • send and receive messages, both voice and text:

NC

Personal Central Office Line Option • Teleterminal communication channel link between station and dedicated trunk circuit via PBX:

NC

Priority Hold Option • Teleterminal feature allows user to hold a call, replace the handset, and place another call:

NC

PBX Line Access Option • Teleterminal user can access a PBX line with all features:

NC

RoseDex Option • Teleterminal feature that offers fast access to frequently called numbers:

NA

Speed Dialing (Personal Teleterminal) Option • automatically dials up to 60 numbers using modified keyboard:

NC

Station Busy Indicator Option • Teleterminal feature allows one Teleterminal station to see switchhook status of another Teleterminal:

NC

Station Direct Station Selection (DSS) Option • Teleterminal feature allows off-hook station to automatically dial preassigned lines or access codes by depressing DSS button:

NC

Station Message Waiting Option • Teleterminal feature turns on a status lamp on other Teleterminal stations:

NC

Station Rearrangement & Change Option • allows customer to move stations and change features:

NC

Station Ringer Cutoff Option • Teleterminal feature turns off station ringer:

NC

Trunk Verification Station Option • allows design at stations to make test calls to verify supervision and transmission:

NC

Applications Software

CXC intends for specialized applications to be developed by distributors for their own use. CXC will provide technical support in development efforts where necessary, but the design of the Rose is such that it lends itself to customization. CXC has developed a full array of business features for the Rose, but for specific applications like Automatic Call Distribution, Hotel/Motel, Healthcare, etc, the emphasis will be on software development by the distributor.

HARDWARE

Terms & Support

Terms • CXC Rose models are available both for direct purchase or for leasing for a variety of time periods, depending on the individual distributor. Typical leasing arrangements are for 2-, 4-, 5-, or 7-year periods • lease rates include maintenance • maintenance contracts available for purchased systems • maintenance provided for first year on purchased systems • 1 year warranty on all systems • end-user prices will vary based on distributor markups, overhead, discounts, installation, maintenance, and training costs.

Support • equipment installed by licensed distributors • service and maintenance provided by distributors • system training provided by distributors.

Overview

Traditional PBX systems have been designed for voice communications first, and all other applications second. The new breed of PBX manufacturers, such as CXC, has taken the opposite tack: build a computer-based business system that can also handle voice communications, and even greater opportunities are possible. The Rose is the embodiment of this philosophy. It has a well thought out design, its execution is superior, and its potential is unlimited. The system's biggest hurdle is overcoming the resistance to a system that seems like it should be based in the data side of the house, rather than the voice side. It also has some pretty firmly entrenched competition.

The Rose architecture decentralizes switching functions and provides a high-speed local area network (LAN) with dynamic bandwidth allocation as the common highway for all system activities. Distributed Communications Processing Nodes provide access points to the system with up to 64 nodes connected to the system's LAN. A maximum of 192 nonblocked ports can be used for voice and/or data applications in each node. The system supports up to 12,288 ports per LAN ring.

Both baseband and broadband LAN technologies are combined into a single network ring. The broadband ring operates at 50M bps, uses circuit switching to process calls between nodes at speeds up to 33M bps, and utilizes a proprietary RF (radio frequency) modem and standard CATV technology. The additional 16M bps of bandwidth is reserved for future applications. Bandwidth within the broadband ring can be dynamically allocated for voice and data in 8K-bps increments. The baseband LAN supports Ethernet (10M bps using Carrier Sense Multiple Access/Collision Detection), and is planned as an interim interface for packet-switched data and signaling between system nodes. Future configurations specify a single token-passing coaxial broadband network to support a wide

CXC Corporation Rose Distributed Digital PBX System

variety of interfaces as well as the IEEE 802 LAN standards. The current Ethernet interface is planned as an optional gateway to other networks.

CXC expects that broadband rings will be interconnected into completely integrated systems through the use of a gateway or bridge. Systems with at least 25,000 ports can be configured, according to CXC. The bridge attached to the LAN and passes various data messages between rings. Individual nodes attached to rings can also serve as gateways to other communications networks, such as voice lines, X.25 packet networks, digital communications lines, and Telex/TWX access lines. Facilities connected to one node can be accessed and shared by all other nodes on the ring.

The Rose uses a distributed Per-Line-Switch architecture, which defines a time-division multiplexed (TDM) slot as 8K bps and combines these slots in different configurations. This variable architecture produces switchable pathways ranging from 8K bps to 512K bps that can connect to CXC proprietary telsets or data ports. Each port card has its own microprocessor to handle switching, and functions like a "PBX on a chip."

Each Distributed Communications Processing Node has several components. Starting with the proprietary CXC telset called the Personal Teleterminal, voice is digitized at the set, which is connected to the Station Interface Module (SIM) by 2-pair wire. Information is transmitted between the set and the node in packet form at 192K bps full duplex. Packet assembly/disassembly (PAD) units are not required with this design. Each 192K bps frame of data is allocated as follows: 32K—packet link control, 32K—synchronization (also packet channel), 64K—voice or data, 64K—data only. A 128K data channel can be configured by combining the 2 64K channels. Each electronic telset connects to a Per-Line-Switch (PLS). There are 4 PLSs per custom VLSI circuit, called the QPLS, and there are 4QPLS circuits per SIM. Up to 12 SIMs are provided in each node, for a total of 192 ports. Under software control, a QPLS can be configured to support 256K or 512K circuit-switched data over 2-pair wiring, which the company says will support digital video at speeds of 448K simultaneously with voice and data.

Network Interface Modules (NIM), also microprocessor-controlled provide interfaces from the TDM slots and CPU memory to the broadband circuit-switched cable and the CSMA/CD baseband cable. Bandwidth to the broadband LAN is dynamically variable in 8K increments, which permits flexible data and voice communications.

Up to 4 integral 32-bit 68000 microprocessors can be configured in each node. CPUs support various customer applications available to Rose users. Each CPU can be shared throughout the network. External applications processors, such as personal computers or multiterminal systems, can be connected to the Rose via the Personal Teleterminal or an RS-232C interface.

All hardware for a node is contained in a single cabinet that can be installed in an office area. A separate equipment room for each node is not required, but multinode system, with all nodes co-located, should be situated in its own equipment room.

The Rose supports all standard analog telephone sets, a low-cost proprietary digital telephone, as well as its own family of proprietary electronic telsets, called Personal Teleterminals. Each teleterminal has integrated data capabilities of 19.2K bps asynchronous and up to 128K bps synchronous. An 80-character LCD display is standard, and supports up to 40 characters of text. The display can be scrolled with unlimited message size. Features include calling party name/number display, various types of messaging, 6 soft keys for option selection, 8 feature keys, 8 line keys plus hold key, "help" key, automatic 1-button return call key, RS-232C, 30-key alphanumeric keyboard, and full-duplex speakerphone.

The Rose attendant console is a color CRT terminal with detached alphanumeric keyboard. Eight function keys are provided for special features, and a handset is included. The terminal prompts operators for ease of training and operation, and functions as a system message center, administration, and maintenance terminal. It doubles as a voice/data workstation, and handles data speeds up to 19.2K bps.

□ Representative System Configurations

Single-Node Rose Configuration • single cabinet, fully redundant; 155 Stations/25 trunks; 35 single-line analog phones; 40 Rose digital telephones; 80 Personal Teleterminals; 1 attendant console:

\$108,900 to \$148,500 approx prch

Four-Node Rose Configuration • 4 cabinets, fully redundant; 580 Stations/65 trunks; 60 single-line analog phones; 255 Rose digital telephones; 265 Personal Teleterminals; 2 attendant consoles:

392,300 to 533,600

Rose Equipment Cabinet • supports up to 192 ports per node; power supply optional:

NA

Central Processing Unit (CPU) • up to 4 configured per node • based on 68000:

NA

Local Memory Module • 1M bytes per module; up to 4M bytes per node:

NA

Tone Interface Module • generates all system tones • interprets tones received from station sets:

NA

Primary Power Supply • converts commercial 115/230 VAC power supply into required DC current for system:

NA

Secondary Power Supply • provides standby power in event of primary supply failure:

NA

Station Interface Module (SIM) Digital Station Card • 16 digital station lines per card • also supports attendant console (up to 4 per node) plus computer interface ports • up to 12 per node:

2,400 to 2,700

Analog Interface Module (AIM) Analog Station/Trunk Card • up to 8 analog stations or 8 trunk lines per card • up to 4 trunk types supported per card:

2,800 to 3,100

Network Interface Module (NIM) • connects SIM to either baseband or broadband LANs:

NA

Conference Interface Module • supports up to 32 ports per card:

NA

Modem & System Test Module • provides modem pooling • provides system test capabilities:

NA

System Management Terminal (SMT) • interface to Rose for customer-controlled administrative functions:

1,800 to 2,000

□ Station Equipment—Voice/Data

Personal Teleterminal • proprietary digital terminal • messaging capabilities, both text and voice • speed dialing • LCD display; 80 characters (40 text); scrollable • integral RS-232C interface • data feature provides synchronous data to 128K bps, simultaneous voice (64K bps) and data (64K bps); asynchronous data to 19.2K bps • 2-pair station wiring • station power is line driven; no external power required • full-duplex speaker phone (eliminates "barrel" effect) • up to 8 lines supported.

Model 2050 • 2 lines; 6 feature access buttons; integral RS-232C:

\$240 to \$265 approx prch

APPROX PRCH: purchase price; price ranges are approximate and include installation and first year's maintenance. NA: not available; price not disclosed by vendor. Prices effective as of December 1984.

CXC Corporation Rose Distributed Digital PBX System

Model 2051 • same as Model 2050 but with full-duplex speakerphone:

300 to 330

Model 2001 • 8 lines plus hold; 30-button alphanumeric keyboard; 80-character LCD display; 6 programmable function buttons • includes data feature and speakerphone:

570 to 590

Model 2002 • same as Model 2001 but without speakerphone:

500 to 525

Model 2003 • same as Model 2001 but without data feature:

470 to 500

Model 2004 • same as Model 2001 but without data feature and speakerphone:

400

Model 2005 • Executive Model • same as Model 2001:

570 to 590

Rose Digital Telephone • single-line digital telephone • speed dialing • indicator for message waiting • feature access button • 2-pair station wiring • station power is line driven; no external power required:

110 to 125

Rose Attendant Console • functions as answering position and fully integrated voice/data workstation • detachable keyboard with 12-key dial pad; 8 programmable function keys; 12 call processing keys; extra jack for training • color CRT monitor; 26x80 display; 8 colors; tilt/swivel; multiple field display capability • line driven; no external power required for telephone function • monitor requires 115/220 VAC 50/60 Hz commercial source:

2,750 to 3,400

Data Communications Equipment

Simultaneous voice and data communications terminal support at data-only speeds up to 128K bps synchronous and 19.2K bps asynchronous; integrated voice/data support of 64K bps voice, and 64K bps synchronous or 19.2K bps asynchronous data • dynamic bandwidth allocation provides increased flexibility • modem pooling available • digital end-to-end communications eliminates modems for intranode communications.

Data Terminal Interface (DTI) • provides interface to various communications standards • DEC VT-100, ADM 3A • connect to digital station or directly to system port:

\$400 to \$850 approx prch

Ethernet Interface • connects to Rose internodal ring based on Ethernet standard:

NA

Broadband Interface • connects to Rose internodal ring based on broadband technology • radio frequency modem:

NA

Peripherals

Disk/Tape Drive • combination hard disk drive and 9-track tape system for applications, memory backup:

NA approx prch

Printers • depending on the application, Rose will support both line and character printers:

1,200 to 2,500

Subsystems

Various subsystems can be connected to a Rose, and will be a function of the specific application. It is anticipated the decision on a particular subsystem will be the individual distributor's. Typical systems will include automatic call distribution, hotel/motel front desk systems, energy management systems, and sophisticated SMDR systems.

■ SYSTEM MAINTENANCE & DIAGNOSTICS

System Reliability • redundant CPUs and all critical electronics • backup battery supplies • error-correcting memory • distributed switching electronics • automatic program load • power failure transfer • fault tolerant system architecture.

System Diagnostics • system continuously diagnoses operations • major/minor alarm indications at attendant console • audit trail generated on system printer • remote diagnostics by Rose distributors.

System Maintenance • performed by authorized Rose distributor most repairs involve replacing defective port card • larger systems typically include inventory of spare parts, such as digital and analog port cards.

System Management • man-machine interface very sophisticated; English-language commands • both attendant and system administrator have high level of interaction with system.

• END

Digital Transmission, Inc 580 DSS Series

Models 580S1, 580S, 580M & 580L

■ PROFILE

Function • stored program computerized branch exchange systems for switching voice and data.

Applications Supported • office automation • healthcare • retailers • hotel/motel • banking • military • education • service sector.

System Parameters • switching technology: digital switching using TDM/PCM • architecture: distributed processing tied to high-speed bus; nonblocking configuration • common control: stored program • transmission: 4-wire internal switching • wiring plan: stations—uniform 3-pair • data switching capability: 64K bps full-duplex at station.

Traffic Capacity • 36 CCS per line (voice), 36 CCS per line (data) • grade of service: P.01 • simultaneous conversations: 580S1—192; 580S—384; 580M—768; 580L—1,536 • nonblocking architecture • see Table 1 for configuration limits.

Trunks/Stations/Consoles • 580S1: up to 72 trunks/288 stations; 4 consoles • 580S: up to 96 trunks/576 stations; 4 consoles • 580M: up to 192 trunks/1,152 stations; 8 consoles • 580M alternate version: 288 trunks/1,056 stations • 580L: up to 576 trunks/2,304 stations; 16 consoles • trunks supported: central office—1-way (in/out), 2-way; DID; FX; tie lines; OCC; AUTOVON; CCSA • attended and unattended operation • see Table 1 for configuration limits.

Voice Equipment • vendor supplied: analog and digital telephones • nonvendor equipment supported: all rotary (500 type) and Touch-Tone (2500 type) telephones • electronic feature telephones: automatic call distribution • digital telephones: not available.

Data Equipment • vendor supplied: User Data Interface (UDI) • nonvendor equipment supported: terminals that support ASCII • data rates: synchronous 1.2K to 64K bps; asynchronous 110 to 38.4K bps; full duplex • modems: all types • multiplexers: all types • data modules: User Data Interface (UDI) for standard phones • interface supported: RS-232C • printers: service printer • data storage: digital cassette unit, diskette subsystem, magnetic tape subsystem • data terminals: ASCII, TTY • computers: minicomputers, personal computers.

Subsystem Support • automatic call distributors: 580 ACD • call detail recording • voice message systems: supports freestanding units • message center systems: supports freestanding units •



centralized attendant service • hotel/motel management systems: interfaces to most management systems.

Communications/Networking • abbreviated dialing • off-network dialing • on-network dialing • dialed digit translation • route optimization • tandem switching • satellite operation • asynchronous to 38.4K bps • synchronous to 64K bps • T1 interface.

First Delivery • 1978.

Systems Delivered • over 250 systems, all models.

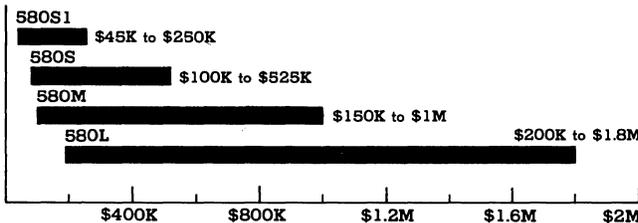
Installation Interval • 12 to 16 weeks ARO.

Comparable Systems • 580S1: American Telecom Focus, AT&T Dimension 400 and System 75, Ericsson Prodigy, Executone Eclipse, GTE Omni SI, Harris/Digital D1200, Hitachi DX, IPC Technologies 160 DPX III, ITT 3100, Mitel SX-200, NEC NEAX 2400, Northern Telecom SL-1S, Siemens Saturn II, Solid State Systems D-TEL, TIE/Communications Data Star • 580S/580M/580L: American Telecom Focus, Anderson Jacobson IOX, AT&T Systems 75 and 85, CXC Rose, Ericsson MD110, Executone Summit, GTE Omni SIII, Harris/Digital D1200, InteCom IBX, Mitel SX-2000, NEC NEAX 2400, Northern Telecom SL-1/SL-100, Siemens Saturn III, TIE/Communications Mercury, United Technologies/Lexar UTX, Ztel PBX.

Environmental Specifications • temperature: 40 degrees to 90 degrees Fahrenheit • humidity: 20 to 55 percent • power: all

PURCHASE PRICE RANGE

hardware & software



DIGITAL TRANSMISSION, INC 580 SERIES PURCHASE PRICING bar graphs cover price ranges between "small" and "large" configurations; installation and first year's maintenance included • 580S1 configuration ranges up to 72 trunks/288 stations; 2 consoles • 580S configuration ranges up to 96 trunks/576 stations; 4 consoles • 580M configuration ranges up to 192 trunks/1,152 stations; 8 consoles • 580L configuration ranges up to 675 trunks/2,304 stations; 16 consoles.

Digital Transmission, Inc 580 DSS Series

Models 580S1, 580S, 580M & 580L

TABLE 1. 580 DSS CONFIGURATION LIMITS

	580L	580M	580S	580S1
Lines (Analog or Digital)	2304	1152 ¹	576	288
Trunks	576	192 ¹	96	72
Attendant Consoles	16	8	4	4
Customer Groups (Tenants)	8	4	2	2
Cabinets	10 ²	5 ²	2 ²	1 ²
Stored Program Control (microprocessors) 3	6 duplex	3 duplex	1 duplex	1 simplex
Network Blocks (PCM, 4-W non-blocking) 3	4 + 1 spare	2 + 1 spare	1 + 1 spare	1
Time Slots	3072	1536	768	384
Paging Adapter (per card) 4	4	4	4	4
Dictation/Music Adapter (per card) 4	4	4	4	4
Recorded Ann. Control (per card) 4	4	4	4	4
Recorded Ann. Source (per card)	1	1	1	1
Power Failure Cut-Thru (8 circuits per card)	32	16	8	8
Conference (hardware ports) 5	48	48	48	48
Trunk Answer Any Station (TAAS):				
Station access levels	16	16	16	16
Trunk groups	8	8	8	8
Hunt Groups (trunk, station, UCD)	356	250	150	50
Maximum group size 6	32	32	32	32
Total group members 7	1400	1000	500	250
No. of groups allowed to overflow	16	16	16	16
No. of overflows per group	3	3	3	3
Toll Restriction:				
Total 6-digit codes	256	256	256	256
No. of levels	20	20	20	20
Codes per level	127	127	127	127
Call Pick-Up Groups (groups/members)	128 of 8 or 64 of 16			
DOD Levels (per customer group)	32	32	32	32
Class Levels (per system)	128	128	128	128
Directory Numbers (hundreds group) 8	39	24	14	9
	(3900 numbers)	(2400 numbers)	(1400 numbers)	(900 numbers)
Speed Call Numbers	819	819	819	819

1. Expanded Trunk Option available in Software Release 1.44 that provides 288 trunks and 1056 lines.
2. Another auxiliary cabinet required for optional CDR magnetic tape equipment.
3. For 580S PBX systems arranged for simplex operation, only one simplex microprocessor and one network block is available.
4. Paging, dictation/music, and recorded announcement cards have no fixed limitations per system. Each card has four identical hardware circuits. However, for each feature card used, one line card (8 line circuits) is lost for use in the system. Also, only one recorded announcement control PCC can be equipped per line shelf because of power limitations.
5. Conference hardware provides for up to 48 ports that can be arranged into 6-, 12-, or 24-port conferences (or combinations thereof) for progressive and meet-me conferences. For each 24-conference hardware port used, a set of 24 lines or 24 trunks is lost for use in the system.
6. Stated maximum hunt group size of 32 members is for administrative purposes. A hunt group can accommodate as many as 256 members, but is not recommended.
7. Currently, there is a tradeoff between number of groups and number of total group members. The tradeoff is linear, ranging from 556 total members in 356 groups to 1400 total members in 115 groups for a 580L PBX.
8. The formula is 7 (# of groups) + 2 (# of members) = 3605 for a 580L, 2630 for a 580M, 1490 for a 580S, or 780 for a 580S1. Currently, a hundreds group (100 directory numbers) is lost for each additionally implemented customer group.

systems—48 VDC (+17% to 8%); separately fused outlet 30-amp service per cabinet • dimensions: 36x24x72 inches (WxDxH); • weight: VSCBX—750 pounds; CBX II—1,000 pounds, 1,200 pounds (redundant CPU) • floor loading: 150 pounds per square foot • minimum equipment room dimensions: 8x10x8 feet (WxDxH) • FCC Registration: ADJ9ZM-67368-PF-E; ringer equivalence 0.9B.

Vendor • Digital Transmission, Inc; 315 Eisenhower Lane South, Lombard, IL 60148 • 312-620-1170.

Distribution • nationwide through Digital Transmission authorized distributors.

Service/Support/Training • service, support, and training by distributor • installation by distributor; subcontractors • warranty one-year parts and labor; maintenance contracts available • local and remote maintenance.

■ **ANALYSIS**

Digital Transmission, Inc. is the latest in a series of companies that

have been associated with the 580 switching product line. Originally developed in the mid-1970s by Wescom, Inc, a manufacturer of telecommunications products for telephone companies, the 580 is a family of PBX and automatic call distributor (ACD) systems ranging up to approximately 2,300 station lines and 576 trunks. Wescom became a part of Rockwell International in the late 1970s. The 580 continued to be manufactured and sold to both end users and telephone companies, but its sales never achieved the levels Rockwell hoped for. Accordingly, Rockwell announced in mid-1983 that it was dropping out of the PBX marketplace, specifically dropping the 580 PBX/ACD products. Later in 1983, a new company called Digital Transmission, Inc (DTI) bought all manufacturing rights to the 580 product line from Rockwell. The new company is investing its resources in updating the 580 to be more competitive in today's PBX marketplace.

The 580 Digital Switching system is a powerful digital PBX. It uses distributed processing, time-division multiplexed switching with pulse code modulation techniques. When first introduced, it

Digital Transmission, Inc 580 DSS Series

Models 580S1, 580S, 580M & 580L

joined a small group of digital PBXs which included the Rolm CBX, Northern Telecom SL-1, GTE GTD Series, ITT TD Series, and the Womack CS-1024. The 580 was perhaps the most sophisticated switch of its time, having a distributed processing arrangement, TDM/PCM, and a fully nonblocking switching network. Unfortunately its sophistication did not come cheaply. The switch was the most expensive of its type, and its sales were few and far between. In spite of these problems, the 580 was, and still is, one of the most technically sophisticated switches on the market.

The systems come in 4 models, the 580S1, 580S, 580M, and 580L. Line sizes range from the 580S1, with 288 stations/72 trunks to the 580L with 2,304 stations/576 trunks. The system supports most standard PBX features like automatic route selection and station message detail recording, and has a powerful set of network and call routing features. It can also be partitioned into as many as 8 separate companies, each with its own communications equipment, operating from a single 580 switch. With the exception of the low-end 580S1, all models have full redundancy of major components.

The major push in today's digital PBX market is for integrated voice and data switching. To date, the 580 has always had the capability to handle voice and data, but it was never required. Of course this has all changed. DTI is developing enhancements to support integrated data and voice communications, but to date they are modest compared with the rest of the industry. A separate User Data Interface (UDI) provides an RS-232C connection for data terminals. This is connected back at the switch through a System Data Interface (SDI), an 8-circuit data/voice line card. Each circuit on the SDI will handle either voice or data communications, but if simultaneous voice/data transmission is desired, 2 lines are required on the SDI. Data speeds supported are 38.4K bps asynchronous and 64K bps synchronous. There is currently no digital telephone offered by DTI, although a multibutton analog feature phone is available. For applications with varying data rates, the UDI will compensate for speed differences by acting as a buffer, in conjunction with the 580. The system currently does not support incoming or outgoing modem pooling. There is currently no protocol conversion capability, X.25 interface, local area network support, voice mail system, or integrated voice/data terminal available from DTI.

Strengths

The 580 DSS is a powerful digital switch, with distributed architecture and a high level of redundancy. It supports the high data speeds required in today's business environment, and has a full mix of features. Digital Transmission, Inc appears to be developing the capabilities to make the 580 a formidable competitor, but is taking its time. The competition is intense in the digital PBX marketplace, and DTI should step up the pace.

Limitations

Some industry observers might say the 580 is a system past its time. Eight years ago, when it was introduced, the 580 was the most technically sophisticated of its peers. Today it is just another digital switch. There are none of the ancillary products, like voice messaging, text messaging, executive workstations, and digital telephones, that characterize the leading players. The 580 can definitely handle the requirements of a voice/data office environment; it just has to be "tweaked" the right way. DTI is moving in this direction; it has some data interfaces available, and simultaneous voice/data switching is possible. The 580s past appears to still haunt it, particularly in the area of price. In today's market, those same prices of 7 or 8 years ago do not scare users away—they are part of the market. DTI is planning to bring out more enhancements to the 580 early in 1985; it will be interesting to see if these new products turn the corner for the 580.

SOFTWARE

Terms & Support

Terms • all software is bundled into the 580 system price with the exception of optional features • end-user prices will vary based on distributor markups, overhead, installation, maintenance, and training costs.

Support • 580 system software is supported by DTI and its associated dealers and distributors • field-developed software is supported by the individual dealer or distributor that authors the programs.

Software Overview

580 software is used to control operations, conduct self-test functions, and provide features. It should be noted that all features of the 580 family are software driven and targeted at 3 areas: (1) System Features; (2) Attendant's Features; and (3) Station Features. System software consists of the Operating System, Self-Test, and Configuration Tables.

The operating system defines major parameters and functions. The distribution of calls and methods of route selection and optimization is also controlled by the operating system.

The self-test provides online testing of the 580 system performance. Error table printouts are available upon request. System fault error codes are stored in the 580 memory and made available to local or remote access. Diagnostic software is used to diagnose problems not found by the self-test programs.

The configuration tables contain information unique to each DTI installation. These tables may be changed or moved. The tables are used to define station characteristics and control assignments.

Features Overview

All features are a function of various software releases • **Release 1.40** supports the basic feature complement for the 580 • **Release 1.41** is the same as 1.40 • **Release 1.42** provides support for digital T1 trunks • **Release 1.43** provides additional networking features • **Release 1.44** provides enhanced system administration features • all releases will run partially or totally in all models • **all standard features are bundled into the system price** • optional features are **extra-cost** items.

580 System Features

General System Features

Standard Features • automatic error correcting memory: appends error correcting bits to each word stored in memory • auxiliary equipment access: connects various devices such as tape and disk drives • bad line reporting: reports stations out of service • distinctive ringing: indicates specific feature is active on incoming call • electronic telephone set: proprietary DTI feature phones • feature usage statistics: system tracks feature utilization • flexible station numbering: stations can be numbered to correspond with specific requirement (e.g., hotel rooms) • intercom blocking: prevents station-to-station calls • multiple console operation: up to 16 • multiple trunk groups: supports C.O., WATS, tie, etc • music-on-hold/camp-on: access to customer-provided music source when call is on hold or camped-on • night service fixed: calls directly routed to designated stations after hours • night service universal (also trunk answer from any station): incoming calls can be answered by any station • off-premises extensions: stations located remote to 580 • paging: access to customer-provided paging system via attendant and/or users • power failure transfer: predesignated trunks and extensions automatically connected during power outage • recorded announcements/intercepts: alerts caller that station or facility is not available • remote administration: system can be monitored or exercised remotely via dial-up telephone line • self-test and fault isolation: 580 detects and isolates malfunctions • station release with howler: stations left off-hook receive burst of tone notifying of condition followed by release from system control • system forwarding: calls routed to designated station on busy or don't answer condition • tie lines: facilities connecting other PBXs with 580 • TTY/CRT interface: connects display terminal and hard-copy output unit.

Automatic Call Distribution (ACD) Option • routes incoming calls to agent positions based on agent available for a call:

NA prch

NA PRCH: purchase price not available; price not disclosed by vendor.

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Centralized Attendant Service (CAS) Option • routes incoming LDN calls from multiple system locations to centralized attendant positions:

NA

Code Calling Access Option • interface to customer-provided coded signaling system:

NA

Direct Inward Dialing Option • designated group of trunks that can complete incoming call directly to station without attendant assistance:

NA

Direct Inward System Access Option • provides direct access into CBX via trunk; user dials authorization code to access system features; Release 1.44:

NA

Force Administration Data System (FADS) Option • provides traffic data on both CAS and UCD operations:

NA

Loudspeaker Paging Option • interface to customer-provided paging system:

NA

Recorded Telephone Dictation Access Option • interface to customer-provided telephone dictation system:

NA

Speed Calling Option • provides directory of frequently called numbers accessed by special dial code:

NA

Uniform Call Distribution (UCD) Option • routes incoming calls to designated stations according to preset pattern:

NA

Restriction Features

Standard Features • class of service: group of features and restrictions assigned to a station • code restriction: denies selected station lines completion of dialed outgoing exchange network calls to selected offices and area codes • data privacy: station user will deny other potential users the ability to override or gain access to the used line; restrictions released when station placed on-hook • data restriction: station or group denies other users ability to gain access to the station or group; attempted bridge-on is routed to a tone • fully restricted station: denies the ability to place or receive anything but station-to-station calls • inward restriction: stations prevented from receiving incoming Common Control Switching Arrangement (CCSA), tie trunk, and exchange network calls; either direct dialed or attendant completed • originating restriction: prohibits station line from originating calls • outward restriction: call attempts are routed to the intercept tone; station can not use CO, FX, CCSA trunks • station-to-station restriction: internal calls only are restricted • termination restriction: stations cannot receive calls at any time • toll restriction: prohibits users of particular trunks from dialing any number except specified office codes and area codes • miscellaneous trunk restriction: denies dial access from preselected station lines to preselected trunk groups.

Call Routing Features

Standard Feature • Route Advance routes outgoing calls to alternate facilities when the first-choice trunk group is busy.

Automatic Alternate Routing Option • automatic routing of tie trunks over alternate trunk groups:

NA prch

Automatic Overflow to DDD Option • optional routing of private network calls via off-net facilities from a point on the network where all on-net routes are busy or none are provided:

NA

Automatic Route Selection Option • provides automatic routing of outgoing calls over alternate customer facilities based on the Direct Distance Dialing (DDD) number; incorporates the functions of and replaces the code restriction and route advance

features:

NA

Call Management Option • provides combination of call routing features with restrictions • on-/off-net dialing • authorization codes • facilities restriction levels • 3- and 6-digit translation • time of day routing • off-hook trunk queuing • user control of call management parameters:

NA

Outgoing Trunk Queuing (OTQ) Option • outgoing trunk calls to busy trunk group are placed in queue, then called back by system when trunk available:

NA

Call Accounting Features

Standard Features • feature usage statistics: stores system usage data into 580 memory • remote polling for DTI distributor analysis center: 580 queried online for data on system performance.

Call Detail Recording Option • outputs data on outside calls to printer, mag tape, diskette, or external call management system:

NA prch

Data Features

Data Communications Option • provides interface support for both asynchronous and synchronous data terminals • data privacy: prevents other stations or attendant from interfering with data call in progress • data speeds: up to 38.4K bps asynchronous, 64K cps synchronous; full duplex • auto-call: 580 automatically dials specific number when request for service activated:

NA prch

Network Features

Centralized Attendant Service Option • groups attendants for multiple 580 locations in centralized site; incoming calls to branch 580s routed to central site for answering, then returned to desired station at originally called location:

NA prch

CCSA Access Option • access from the inward dialing from the CCSA network, outward dialing from the PBX without attendant assistance:

NA

Facilities Restriction Level (FRL) Option • class of service information for a station that determines which facilities it can access:

NA

Main/Satellite Option • allows multilocation PBX users to centralize attendant positions at one location:

NA

Tandem Tie Trunk Switching Option • allows tie trunk-to-tie trunk, tie trunk-to-CCSA, and tie trunk-to-exchange network connections through the switching system dialed directly by the remote PBX station user:

NA

Uniform Numbering Plan Option • permits users at a Satellite or Main PBX to place calls over tie trunks using a uniform dialing plan:

NA

Attendant Console Features

Standard Features • alphanumeric display for console: LED displays provide call information and status • attendant control of trunk group access: restriction of station access to specific trunk groups • attendant direct station selection (DSS) with busy lamp field (BLF): single-button connection of calls to stations, visual display of busy condition of station • attendant lockout: prevents attendant from reentering connected station call • attendant transfer: calls can be transferred by attendant • attendant call waiting: extending call to a busy station sends special tone to user alerting of a waiting call • attendant verification of busy stations:

Digital Transmission, Inc 580 DSS Series

Models 580S1, 580S, 580M & 580L

attendant can check on status of a station line • calling number display to attendant displays either station number calling or type of incoming trunk call • class of service display to attendant: displays station class of service to attendant • direct trunk group selection: attendant can directly access trunk group by depressing specific button on console • interposition calling and transfer: calls between attendants can be arranged, as well as call transfer • night console position: console arranged to handle night service • privacy: automatic splitting of attendant from incoming call while talking with called station • serial call: attendant can establish a series of station calls from a single incoming call, with the original call always returning to the attendant after completing each call • splitting: incoming call on hold while attendant talks with station • straightforward outward completion: attendant dials call for station user, then releases • switched loop operation: calls coming into console handled on one of several loops, which can be reused for next call • through dialing: attendant passes dial tone through to station user, who then dials a call • timed reminder: unanswered calls extended from console return to console for further handling after predetermined time • trunk group busy/warning indicators: LED indicator that tells when all trunks in a group are in use (busy) or when a predetermined number of trunks in a group are busy (warning) • trunk identification by attendant: trunk type in use on a call identified by display • trunk-to-trunk connections: attendant can connect incoming or outgoing trunk call with outgoing trunk call • 2-party hold: attendant can put call on hold that uses 2 facilities for call.

Station Features

Standard Features • automatic camp-on: station user trying to reach busy extension dials code and stays on line until busy station frees up • call forwarding: calls routed to alternate stations if called station is busy or if it is unanswered • call hold: calls can be placed on hold • call park: calls placed on hold within system for retrieval at another station • call pickup: stations within a designated group can answer another ringing phone by dialing a code • call waiting: busy station notified of a waiting call by special tone • camp-on callback: station user trying to reach busy extension dials code and hangs up; system calls back once busy extension frees up • dial access to attendant: stations can dial attendant by dialing "0" • direct outward dialing: permits station to originate outside call without operator • executive override: designated stations can break into existing conversations or can override the do not disturb feature • single-digit dialing: access to specific system functions by dialing a single digit • station hunting: calls to busy stations routed to alternate stations • station-to-station dialing: internal calls dialed without attendant assistance • 3-way conference transfer: incoming and outgoing calls can be transferred to other stations or bridged to make 3-way conference.

Application Software

The 580 DSS has been installed in numerous application environments. To date, the 580 has been configured for the following industries: airlines; health care; retailers; and in all commercial areas; military; lodging; and service sector.

HARDWARE

Terms & Support

Terms • the 580 DSS models are available for purchase or on a 1-, 2-, 3-, or 5-year lease • lease rates include maintenance • purchase prices include installation • maintenance contracts available • end-user prices will vary based on distributor markups, overhead, installation, maintenance, and training costs.

Support • equipment can be installed by Digital Transmission, Inc, authorized distributors, and Telcos • service and maintenance is based on the policies established by individual dealers and distributors.

Overview

The 580 PBX switching systems are part of a family of switching system products that currently contains PBXs and ACDs (Automatic Call Distributors). The 580 PBX products provide

solid-state, nonblocking, 4-wire, time-division, distributed microprocessor-controlled switching systems.

The 580 PBX product architecture is functionally organized to allow assembly of various PBX configurations from a basic set of hardware and software modules, and to allow for the future addition of digital trunk, line, and station equipment.

The overall system organization of the 580 PBX family includes 6 main hardware oriented building blocks for lines, trunks, service, network, control, and power. These basic building blocks are packaged in various configurations to provide the hardware required for each member of the 580 PBX family.

The line module interfaces with a normal 2-wire telephone set and converts analog information from 96 subscriber lines into a 6-MHz D3-compatible serial PCM (Pulse Code Modulation) bit stream. Similarly, the trunk module interfaces 96 central office and/or tie trunks. The service module contains digital tone sources, where presynthesized tones are stored in their digital PCM format in ROM. The service module also contains dial pulse and dual-tone multifrequency (DTMF) receivers. These 3 modules are generally referred to as input/output interface circuitry. All of these interface modules employ a 96-channel serial bus for interconnection to the switch network.

The network contains from 1 to 4 nonblocking, 4-wire, full-availability modules. Each network module terminates 4 (580S1) or 8 (580S, M, and L) full-duplex 96-channel buses, and 1 to 4 modules are interconnected to provide a completely nonblocking switch network for 384 to 3072 ports. A spare network block is provided on most PBX models and is automatically switched into service to replace any one of the other blocks in case of failure. The network is designed to handle a 96-channel format of 4 24-channel North American standard PCM encoded channel groups. The network provides fully transparent 64K-bit channels through the switch. Signaling is transmitted by a separate 8K-bit channel associated with each 64K-bit channel.

The control complex in larger 580 models is based on a distributed processing approach with microprocessors arranged in a multiprocessor configuration. The basic control structure for the 580L PBX system, for example, requires 6 hardware-identical microprocessors. Each of these microprocessors has its own maintenance software, memory, and interprocessor buffers to communicate with other microprocessors. For smaller sized systems, these 6 microprocessors are restructured to form a 3- or a 1-microprocessor-based system. Each microprocessor system is fully duplicated in all the 580 PBX products that employ a duplex control system.

The input/output (I/O) interface circuits provide an appropriate interface for all the telephone equipment, such as lines, trunks, senders, receivers, attendant consoles, etc. The I/O interface functions include analog-to-PAM (Pulse Amplitude Modulation) conversion, analog signaling, and control. The code converters and the multiplexing include normal digital multiplexing, the PAM to PCM code conversion (A/D), and the PCM to PAM conversion (D/A).

The 580S1 is a single-cabinet system that supports up to 288 stations and 72 trunks. It has a single CPU, with an option for redundant processing, and up to 256K bytes of memory. The 580S is a 2-cabinet system with 576 stations and 96 trunks. It has a single CPU with an option for redundancy, and 256K bytes of memory. An additional 64K is required for the Call Management feature. The 580M requires up to 5 cabinets for its maximum configuration of 1,152 stations and 192 trunks. It has 6 CPUs and 768K bytes of memory; major components are fully redundant. An additional 192K of memory is required for Call Management. The top-end 580L has up to 10 cabinets, 6 CPUs, 768K bytes of memory, and fully redundant components. It supports up to 2,304 stations, 576 trunks, and 16 consoles. Like the 580M, it requires an additional 192K for Call Management. Station circuit cards provide 8 circuits, analog trunk and tie trunk cards provide 4 circuits each.

Representative System Configurations

580S1 Configuration • single-cabinet nonredundant system •

Digital Transmission, Inc 580 DSS Series

Models 580S1, 580S, 580M & 580L

up to 256K bytes of memory • maximum 288 stations/72 trunks; 4 consoles.

Small System • includes 128K of memory; 12 trunks/60 stations; single console:

\$52,400 to \$66,200 approx prch

Large System • includes 256K of memory; 40 trunks/235 stations; 2 consoles:

183,400 to 231,000

580S Configuration • 2-cabinet system; redundancy optional • up to 256K of memory • maximum 576 stations/96 trunks; 4 consoles.

Small System • includes 192K of memory; 25 trunks/150 stations; single console:

117,900 to 150,300

Large System • includes 256K of memory; 56 trunks/470 stations; 2 consoles • Call Management software:

347,200 to 442,500

580M Configuration • 5-cabinet system; redundant • up to 768K of memory; 192K required for Call Management • up to 1,152 stations/192 trunks; 8 consoles • expanded trunk version provides 1,056 stations/288 trunks.

Small System • includes 382K of memory; 35 trunks/195 stations; 2 consoles:

157,200 to 200,400

Large System • includes 768K of memory; 75 trunks/850 stations; 3 consoles; Call Management:

610,500 to 776,500

580L Configuration • 10-cabinet system; redundant • up to 768K of memory; 192K required for Call Management • up to 2,304 stations/576 trunks; 16 consoles.

Small System • includes 512K of memory; 65 trunks/275 stations; 2 consoles:

222,700 to 283,900

Large System • includes 768K of memory; 192K for Call Management; 190 trunks/1,700 stations; 4 consoles; Call Management:

1,244,500 to 1,586,500

Station Equipment—Voice/Data

The 580 supports standard analog telephones, both 500 and 2500 types. DTI also provides an electronic feature telephone for the 580. No digital telephones are offered.

Attendant Console • primary function to service incoming calls and connect to desired station • places outgoing calls • includes alphanumeric display; control buttons • Direct Station Selection/Busy Lamp Field (DSS/BLF) optional.

APPROX PRCH: purchase price: price ranges are approximate and include installation. Prices effective as of December 1984.

Console:

\$2,200 to \$2,800 approx prch

DSS/BLF:

950 to 1,150

Electronic Feature Telephones • DTI provides the Models 2200 and 2400 sets • 2200 supports 2 lines; 2400 supports 4 lines • 12 programmable feature buttons • 3-pair station wiring.

Model 2200:

200 to 275

Model 2400:

260 to 325

Administrative Terminal • keyboard/printer for direct access to system for administrative operations • requires RS-232C interface; 300 baud service:

1,150 to 1,300

Data Communications Equipment

Simultaneous voice and data supported at speeds up to 38.4K bps asynchronous and 64K bps synchronous • system handles speed conversions • modem pooling not supported • keyboard dialing for data sessions available first quarter 1985 • User Data Interface (UDI) connects data terminals; includes 2 RS-232C, single parallel interfaces • parallel port compatible with printer port of IBM PC.

User Data Interface (UDI):

\$850 to \$1,100 approx prch

System Data Interface (SDI) • 8-circuit card that replaces analog station card • supports analog and data connections:

1,500 to 1,800

Peripherals

Magnetic Tape Subsystem • used for call detail recording output storage • either 800 bpi or 1600 bpi:

\$7,000 to \$20,000 approx prch

SYSTEM MAINTENANCE & DIAGNOSTICS

System Reliability • redundant CPUs • error-correcting memory • redundant critical electronics • reserve memory power • backup battery • automatic program load.

System Diagnostics • system continuously diagnoses operation • major/minor alarm indications at attendant console • audit trail generated on system service teleprinter • remote diagnostics by distributor service centers.

System Maintenance • normally performed by authorized distributor • larger systems typically include inventory of line cards, trunk cards, phones, cable, test equipment, etc for customer or vendor maintenance.

System Management • users can change such functions as pick-up groups and call routing, perform station relocations • system CRT or teleprinter used.

• END

The DMW Group Software Systems

Telecost; TeleTrack; Teletraffic Optimizer Program; Network Design & Management System; and NetWorker

■ PROFILE

Function • Network Design and Management System PC User's Guide (NDMS/PC): analyze network requirements and configure leased line multipoint networks • NetWorker: design and management of current and future hierarchical data communications networks • Telecost: call usage and allocation • TeleTrack: inventory and service order tracking of telecommunications equipment • Teletraffic Optimizer Program (TOP): optimizes user voice networks.

Computers/Operating Systems Supported • NDMS/PC: IBM PC or PC/XT and compatible systems; MS-DOS • NetWorker: IBM 360, 370, 30XX, 4300 Series, and compatible systems; DEC VAX 750 or 780; Amdahl Computers; MVS/TSO, VM/CMS, and VAX/VMS • Telecost: IBM 360, 370, 30XX, 4300 Series, and compatible systems; DEC VAX 750 or 780; Amdahl Computers; MVS/TSO and VAX/VMS • TeleTrack: IBM PC or PC/XT with color monitor; MS-DOS, PC-DOS 2.1 • TOP: IBM 360, 370, 30XX, or 4300 Series; DEC VAX 750 or 780; Amdahl Computers; MVS/VM/TSO, VAX/VMS.

Languages Supported • ANSI COBOL, FORTRAN 66, C, Microsoft Macro Assembler, MDBS III, CROSSTALK, Pascal, FORTRAN.

Special Features • NDMS/PC provides certain specific common carrier tariffs upon request.

Installations • NDMS/PC: 5 • NetWorker: 9 • Telecost: 30 • TeleTrack: new product • TOP: 10.

Comparable Systems • Commercial Software Cadets and TEMS, Communications Design Com-Net, CP National TSS, Creative Management Systems CMS-2000, Telco Research General Cost Allocation.

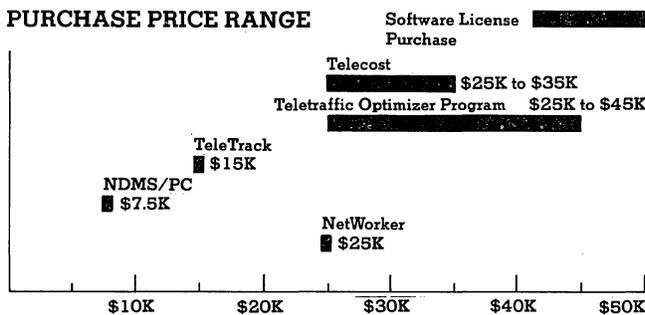
Vendor • The DMW Group, Inc; 2020 Hogback Road, Ann Arbor, MI 48104; 313-971-5234 • principal U.S. offices: Stamford, CT; Los Angeles, CA; San Diego, CA; New York, NY.

Canadian Distribution • contact U.S. headquarters.

GSA Schedule • not listed.

■ ANALYSIS

While the bottom line in business is most often cost effectiveness,



THE DMW GROUP SOFTWARE SYSTEMS PURCHASE PRICE bar graphs cover software license purchase prices for small to large system configurations, with the exception of single-price software products • prices are for first-year licenses; subsequent annual licenses are at reduced rates.

the all too common misuse of today's telecommunications equipment spells overspending for most companies. Increased attention is being paid lately to the control of this equipment and its usage for more cost-effective results. The telecommunications software offerings from The DMW Group, Inc are designed to do just that. The common goal of these packages is to save money through efficient design and management of telecommunications networks.

DMW's NetWorker provides the means for effective planning and design of hierarchical networks by determining the most efficient communications links between elements of the network. NetWorker stores the complete description of a data communications network in a design set which also contains the tariff descriptions, data traffic statistics, constraints, and parameters needed to design a network. At any time the entire network can be designed or redesigned, or certain portions of the network can be redesigned as needed. DMW's Network Design and Management System (NDMS) family of programs is designed to analyze network requirements to configure leased line multipoint networks.

The Teletraffic Optimizer Program (TOP) enables users to design the most cost-effective long-distance service configurations. This is accomplished by processing actual traffic data—not by using statistical modeling as with other systems. There are no assumptions as to how many calls were placed during the busiest hour of the day; the program takes each call and routes it in the same manner as the actual phone network. The computer reads each call, routes it, and then records information about the calls and their costs. The program will mimic actual call traffic with accuracy to within 1 percent.

Sharing data with TOP, Telecost enables Station Message Detail Recording or Call Detail Recording data tapes to be formed into management reports, which can then be used to determine telephone use by department or employee. Charges can then be billed to the departments accordingly. Inventory control and service order tracking is provided through the menu-driven TeleTrack system through the maintenance of separate databases for communications equipment and service orders. The chargeback of equipment and service orders is also provided.

□ Strengths

The most significant benefit to be achieved from the use of The DMW Group's telecommunications software is an overall savings in the cost to design and operate a telecommunications system in today's high-cost operating environment. Each package aids this savings in its own way. NetWorker designs links between network locations so that the communications costs are the lowest possible. Telecost's call monitoring reduces telephone misuse, thus lowering bills. TeleTrack's equipment monitoring provides management with the information needed to cut back on equipment loss and incorrect billing. The Teletraffic Optimizer Program (TOP) allows the user to simulate new configurations of long-distance voice networks before equipment is purchased and installed. Initial savings for TOP users have ranged from 10 percent to 30 percent, according to The DMW Group, Inc.

□ Limitations

Tariff updates based on rate changes can take several weeks to reach licensees, which can cause problems in accurately pricing calls. The products are all very sophisticated, and can sometimes require additional training to maximize their effectiveness. Other than these, the products all perform well.

The DMW Group Software Systems

Telecost; TeleTrack; Teletraffic Optimizer Program; Network Design & Management System; and NetWorker

■ OVERVIEW

Terms & Support

Terms • The DMW Group, Inc telecommunications software can be obtained through a first-year's lease fee followed by subsequent annual renewal fees.

Support • first-year's maintenance is included in the annual lease
• as an option, additional yearly maintenance is available for an annual fee.

Component Summary

Network Design & Management System (NDMS) is a family of programs designed to analyze network requirements and configure minimum-cost multipoint leased line networks that connect remote terminals to a data center. NDMS consists of several design modules, selected by the user depending on the type of problem involved. One or more of the design modules is selected by the user, causing the desired design and analysis activity to take place. Once the modules are chosen, a design data file is prepared.

The NDMS Modules include: Response 1, which provides for the generation of traffic rate tables; Partition, which assigns remote terminals to the nearest concentrators, multiplexers, or CPUs; Design, which sets the line configuration; and Response 2, which provides analysis of response time for particular multipoint lines. Slow-speed lines are always optimized by the Design module to produce the minimum-cost network which satisfies the traffic rate table constraints, as well as other user-specified constraints such as a set number of drops per multipoint line. For each multipoint slow line and fast line, Design will produce a report. The Partition module produces a disk file of partitioned remote terminal location records, grouped with the multiplexer, concentrator, or CPU to which Partition assigned them. The Partition module also produces a print summary of the assignments.

First-Year Lease:
\$7,500 annual license

Renewal Lease:
1,000

NetWorker is used in conjunction with NDMS to automatically optimize the multiplexer and concentrator locations within hierarchical networks which consist of a host computer, hubs such as multiplexers and concentrators, terminals, and circuits. Point-to-point, multipoint, and loop circuits are supported. NetWorker stores the complete description of a data communications network in a design set. Each design set contains a list of both the equipment and the telephone circuits which make up the network. The design set also contains the tariff descriptions, data traffic statistics, constraints, and parameters needed to design a network. A modification set, which consists of additions, deletions, and changes to the items in an existing design set, is used to change a network design or to design a new network. NetWorker combines an existing design set with one or more modification sets to create a new design set and its new network design.

A database of private-line tariffs is included with NetWorker. Tariffs supported include the current AT&T interstate tariff plus former Bell Operating Company intraLATA and intrastate-interLATA tariffs. User-defined tariffs are also supported. Protocols supported include BSC, SDLC/HDX, SDLC/FDX, HDLC/LAPB, asynchronous and user-defined protocols.

First-Year Lease:
25,000

Renewal Lease:
5,000

Telecost transforms raw Station Message Detail Recording (SMDR) or Call Detail Recording (CDR) data produced by the PBX into management reports. These reports are then used to monitor, control, and allocate telephone usage costs. Support information regarding the installation's employees and the

configurations of their voice networks are maintained in an interactive environment with comprehensive audit trails for quality control. Telecost can process data from Centrex and all major PBXs in both single-node and multinode environments. The Tape Decode and Validation Procedure edits the tapes containing call detail, equipment, and other charges and credits to insure that the data is readable and complete. The pricing procedure consists of 2 distinct stages which associate costs with the traffic and call records. Traffic pricing determines the actual facility costs of each activity over a trunk group. Call pricing determines the billing amount which is charged to the user for each call and the MTS equivalent cost of each call. During the Expense Allocation Procedure, expenses can be allocated to all users of a switch, organization, or to an individual user.

First-Year Lease:
25,000 to 35,000

Renewal Lease:
5,000 to 7,000

TeleTrack provides telecommunications equipment inventory and service order tracking. TeleTrack accomplishes this by maintaining a database of all communications equipment including voice, data equipment, circuits, computers, and others. TeleTrack maintains a separate database of service orders. Billing confirmation and chargeback of equipment and service orders are also provided. TeleTrack is a menu-driven system with 7 major operations, including: data entry, which allows information to be entered by filling in blank fields on the screen; browsing, which enables TeleTrack to locate a certain piece of equipment or service order; grabbing, which pulls related records from other files; update, which allows changes to be made to records; inquiry, which permits the user to request online listing of certain equipment or service orders; reporting, which allows the user to select one of the system's standard reports; and file transfer, which is implemented through the use of DMW's TeleTalk software, to move reports and other files to and from the mainframe. TeleTrack will automatically call the central computer, sign on, transfer the file, give instructions to print, and provide the receipt number for the print job.

First-Year Lease:
15,000

Renewal Lease:
1,500

Teletraffic Optimizer Program (TOP) analyzes call data to aid in the selection of long-distance facilities in the construction of route guides. The system provides the user with the ability to reconfigure the voice network to see what savings will consist of without actually installing or moving circuits. TOP uses the actual SMDR/CDR data from one month to simulate the automatic route selection (ARS) performed by the PBX. The user enters possible facilities and route guide changes into the computer. Examples of network environment information are: the description of all translation tables, routing guides and trunk/ports assignments in the network, remote user location, time-of-day routing options, queuing and network cost. TOP then reports how much could be saved with the changes.

First-Year Lease:
25,000 to 45,000

Renewal Lease:
5,000 to 9,000

Host Computers/Operating Systems

NDMS/PC can be implemented on an IBM PC or PC/XT, or any compatible system with 128K bytes of RAM, 1 or 2 diskette drives, and a printer. The operating system supported is MS-DOS. A

ANNUAL LICENSE: purchase price for annual software license. Prices effective as of May 1985.

The DMW Group Software Systems

Telecost; TeleTrack; Teletraffic Optimizer Program; Network Design & Management System; and NetWorker

minimum memory capacity of 128K bytes is required and 256K bytes is considered optimum in order to run NDMS/PC. The software is resident on 320K- or 360K-byte diskettes.

NetWorker runs on IBM 360, 370, 30XX, or 4300 Series systems, DEC VAX 750 or 780 systems, or Amdahl Computers with MVS/TSO, VM/CMS, and VAX/VMS operating systems. A minimum memory of 2M bytes is required.

Telecost operates on IBM 360, 370, 30XX, or 4300 Series systems, DEC VAX 750 or 780 systems, or Amdahl Computers within the MVS/VM/TSO environment. A minimum memory of 200K bytes is required for Telecost.

TeleTrack runs on the IBM PC and PC/XT with MS-DOS or PC-DOS 2.1 and color monitor, hard disk drive, Hayes 1200-type modem, and 132-column printer. A minimum memory of 256K bytes is required for operation, while an optimum memory of between 512K to 640K bytes is desirable. The software is resident on 5.25-inch double-sided double-density diskettes.

TOP is implemented on the IBM 360, 370, 30XX, or 4300 series, the DEC VAX 750 or 780, and Amdahl computer systems within the MVS/VM/TSO or VAX/VMS environments. A minimum memory capacity of 4M bytes is required.

□ Reports Summary

NetWorker produces online and printed reports covering a broad range of user needs from high-level summaries to very detailed descriptions. These reports include circuit pricing, equipment costs by location, response time analysis, circuit traffic and loading, node traffic and loading, tariff descriptions, and design parameters and constraints.

Telecost produces chargeback reports including: a detail usage report, which lists all calls placed by each employee; summary by department; and international call summary reports. Summary reports provide total expenses for up to 4 organizational levels. Exception reports help eliminate abuse by listing calls exceeding a certain duration and cost, and by listing multiple calls to a single number. Network analysis reports help to identify telephone traffic patterns.

TeleTrack generates monthly detailed and summary billing confirmation reports showing what should be paid for equipment. Chargeback charges are also reported through Telecost. In addition to the billing reports, TeleTrack generates several other reports. The Inventory Confirmation report lists all telecommunications equipment, room by room. The past-due service order report lists all service orders which are past due, and the scheduled service order report lists service orders due in the time period specified.

TOP produces 3 types of reports for optimization, traffic summaries, and foreign exchange summaries. The optimization reports include: trunk detail usage; choice of port usage by hunting sequence; route guide analysis; and usage summary. Traffic summaries include: call distribution by area code, exchange within rate center; distribution of minutes by rate center; distribution of minutes by rate center broken down by hours of day; OCC services by hour within area code; summary of OCC services; hourly distribution of traffic reported by destination zone; and hourly distribution of traffic reported by area code. The foreign exchange summaries include a summary FX detail by metropolitan area and detail FX information.

• END

Ericsson PBX Systems

Prodigy & MD110

■ PROFILE

Function • stored program computerized branch exchange (PBX) systems for switching voice and data.

Applications Supported • office automation • healthcare • retailers • hotel/motel • banking • military • education • service sector.

System Parameters • switching technology: digital switching using TDM/delta modulation (Prodigy), TDM/PCM (MD110) • architecture: distributed processing tied to high-speed bus; nonblocking configuration available • common control: stored program • transmission: 4-wire internal switching • wiring plan: stations—uniform 2-pair, internode—coaxial, fiber optic, or T-1 (MD110) • data switching capability: 64K-bps full-duplex at station (MD110).

Traffic Capacity • Prodigy—36 CCS/line per cabinet with 9 CCS between cabinets; MD110—36 CCS between modules, stations 14 CCS per line • grade of service: P.01 • nonblocking architecture: yes.

Trunks/Stations/Consoles • Prodigy: up to 64 trunks/400 stations; 12 consoles • MD110: up to 1,000 trunks/20,000 stations; 30 consoles • trunks supported: central office—1-way (in/out), 2-way; DID; FX; tie lines; OCC; AUTOVON; CCSA • attended and unattended operation.

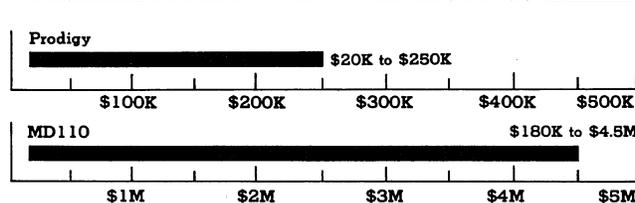
Voice Equipment • vendor supplied: analog and digital telephones • nonvendor equipment supported: all rotary (500 type) and Touch-Tone (2500 type) telephones • electronic feature telephones: Prodigy Plus II • digital telephones: MD110 digital telsets.

Data Equipment • vendor supplied: Terminal Adapter Unit (MD110) • nonvendor equipment supported: terminals that support IBM 3270, BSC, ASCII, VT-100 • data rates: synchronous 1.2K to 64K bps; asynchronous 110 to 19.2K bps; full-duplex (MD110) • modems: all types; modem pooling (MD110) • multiplexers: all types • protocol converters: 3270 • data modules: Terminal Adapter Unit (MD110) • interfaces supported: RS-232C, RS-366, V.35 • printers: service printer • data storage: digital cassette unit, diskette subsystem, magnetic tape subsystem • data terminals: ASCII, TTY, 3270, VT-100 • computers: minicomputers, personal computers.

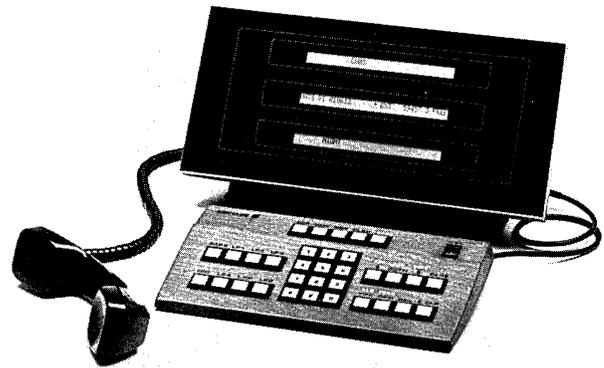
Subsystem Support • call detail recording • message center systems: integral messaging (MD110) • hotel/motel management systems: interfaces to most management systems (Prodigy).

PURCHASE PRICE RANGE

hardware & software



ERICSSON PBX PURCHASE PRICING bar graphs cover price between "small" and "large" configurations; installation and first year's maintenance included • **Prodigy** small configuration consists of 8 trunks/25 stations; 1 console; large configuration consists of 50 trunks/300 stations; 2 consoles • **MD110** small configuration consists of 35 trunks/250 stations; 1 console; large configuration consists of 450 trunks/3,000 stations; 50 percent data • larger MD110 configurations capable of 20,000 stations.



Communications/Networking • abbreviated dialing (MD110) • off-network dialing (MD110) • on-network dialing (MD110) • dialed digit translation (MD110) • route optimization • tandem switching • satellite operation (MD110) • asynchronous to 19.2K bps • synchronous to 64K bps • T-1 interface.

First Delivery • Prodigy: 1980; MD110: 1983.

Systems Delivered • over 1,000 systems, all models.

Installation Interval • Prodigy: 12 to 16 weeks ARO • MD110: 16 to 24 weeks ARO.

Comparable Systems • Prodigy: American Telecom Focus, AT&T Dimension 400 and System 75, Executone Eclipse, GTE Omni SI, Harris/Digital D1200, Hitachi DX, IPC Technologies 160 DPX III, ITT 3100, Mitel SX-200, NEC NEAX 2400, Northern Telecom SL-1S, Siemens Saturn II, Solid State Systems D-TEL, TIE/Communications Data Star • MD110: American Telecom Focus, Anderson Jacobson IOX, AT&T Systems 75 and 85, CXC Rose, Ditrans 580 DSS, Executone Summit, GTE Omni SIII, Harris/Digital D1200, InteCom IBX, Mitel SX-2000, NEC NEAX 2400, Northern Telecom SL-1/SL-100, Siemens Saturn III, TIE/Communications Mercury, United Technologies/Lexar UTX, Zitel PBX.

Environmental Specifications • temperature: 41 degrees to 104 degrees Fahrenheit • humidity: 20 to 80 percent • power: Prodigy—110 VAC at 60 Hz; MD110—VDC per module; separately fused outlet 30-amp service per cabinet • dimensions: Prodigy—17x17x14 inches (WxDxH); MD110—24x12x83 inches (WxDxH) • floor loading: 100 pounds per square foot • minimum equipment room dimensions: 8x10x8 feet (WxDxH).

Vendor • Ericsson, Inc, Communications Division; 7465 Lampson Avenue, Garden Grove, CA 92642-0938 • 714-895-3962.

Distribution • nationwide and worldwide through Ericsson direct sales offices and independent dealers and distributors • MD110 distributed by Ameritech and Honeywell Communications.

Service/Support/Training • service, support, and training by Ericsson or distributor • installation by Ericsson or distributor; subcontractors • warranty 1-year parts and labor; maintenance contracts available • local and remote maintenance.

Ericsson PBX Systems Prodigy & MD110

■ ANALYSIS

Digital PBX systems from Ericsson come in 2 specific packages—the low-end Prodigy, for applications up to 400 stations in business and hotel/motel markets, and the large-scale MD-110, a powerful integrated voice/data switch that can support up to 20,000 stations. The parent company, L.M. Ericsson, of Sweden, is a major worldwide manufacturer of electronics and communications products, and has achieved a successful track record in the U.S. The company distributes its products through an extensive network of distributors, which today include such companies as Ameritech, one of the Regional Bell Holding companies, and Honeywell, a major computer and electronics manufacturer.

Prodigy was introduced in 1980, and was Ericsson's first entry into the digital PBX market. The company already had a marketing presence with its ASB-100 and ASB-900 analog PBXs, but a digital system was definitely needed to remain competitive. Offering modular growth from 40 to 400 stations, Prodigy has been well accepted in the industry. Unfortunately, it is not designed for integrated data/voice applications as its larger sibling, the MD110.

The MD110 was unique at the time of its July, 1983 introduction here in the U.S. Over 50 systems were already running in Europe, as the company brought the product out a year earlier over there. The system is also based largely on central office switching technology, specifically the company's AXE-10 digital central office, and was extensively field-proven before entering the end-user market. Development on the MD110 is being handled by the Honeywell Ericsson Development Company, a 50/50 joint venture that currently has over 150 engineers working on product enhancements for the system. The system got off to a moderate start in the U.S., but worldwide there are more than 600,000 lines of equipment on order or installed.

The company calls the MD110 a "Fourth Generation" switch, based on specific system parameters, but says the key difference between it and other so-called fourth generation systems, the CXC Rose and the Zitel PNX, is the absence of a local area network in the system design. Instead, the MD110 uses what Ericsson calls a star/star network architecture with transmission data rates of 64K bps. With parallel circuit switching of up to 32 circuits, a maximum data rate of 2.048M bps can be provided, which the company says is more than adequate for most data switching and even some video requirements. Rather than being based on a single intelligent central switch, which is subject to central failure as are traditional PBXs, the MD110 star/star has as its basis a series of intelligent modules called LIMs (Line Interface Modules), which can be linked together in a highly flexible network. Each LIM is an independent PBX with support for up to 200 voice and/or data stations. LIMs can be connected directly or in "constellations" with a functionally nonintelligent, space-time-space Group Switch. Connection between modules is provided by EriLinks, which are based on the standardized 32-channel PCM transmission method. Conversion to T-1 is provided for off-campus requirements. When connected, the constellation of LIMs functions as a single PBX, but should the links be separated for any reason, each LIM can operate independently. The Group Switch, in combination with EriLinks, implement the MD110s star/star architecture and provide the integrated network functions. In a traditional LAN, the various rings are used to connect intelligent units in a cooperative operation. In the star/star, the Group Switch performs this function. Ericsson notes that if a ring with its interfaces were lifted out of the system and the Group Switch/EriLink element of the MD110 put in its place, the systems would be largely interchangeable.

Data communications in the MD110 is very comprehensive. Transmission speeds in the system range up to 64K bps-synchronous/19.2K-bps asynchronous for data only, and simultaneous voice/data is supported up to 9600 bps using only a single pair of wires. Digital telephones are available for connecting data terminals, as are separate data connecting devices called Terminal Adapter Units. Numerous interfaces are supported, including RS-232C, RS-366, and V.35. Modem pooling is available on an incoming and outgoing basis, and data calls can be originated from either a keyboard or a digital telephone. The Prodigy, although a digital switch, is not designed

to support simultaneous voice and data transmission. Speeds up to 4800 bps are supported using modems.

□ Strengths

In its marketplace, the Prodigy is a competitive switch. Its price is in line with the rest of the market, and its features are the same as the competition. Its biggest distributor, Ameritech, should help increase its market presence. It is a modularly expandable product that requires little floor space for a fully configured system. Expansion is easily accomplished with a minimum of downtime, and the system has low power consumption.

The MD110 has several distinct advantages, primary among which is the use of proven technology in the system. Ericsson has several years experience with its digital AXE-10 central office, and this expertise is applied liberally throughout the MD110. It also has numerous existing users, which is unusual for a system new to the U.S. PBX market. It represents less risk for those interested in upgrading to leading-edge technology. Ericsson also points out that the star/star architecture of the MD110 standardizes the physical connecting media within the system, rather than local area network technologies, which are much newer and usually proprietary in nature. The system's architecture permits remote modules located as far away as 600 miles to be interfaced to the MD110 in much the same way as local LIMs. The system's distribution is spearheaded by Honeywell Communications Systems, among others, which means the system is in good hands when it comes to marketing.

□ Limitations

The Prodigy's limitations are its inability to switch data like other systems in the industry, and its lack of a proprietary digital telephone. It is a blocking system, which, for most installations, is not a problem. It cannot be field upgraded to the MD110. A complete system swapout must be done.

Although claimed as a nonblocking system, the MD110 is nonblocking only up to about 8,000 lines. There is no integrated voice/data terminal yet, and there is no support for packet-switching or local-area networks.

■ SOFTWARE

□ Terms & Support

Terms • all software is bundled into the PBX system price with the exception of optional features.

Support • PBX system software is supported by Ericsson and its associated dealers and distributors • field-developed software is supported by the individual dealer or distributor that authors the programs.

□ Software Overview

Ericsson PBX software is used to control operations, conduct self-test functions, and provide features. It should be noted that all features of the Ericsson family are software driven and targeted at 3 areas: (1) System Features; (2) Attendant's Features; and (3) Station Features. System software consists of the Operating System, Self-Test, and Configuration Tables.

The operating system defines major parameters and functions. The distribution of calls and methods of route selection and optimization is also controlled by the operating system.

The self-test provides online testing of system performance. Error table printouts are available upon request. System fault error codes are stored in memory and made available to local or remote access.

The configuration tables contain information unique to each Ericsson installation. These tables may be changed or moved. The tables are used to define station characteristics and control assignments.

Diagnostic software is used to diagnose problems not found by the self-test programs. They are recorded serially on cassette tape. When diagnostics are run, nonredundant systems will not be able to function. Redundant MD100 systems will not experience any interruption in service while the diagnostic routines are being executed.

Ericsson PBX Systems Prodigy & MD110

□ Features Overview

All features are a function of various software releases and will run partially or totally in all models • **all standard features are bundled into the system price** • optional features are **extra-cost** items.

□ Prodigy System Features

Prodigy General System Features

Standard Features • automatic error correcting memory: appends error correcting bits to each word stored in memory • auxiliary equipment access: connect various devices such as tape and disk drives • bad line reporting: reports stations out of service • distinctive ringing: indicates specific feature is active on incoming call • electronic telephone set: proprietary Prodigy/MD110 feature phones • feature usage statistics: system tracks feature utilization • flexible station numbering: stations can be numbered to correspond with specific requirement (e.g., hotel rooms) • intercom blocking: prevents station-to-station calls • key telephone features using 2-pair wiring: modules simulate key features but eliminate 25- and 50-pair cables • multiple console operation: up to 12 (Prodigy), 30 (MD110) • multiple trunk groups: supports C.O., WATS, tie, etc • music-on-hold/camp-on: access to customer-provided music source when call is on hold or camped-on • night service fixed: calls directly routed to designated stations after hours • night service universal (also trunk answer from any station): incoming calls can be answered by any station • off premises extensions: stations located remote to PBX • paging: access to customer-provided paging system via attendant and/or users • power failure transfer: predesignated trunks and extensions automatically connected during power outage • recorded announcements/intercepts: alerts caller that station or facility is not available • remote administration: system can be monitored or exercised remotely via dial-up telephone line into PBX • self-test and fault isolation: system detects and isolates malfunctions • station release with howler: stations left off-hook receive burst of tone notifying of condition followed by release from system control • system forwarding: calls routed to designated station on busy or don't answer condition • tie lines: facilities connecting other PBXs • TTY/CRT interface: connects display terminal and hard-copy output unit.

Restriction Features

Standard Features • class of service: group of features and restrictions assigned to a station • code restriction: denies selected station lines completion of dialed outgoing exchange network calls to selected offices and area codes • fully restricted station: denies the ability to place or receive anything but station-to-station calls • inward restriction: stations prevented from receiving incoming Common Control Switching Arrangement (CCSA), tie trunk, and exchange network calls: either direct dialed or attendant completed • originating restriction: prohibits station line from originating calls • outward restriction: call attempts are routed to the intercept tone; station cannot use CO, FX, CCSA trunks • station-to-station restriction: internal calls only are restricted • termination restriction: stations cannot receive calls at any time • toll restriction: prohibits users of particular trunks from dialing any number except specified office codes and area codes • miscellaneous trunk restriction: denies dial access from preselected station lines to preselected trunk groups.

Call Routing Features

Automatic Route Selection Option • provides automatic routing of outgoing calls over alternate customer facilities based on the Direct Distance Dialing (DDD) number, incorporates the functions of and replaces the code restriction and route advance features:

_____ NA prch

Outgoing Trunk Queuing (OTQ) Option • outgoing trunk calls to busy trunk group are placed in queue, then called back by system when trunk available:

_____ NA

Call Accounting Features

Station Message Detail Recording (SMDR) Option • provides

Prodigy Plus II Feature Phone



station or attendant identity, starting time, duration, and trunk group used for outgoing and/or incoming calls:

_____ NA prch

Network Features

Tandem Tie Trunk Switching Option • allows tie trunk-to-tie trunk, tie trunk-to-CCSA, and tie trunk-to-exchange network connections through the switching system dialed directly by the remote PBX station user:

_____ NA prch

Attendant Console Features

Standard Features • alphanumeric display for console: LED displays provide call information and status • attendant control of trunk group access: restriction of station access to specific trunk groups • attendant direct station selection (DSS) with busy lamp field (BLF): single-button connection of calls to stations, visual display of busy condition of station • attendant lockout: prevents attendant from reentering connected station call • attendant transfer: calls can be transferred by attendant • attendant call waiting: extending call to a busy station sends special tone to user alerting of a waiting call • attendant verification of busy stations: attendant can check on status of a station line • calling number display to attendant: displays either station number calling or type of incoming trunk call • class of service display to attendant: displays station class of service to attendant • direct trunk group selection: attendant can directly access trunk group by depressing specific button on console • interposition calling and transfer: calls between attendants can be arranged, as well as call transfer • night console position: console arranged to handle night service • privacy: automatic splitting of attendant from incoming call while talking with called station • serial call: attendant can establish a series of station calls from a single incoming call, with the original call always returning to the attendant after completing each call • splitting: incoming call on hold while attendant talks with station user, then releases • switched-loop operation: calls coming into console handled on one of several loops, which can be reused for next call • through dialing: attendant passes dial tone through to station user, who then dials a call • timed reminder: unanswered calls extended from console return to console for further handling after

PRCH: purchase price. NA: not available; price not disclosed by vendor. NC: no charge. Prices effective as of December 1984.

Ericsson PBX Systems Prodigy & MD110

predetermined time • trunk group busy/warning indicators: LED indicator that tells when all trunks in a group are in use (busy) or when a predetermined number of trunks in a group are busy (warning) • trunk identification by attendant: trunk type in use on a call identified by display • trunk-to-trunk connections: attendant can connect incoming or outgoing trunk call with outgoing trunk call • 2-party hold: attendant can put call on hold that uses 2 facilities for call.

Station Features

Standard Features • add-on conference: permits an internal extension to add one inside or outside call to an existing conversation • call hold: places call on hold • call park: places call on hold within PBX for retrieval at another station • call pick-up: stations can answer another phone either by dialing a code and the ringing extension, or by dialing the pick-up code and answer a ringing station in the same pick-up group • call transfer: station can transfer a call to another station • call waiting: station on a call can answer a second call after being alerted to the incoming call by a special tone • direct outward dialing: permits station to originate outside call without operator.

Advanced Station Features Option • automatic camp-on: station user trying to reach busy extension dials code and stays on line until busy station frees up • camp-on callback: station user trying to reach busy extension dials code and hangs up; system calls back once busy extension dials code and hangs up; system calls back once busy extension frees up • do not disturb: prevents incoming calls to a station • executive override: designated stations can break into existing conversations or can override the do-not-disturb feature • forwarding: calls can be diverted to another extension • message reminder: station user can leave a callback message on a Prodigy Plus II telephone • privacy: prevents call from interruptions such as camp-on or barge-in tones • queuing: permits station-to-access busy trunk facility by dialing a code and either staying on the line (standby) or hanging up (callback) • save/repeat: permits user to store an outside number for ease of redialing at a future time • station-speed calling: users can program their extensions with frequently dialed numbers • system-speed calling: users can access additional numbers stored in PBX memory • trunk select: stations can access specific trunk lines:

_____ **NA prch**

□ MD110 System Features

MD110 General System Features

Standard Features • the MD110 includes all Prodigy standard features plus the following options.

Authorization Code Option • requires station user to dial special access code prior to dialing desired facility:

_____ **NA prch**

Code Calling Access Option • interface to customer-provided coded signaling system:

_____ **NA**

Direct Inward Dialing (DID) Option • permits incoming trunk calls to bypass attendant and terminate directly on designated stations:

_____ **NA**

Direct Inward System Access Option • provides direct access into MD110 via trunk; user dials authorization code to access system features:

_____ **NC**

Facilities Administration & Control Option • provides detailed information on system facilities activities:

_____ **NA**

Loudspeaker Paging Option • interface to customer-provided paging system:

_____ **NA**

Music-On-Hold Access Option • interface to customer-provided music source:

_____ **NA**

Radio Paging Access Option • interface to customer-provided radio paging system:

_____ **NA**

Recorded Telephone Dictation Access Option • interface to customer-provided telephone dictation system:

_____ **NA**

Redundant Critical Electronics Option • provides duplicate electronic components as backup:

_____ **NA**

Reserve Power Option • independent power source for temporary power during a short-term outage:

_____ **NA**

Speed Calling Option • provides directory of frequently called numbers accessed by special dial code:

_____ **NC**

Station Rearrangement & Change Option • in conjunction with CACS or CAP, permits user-controlled station moves and feature changes:

_____ **NC**

Uniform Call Distribution (UCD) Option • routes incoming calls to designated stations according to preset pattern:

_____ **NC**

Restriction Features

Standard Features • all features of the Prodigy.

Call Routing Features

Standard Features • all features of the Prodigy.

Automatic Overflow to DDD Option • optional routing of private network calls via off-net facilities from a point on the network where all on-net routes are busy or none are provided:

_____ **NC prch**

Time of Day Routing Option • completes call routing as a function of the time of day; important when operating in multiple time zones:

_____ **NC**

Call Accounting Features

Standard Features • all features of the Prodigy.

Data Features

Data Communications • provides interface support for both asynchronous and synchronous data terminals • data privacy: prevents other stations or attendant from interfering with data call in progress • modem pooling: provides for sharing of modems for both incoming and outgoing data calls • data speeds: up to 19.2K-bps asynchronous, 64K-bps synchronous; full-duplex • auto-call: MD110 • automatically dials specific number when Request for Service activated:

_____ **NA prch**

Network Features

Standard Features • same as for Prodigy.

CCSA Access Option • access from the inward dialing from the CCSA network, outward dialing from the PBX without attendant assistance:

_____ **NA prch**

Facilities Restriction Level (FRL) Option • class-of-service information for a station that determines which facilities it can access:

_____ **NA**

Inter-PBX Call Transfer Option • calls transferred to and from a Main and Satellite PBX system:

_____ **NC**

Main/Satellite Option • allows multilocation PBX users to concatenate their attendant positions at 2 locations:

_____ **NC**

Ericsson PBX Systems

Prodigy & MD110

Uniform Numbering Plan Option • permits users at a Satellite or Main PBX to place calls over tie trunks using a uniform dialing plan:

NC

Attendant Console Features

Standard Features • all features of the Prodigy console.

Station Features

Standard Features • all of the Prodigy standard and optional features.

□ Application Software

Ericsson has installed its systems in numerous application environments. To date, Ericsson has application packages for the following industries: health care; retailers; and office automation in all commercial areas; military; lodging; and service sectors.

■ HARDWARE

□ Terms & Support

Terms • the Prodigy and MD110 models are available for purchase or on a 1-, 2-, 3-, or 5-year lease • lease rates include maintenance • purchase prices include installation.

Support • equipment can be installed by Ericsson or distributors and Telcos • service and maintenance is based on the policies established by individual dealers and distributors.

□ Overview

The modular design of the Prodigy PABX provides system configuration flexibility and expandability as requirements increase. Within this design concept, each Prodigy cabinet provides up to 128 ports for assignment to user-defined services. Typically, these 128 ports are assigned as lines and trunks. The Prodigy features 64 speech paths and is internally nonblocking, thus ensuring that each originating subscriber has access to any idle subscriber.

Line and/or trunk increases beyond the capacity of a single cabinet can be accommodated by expanding the single-cabinet into a multicabinet system. Such a multicabinet system can comprise up to 4 single cabinets.

Each cabinet houses printed-circuit boards and can accommodate 128 lines or 64 trunks, or a combination, by selecting the proper line- and trunk-printed circuit (PC board) complement in accordance with the system configuration requirements. Line boards can accommodate 8 lines per board, trunk PC boards have 4 trunks per board, and the equipment cabinet can contain a maximum of 16 PC boards of either type.

A single-cabinet Prodigy system consists of an equipment cabinet module (including power supply), switchtone PCB, processor PCB, memory expansion PCB, configuration ROM PCB, line PCBs (8 lines per PCB), and trunk PCBs (4 trunks per PCB). Optional boards and components include the DTMF PCB, interprocessor PCB, attendant console, wall mount bracket, and relay rackmounting bracket.

The Processor PCB acts as the master control for the Prodigy system. Additionally, the Processor PCB performs system diagnostics and outputs alarms in the event of a failure. The Processor PCB contains a Z80 microprocessor, 28K bytes of erasable PROM program store memory, 16K bytes of dynamic read/write memory (RAM), 512-word x 4-bit directory PROM, a dual-channel serial communications link, and decoding and control lines for system control.

The Memory Expansion PCB is used to provide system feature packages. Each Memory Expansion PCB contains up to 32K bytes of Erasable Programmable Read Only Memory (EPROM), containing the feature packages, and 2K bytes of CMOS Random Access Memory (RAM), with battery backup. Additionally, the real-time clock circuitry is contained on the Memory Expansion PCB.

The Interprocessor PCB supplies the logic circuitry to enable and support intercabinet communication of both processor and voice

data in a multicabinet system.

The MD110 has a simple architecture consisting of only 2 basic "building blocks." In its simplest form, the system comprises a single entity known as a LIM (Line Interface Module). As the system grows in response to traffic demand, more LIMs are added and interconnected by a Group Switch (GS). The interconnection is accomplished with links carrying pulse code modulated (PCM) data in a time-division, multiplexed format.

The Line Interface Module (LIM) is the basic building block of the system. A single LIM contains a nonblocking time-division switch and can operate autonomously, serving approximately 200 lines, trunks, and other devices. For larger systems, a second element called a Group Switch (GS) can be used to interconnect 3 or more LIMs in various arrangements by means of PCM links. In this way, by adding LIMs and PCM links and increasing the size of the Group Switch, the system can be expanded up to 20,000 ports. A LIM can be equipped to serve any combination of devices, including line and trunk circuits, data terminals, teleprinters, modems, and computers. The Group Switch (GS) is used to interconnect 3 or more LIMs by acting as an intermediate switching point. The GS provides a nonblocking time division switching matrix that establishes a "talking path" between any 2 LIMs via the PCM links that connect them to the GS. The PCM links that interconnect the LIMs and the GS are 32-channel, 4-wire facilities over which encoded speech and data are transmitted. Thirty of the channels carry this information while the remaining 2 carry synchronization and control information.

Closely tied to the MD110s modular construction is the distribution of its control processing among the various LIMs. Distributed control makes it possible for each LIM to function autonomously in the event that it is cut off from the rest of the system. This is achieved by placing a processor in each LIM and allowing it to handle the establishment of "talking paths" between the ports served by that LIM.

Although the system's distributed architecture ensures a high degree of reliability, it is designed so that most of its basic elements (GS, PCB links, and most LIM circuitry) can be duplicated. This duplication ensures that a failure in one of the primary elements will result in an automatic switchover to its standby counterpart, further minimizing the possibility of a service interruption.

MD110 hardware is contained in uniformly sized cabinets that can be arranged in single or double (back-to-back) rows to adapt to a variety of floor plan requirements. Each cabinet can house 2 magazines (top and bottom) with 3 shelves per magazine. Each magazine can contain up to 24 circuit boards that are interconnected via the magazine backplane. Line-circuit boards provide 8 circuits, trunk-circuit boards provide 4 circuits. External connections are made through cables that connect to the front of the circuit boards.

Representative System Configurations

Prodigy Configuration • 1 to 4 cabinets; nonredundant system • up to 64 trunks/400 stations, 12 consoles; single cabinet up to 16 trunks/100 stations, 3 consoles • field upgrade from single-cabinet to 4-cabinet system.

Small System • single cabinet • 8 trunks/50 stations; single console:

\$27,300 to \$34,500 prch

Large System • 4 cabinets • 35 trunks/290 stations; 2 consoles:

150,200 to 189,800

MD110 Configuration • multicabinet system; redundant • up to 1,000 trunks/20,000 stations; 30 consoles • up to 3 LIMs required before Group Switch configured • field upgrade from smallest to largest system.

Small System • single cabinet; 2 LIMs; redundant • 50 trunks/450 stations; single console • 30 percent data transmission • 400 digital telsets; 50 2500 phones:

492,500 to 582,600

PRCH: purchase price; price ranges are approximate and include installation. Prices effective as of December 1984.

Ericsson PBX Systems Prodigy & MD110

Large System • multiple cabinets, LIMs; redundant • 160 trunks/2,200 stations • 50 percent data • 2,000 digital telsets; 200 2500 phones:

2,364,000 to 2,796,000

Station Equipment—Voice/Data

Attendant Console • primary function to service incoming calls generated outside Prodigy MD110 system, and connect to appropriate internal stations • provides call status and alarm indications • place outgoing calls • Prodigy has 16-digit LED display and DSS/BLF • MD110 has detachable keyboard and separate display with 3 LED display areas with 40 characters each • Prodigy requires 25-pair cable; MD110 requires single-pair of wires.

Prodigy Console:

NA prch

MD110 Console:

NA

Prodigy Plus II • proprietary telephone for use on the Prodigy system • microprocessor control • includes 32-character LED display for messaging/prompting/directory/line status info • 16 feature buttons • 5 lines plus hold:

300 to 450

MD110 Digital Telephone Instrument • proprietary telephone designed for use with the MD110 • 12- or 36-button version available • programmable features • 16-character LED display for prompts, directory, alarms • handsfree operation • volume control.

12-Button Model:

450 to 500

36-Button Model:

575 to 650

Data Communication Equipment

Data communications support in MD110 at data speeds up to 19.2K-bps asynchronous and 56K-bps synchronous between on-premise terminal or terminal and transmission facility; simultaneous voice/data up to 9600 bps • eliminates modems for internal communication; reduces long-distance modems by pooling data lines • single Data Circuit Equipment (DCE) interface required for each terminal or data resource connected to the system.

DCE-T • connects to MD110 digital phone • RS-232C:

NA prch

DCE-S • standalone unit connects DTE to MD110 • RS-232C:

NA

DCE-H • standalone unit connects DTE to MD110 • V.35 interface:

NA

DCE-A • auto-dialer for computer • RS-232C, RS-366 interfaces:

NA

Modem Gateway Equipment • connects to existing modem; provides connections to MD110 • can be used for modem pooling:

NA

Peripherals

Service Teleprinter • instructs system computer when moves and changes are performed • connected to equipment cabinet in local mode • can be used for remote MD110 communications • lists Self-Test Error Table; Audit Table; Traffic Table; extension and trunk attributes; establishes security key:

\$1,500 to \$1,800 prch

SYSTEM MAINTENANCE & DIAGNOSTICS

System Reliability • redundant CPUs (MD110) • error-correcting memory • redundant critical electronics (MD110) • reserve memory power • backup battery • automatic program load (MD110).

System Diagnostics • system continuously diagnoses operation • major/minor alarm indications at attendant console • audit trail generated on system service teleprinter • remote diagnostics by Ericsson or distributor service centers.

System Maintenance • normally performed by Ericsson or authorized distributor • larger systems typically include inventory of line cards, trunk cards, phones, cable, test equipment, etc for customer or vendor maintenance.

System Management • users can change such functions as pick-up groups and call routing, perform station relocations • system CRT or teleprinter used.

• END

Executone Key Systems

Command, Encore, Equity II & Gateway

■ PROFILE

Function • electronic key telephone systems for switching voice.

Applications Supported • targeted at small- to medium-sized business users (10 to 96 stations).

System Parameters • analog systems with space division switching and centralized common control.

Traffic Capacity • Gateway 1448: up to 21 unblocked connections • Gateway 2496: up to 37 unblocked connections • Command K1900 (2056): up to 29 unblocked connections • Encore 616: up to 11 unblocked connections • Encore 1232: up to 17 unblocked connections • Encore 2464: up to 36 unblocked connections • Equity II: up to 6 unblocked connections.

Trunks/Stations/Consoles • Gateway 1448: 14 trunks/48 stations • Gateway 2496: 24 trunks/96 stations • Command K1900: 20 trunks/56 stations • Encore 616: 6 trunks/16 stations • Encore 1232: 12 trunks/32 stations • Encore 2464: 24 trunks/64 stations • Equity II: 5 trunks/10 stations.

Voice Equipment • vendor supplied: **Gateway**—single-line, 8-button, 16-button, 24-button electronic telephones; 56-button DSS/BLF; external speed dialer; external BLF • **Command**—24-button electronic telephone • **Encore**—6-button, 12-button, 24-button electronic telephones; 38-button, 72-button DSS/BLF; speakerphone • **Equity II**—6-button, 6-button hands-free electronic telephones • nonvendor equipment supported: Gateway and Command systems support industry-standard 500/2500 telephones.

Data Equipment • none.

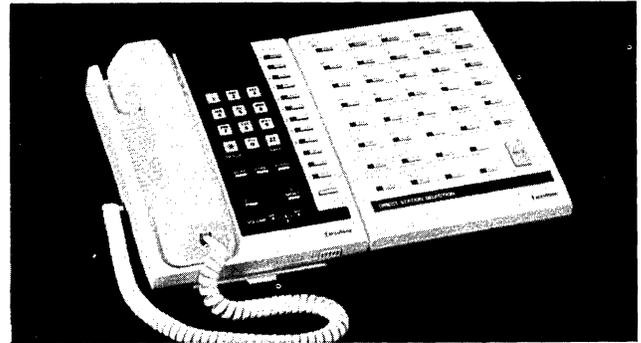
First Delivery • Gateway: 1980; Command: 1983; Encore: 1984; Equity II: 1983.

Systems Delivered • over 5,500; all models.

Installation Interval • 2 to 4 weeks ARO.

Comparable Systems • AT&T Information Systems Com Key, Merlin • Comdial Maxkey • Inter-Tel Phoenix-Hitec Series • ITT EKS-701, EKS-801 • Iwatsu Omega III • NEC Electra 6/16 and 16/48 • Northern Telecom Vantage 12 and 48 • TIE Businesscom and Ultracom • Toshiba Strata III and VI.

Environmental Specifications • all models—temperature: 32 to 104 degrees Fahrenheit • humidity: 20 to 90 percent noncondensing • dimensions (in inches unless otherwise stated, HxWxD): Gateway 1448—19.75 x 24.125 x 11; Gateway 2496—19.75 x 47.25 x 11; Command K1900—24 x 17 x 13; Encore 616—



510mm x 370mm x 190mm; Encore 1232—510mm x 520mm x 190mm; Encore 2496—510mm x 710mm x 190mm; Equity II—18.75 x 15 x 13.75 • weight: 25 to 75 pounds, depending on model • power: 117 VAC at 47 to 60 Hz (all models).

Vendor • Executone Inc; Two Jericho Plaza, Jericho, NY 11735 • 516-681-4000.

Canadian Headquarters • Executone Canada; 127 Milvan Drive, Weston, ON M9L 1Z8 • 416-747-1877.

Distribution • nationwide through Executone offices and independent Executone locations.

Service/Support/Training • service, support, and training are provided by Executone branch locations and supported nationally by Executone engineering, marketing, and training groups • maintenance contracts available for all products on various schedules for ongoing product support.

GSA • listed.

■ ANALYSIS

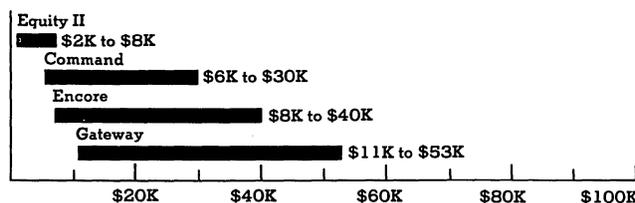
Executone manufactures and sells an extensive line of electronic key systems using analog switching techniques. The company is one of the pioneers in the interconnect key system marketplace and has been an important force in the development of improved systems. The current product line has 4 basic systems: the Equity II, Encore, Command, and Gateway.

The Equity II, designed for offices using from 2 to 10 phones and up to 5 outside lines, offers small businesses many of the benefits of advanced microcomputer-based telephone systems previously available only to larger users. Each Equity II telephone contains a microprocessor that can be programmed to restrict long-distance calling by unauthorized users and permit individual phone users speed dialing up to 100 frequently called numbers. Equity II also features 3-way conference calling and single-button intercom calling with an optional built-in speaker for hands-free operation.

Executone's Encore key system is available in 2 versions for businesses which need up to 6 outside lines and 16 phones, 12 outside lines and 32 phones, or 24 outside lines and 64 phones. Encore can expand from a small configuration to a larger one with a minimum of equipment change. The system uses 2-pair wiring and each phone has a built-in microcomputer with memory, providing numerous features including 3-way conference calling; memory speed dialing of up to 100 numbers; and line restriction, which allows the purchaser to decide which phones in the office

PURCHASE PRICE RANGE

hardware & software



EXECUTONE KEY SYSTEMS PURCHASE PRICE bar graphs cover purchase price ranges between small and large configurations; installation and first year's maintenance included • Equity II supports up to 5 trunks/10 stations • Encore supports up to 24 trunks/64 stations • Command supports up to 20 trunks/56 stations • Gateway supports up to 24 trunks/96 stations.

Executone Key Systems Command, Encore, Equity II & Gateway

will have access to long-distance lines. The system also provides SMDR.

The Executone Command system can serve a small district office or a mid-size corporate division. Command 8/16 supports up to 8 lines and 16 telephones; the Command 20/56 supports up to 20 lines and 56 telephones. Among the Command features are a built-in speakerphone; page announcement; conference calling; and call forwarding and privacy on all C.O. lines.

The Gateway system serves businesses that need between 20 and 96 telephones and up to 24 outside lines. The system has over 48 standard and optional features. Gateway features include a built-in cost control system, Toll Master, which automatically selects the least costly outgoing line available; on-hold reminder, so no caller is left on-hold for too long a time; directed call pick-up, which allows users to answer any ringing phone from their stations; and call forwarding.

The electronic key system market is one of the most competitive in telecommunications today. Executone has one of the largest sales, installation, and maintenance organizations in the business. The company's products have a reputation for dependable, economical communications, and the present family of electronic key systems offers features to meet the needs of most small- to medium-sized business applications.

Strengths

Executone's strong points are product and market presence along with a reputation for quality products and support. The Executone family of electronic key systems is a proven and dependable line of communications equipment. Service is available in over 200 locations nationwide.

Limitations

There are no major operational problems with the Executone product line. The major limitation in all of the systems is the lack of data communications support. The present key system market doesn't normally call for data communications as a standard key system feature, but some of the more recently introduced products offer data switching in system as small as 24 ports. The systems are fine for normal business use, but the user who requires data communication should consider this limitation.

SOFTWARE

Terms & Support

Terms • software is bundled in with the system price; lease terms are arranged through the local Executone office and range from 1 to 6 years normally.

Support • software is supported by Executone and its field-authorized locations.

Software Overview

Software controls all system operations, provides features, and handles system diagnostics. Features are either built into the system or user programmable. Operating features are implemented in ROM while user features are implemented in RAM.

Features Overview

Executone systems have standard bundled feature packages and are restricted only by the type of telephone used. Some of the features in the packages are intended for use with electronic telephones and are not available on industry-standard telephones. The major difference among software packages is the attendant features associated with the DSS console used on larger systems. Smaller systems usually are not equipped with the DSS unit. For detailed description of specific features, refer to the Glossary in Section 1100 of this volume.

General System Features

System Features • automatic callback; automatic hold release; automatic timeout on intercom calls; battery backup; busy lamp field (BLF); distinctive ringing; direct station selection/busy lamp field (DSS/BLF); DTMF/dial pulse signaling; exclusive hold;

external tone signals; flexible ringing; hands-free answerback on intercom; hands-free dialing and monitoring; hold; intercom tone/voice signaling; message waiting; multiline access; music on hold; night transfer; paging access; off-premises extensions; outgoing call restriction—0/1; outgoing call restriction—toll; privacy; power failure transfer; privacy with release; recall/flash button for feature access; single-line telephone access; system speed dialing; station message detail recording; trunk queuing; zone paging; diagnostic routines.

Station Features • add-on conference; call forwarding—all calls; call forwarding—busy; call pickup; call transfer; call waiting; do not disturb; I-Hold indication; key set display; last number redial; nonlocking buttons; hands-free operation; multiline conference; prime line selection—originating, receiving; programming features from key set; pushbutton dialing; speed dialing—station; volume control.

Attendant Features • attendant automatic answer; attendant recall with station identification on display; busy lamp field/direct station selection unit; programming from attendant position.

HARDWARE

Terms & Support

Terms • Executone systems are available from any of the 200 plus Executone locations • purchase prices include installation and first year's maintenance • lease rates normally include maintenance • installation rates are normally not included in the lease price but may be from some locations • end-user pricing will vary based on costs such as markups, discounts, overhead; installation, maintenance, and training costs will also impact price.

Support • Executone systems are supported by Executone's service organization with engineering assistance provided on an as-needed basis • service personnel are trained by Executone and maintenance repairs are handled on a replacement basis.

Overview

Each Executone key system has a fully self-contained key service unit (KSU) that provides system control, switching, and trunk/station connections. Printed circuit boards (PCBs) for specific functions insert into a prewired backplane. A color-coding scheme assures the correct PCB for the desired function. Connections to telephone instruments are normally made with standard 2-pair wiring.

The Equity distributes much of its control functions to stations. Its KSU comes completely equipped for the maximum number of telephones; the only plug-in PCBs used are for music on hold, paging, speed dialing, and toll restriction.

The other Executone systems are more traditional in their KSU implementations. Each KSU has multiple slots into which a CPU card, trunk cards, station cards, and other feature PCBs are inserted. System configurability is a function of the arrangement of specific PCBs in a system.

Feature changes are easily made using a standard electronic telephone. Specific peripheral devices, such as an SMDR printer, paging speakers, and music source, can be attached using standard interfaces. The systems are designed for quick installation, and maintenance by replacement is facilitated by plug-in PCBs.

Representative System Configurations

Equity II • up to 5 trunks/10 stations.

2 Trunks/5 Stations:	\$3,300 to \$3,800 approx prch
5 Trunks/10 Stations:	6,900 to 7,500

APPROX PRCH: purchase price; price ranges are approximate and include installation. NA: not available; price not disclosed by vendor. Prices effective as of March 1985.

Executone Key Systems Command, Encore, Equity II & Gateway

Command (816) • up to 8 trunks/16 stations.
6 Trunks/12 Stations: 8,500 to 9,000

Command (2056) • up to 20 trunks/56 stations.
15 Trunks/40 Stations: 26,500 to 30,000

Encore (1232) • up to 12 trunks/32 stations.
10 Trunks/28 Stations: 19,500 to 23,000

Encore (2464) • up to 24 trunks/64 stations.
20 Trunks/50 Stations: 35,000 to 38,000

Gateway (1448) • up to 14 trunks/48 stations.
12 Trunks/40 Stations: 25,000 to 28,000

Gateway (2496) • up to 24 trunks/96 stations.
20 Trunks/75 Stations: 49,500 to 52,500

System Components

Equity II

Key Service Unit • provides up to 5 trunks/10 stations:
\$2,000 to \$2,500 approx prch

Paging Adapter • connects external paging system:
150 to 200

Speed Dialing/Toll Restriction • provides toll restriction and up to 90 system speed dial numbers and 10 station speed dial numbers:
300 to 325

Music-On Hold • connects to external music source:
175 to 200

Privacy/Exclusion Module:
250 to 275

Encore Models 616, 1232 & 2464

Key Service Unit:
\$2,500 to \$3,500 approx prch

Station Circuit Board • provides 8 stations:
400 to 475

Trunk Circuit Board • provides 2 or 4 trunks:
450 to 500

CPU Card • system processor and memory:
950 to 1,100

Tone Generator Board • provides system tones and paging:
250 to 300

Off-Premises Station Board • supports 1 off-premises station:
275 to 300

Station Message Detail Recording Board • accumulates call records for subsequent processing:
800 to 850

Power Supply:
300 to 350

Command (Models 816 & 2056)

Key Service Unit:

Model 816: \$2,500 to \$3,200 approx prch

Model 2056: 3,000 to 3,500

Station Circuit Boards • provides 8 stations:
500 to 575

Trunk Circuit Boards • provides 4 trunks:
575 to 625

CPU Board:
950 to 1,100

Auxiliary Circuit Board • used for toll restriction, dial outpulsing pause control, and speed dialing:
400 to 425

Power Supply:
300 to 350

Gateway (Models 1448 & 2496)

Key Service Unit:

Model 1448: \$3,700 to \$3,850 approx prch

Model 2496: 3,900 to 4,100

Station Circuit Boards • provides 3 stations:
590 to 640

Trunk Circuit Boards • provides 2 trunks, loop or ground start:
700 to 775

CPU Board:
1,200 to 1,350

Paging Adapter Board:
150 to 200

Call Coverage Board • used by 2 stations who monitor incoming calls for up to 6 other telephones:
350 to 400

Toll Restriction/Ring Expansion Board • provides toll restriction, trunk ringing on up to 31 stations:
650 to 700

Power Supply:
300 to 350

Station Equipment

Equity II

5-Line Telephone: \$295 to \$350 approx prch

5-Line Telephone with Handsfree: 340 to 375

Door Phone Unit: 175 to 200

Busy Lamp Field: 300 to 350

Encore

6-Button Telephone: \$250 to \$300 approx prch

6-Button Telephone with Speakerphone: 295 to 375

12-Button Telephone: 300 to 350

12-Button Telephone with Speakerphone: 375 to 425

24-Button Telephone: 425 to 475

Executone Key Systems

Command, Encore, Equity II & Gateway

24-Button Telephone with Speakerphone: 500 to 575

38-Button DSS/BLF: 425 to 500

72-Button DSS/BLF: 540 to 625

Command

Model 816 Station: \$350 to \$425 approx prch

Model 2056 Station: 425 to 475

56-Button DSS/BLF: 495 to 540

Gateway

Single-Line Station: \$175 to \$220 approx prch

8-Button Station with 8-Character Display: 340 to 395

16-Button Station with 8-Character Display: 395 to 450

24-Button Station with 8-Character Display: 490 to 545

24-Line BLF: 400 to 475

56-Button DSS/BLF: 495 to 550

32-Button Speed Dialer • stores 30 numbers: 150 to 175

■ SYSTEM MAINTENANCE & DIAGNOSTICS

System Reliability • reserve battery for system memory • automatic program load after system restart.

System Diagnostics • major/minor alarm indications • on-site diagnostics.

System Maintenance • performed by Executone's service locations • maintenance by replacement of defective or faulty parts • inventory of spare parts normally maintained by distributor.

System Management • users have the ability to change system features and classes of service from designated stations.

• END

GTE Omni Family

Models I, II, III & V

■ PROFILE

Function • stored program computerized branch exchange (PBX) for switching voice and data.

Applications Supported • office automation • healthcare • hotel/motel • Centrex • education • service sector • banking • airlines • general business.

System Parameters • switching technology: digital using TDM/PCM with distributed processing • architecture: distributed tied to dual high-speed buses, one for switching voice (circuit switching), and one for data (packet switching) • common control: stored program • transmission: PCM with 4-wire internal switching • wiring plan: 3-pair for stations • data switching capability: 19.2K-bps asynchronous and 64K-bps synchronous; internal packet switching technology based on X.25 • dynamic bandwidth allocation: submultiplexing.

Traffic Capacity • Omni I—5,184 CCS maximum per system; Omni II—13,824 CCS maximum per system; Omni III—27,648 CCS maximum per system • grade of service: P.01 • nonblocking architecture: voice—no, data—yes.

Trunks/Stations/Consoles • Omni I—256 ports/64 trunks, 2 consoles; Omni II—1,024 ports/400 trunks, 8 consoles; Omni III—2,048 ports/800 trunks, 8 consoles; Omni V—4,000 to 100,000 ports, number of consoles engineered for each system • trunks supported: central office—one-way (in/out), 2-way, DID, FX, WATS, tie, T1 lines • attended and unattended operation • see Table 1 for configuration limits.

Voice Equipment • vendor supplied: analog and digital telephones • nonvendor equipment supported: all rotary (500-type) and Touch-Tone (2500-type) telephones • electronic feature telephones: GTE FeatureComm Series, GTE XT300 ActionStation.

Data Equipment • vendor supplied: XT300 ActionStation communications terminal: data rates, 19.2K-bps synchronous and 64K-bps asynchronous; modems and data terminals with standard interface capability may be used with the Omni Systems, X.25 interface, modem pooling, data terminal interface.

Subsystem Support • automatic call distribution: custom software



on the Omni II and III • voice message system: Omni integrated voice message system • centralized attendant service • hospital management package • hotel/motel management package.

Communications/Networking • abbreviated dialing • off-network dialing • dialed digit translation • least-cost routing • tandem switching • remote unit operation • T1 interface • asynchronous to 19.2K bps • synchronous to 64K bps.

First Delivery • Omni I: 1984; Omni II: 1982; Omni III: 1984; Omni V: 1985.

Systems Delivered • over 300 systems, all models.

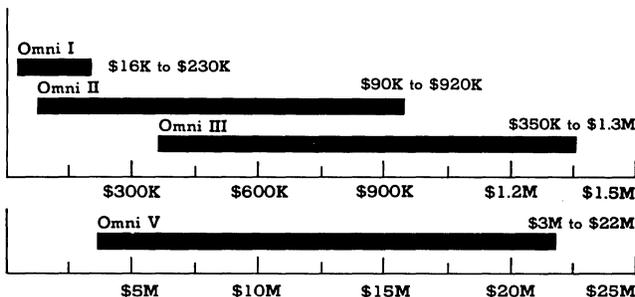
Installation Interval • Omni I/II/III: 12 to 16 weeks ARO • Omni V: 12 to 36 weeks depending on size and system design.

Comparable Systems • Omni I-II: Rolm VSCBX, American Telecom Focus, AT&T Dimension 400, Ericsson Prodigy, Executone Eclipse, Harris D1200, Hitachi DX, ITT 3100, Mitel SX-200, NEC NEAX 2400, Northern Telecom SL-1S, Solid State Systems 1024, Siemens Saturn II • Omni III: American Telecom Focus, AT&T-IS Systems 75 and 85, CXC Rose, DTI 580 DSS, Ericsson MD-110, Executone Summit, Rolm CBX-II, Harris D1200, InteCom IBX, Mitel SX-2000, NEC NEAX 2400, Northern Telecom SL-1, Siemens Saturn III, TIE/communications Mercury, United Technologies Lexar UTX, Zitel PNX • Omni V: Northern Telecom SL-1/SL-100, Rolm CBX II, Ericsson MD-110.

Environmental Specifications • temperature: 45 to 105 degrees Fahrenheit • humidity: 20 to 80 percent • power: Omni I—110 VAC at 60 Hz; Omni II/III—208 and 240 VAC at 50 or 60 Hz; all systems—48 VDC • dimensions: Omni I—30 inches wide x 24.4 inches deep x 43.4 inches high; Omni II—28.5 inches wide x 25 inches deep x 78.8 inches high; Omni III—28.5 inches wide x 25 inches deep x 78.8 inches high; Omni V—made up of various cabinets, will vary in size depending on traffic design and application • floorloading: 100 pounds per square foot • minimum equipment room dimensions: a typical system equipped for 84 trunks and 768 lines would require approximately 285 square feet of floor space.

Vendor • GTE Communication Systems; 2500 West Utopia Road, Phoenix, AZ 85027 • 602-582-7000.

PURCHASE PRICE RANGE hardware & software



GTE OMNI PURCHASE PRICING bar graphs cover price ranges between "small" and "large" configurations; installation and first year's maintenance included • Omni I configurations range from 30 stations/6 trunks to 230 stations/25 trunks • Omni II configurations range from 250 stations/30 trunks to 900 stations/85 trunks • Omni III configurations range from 850 stations/90 trunks to 1,800 stations/200 trunks • Omni V configuration ranges from 4,000 ports to 25,000 ports.

GTE Omni Family Models I, II, III & V

TABLE 1: GTE OMNI FAMILY CONFIGURATION LIMITS

MODEL	MAX LINES	MAX TRUNKS
GTE OMNI I	256	64
GTE OMNI II	1,024	400
GTE OMNI III	2,048	800
GTE OMNI SV	50,000	Note 1

Note 1

OMNI SV is engineered for each application with up to 50,000 lines and can have remote switching units with up to 3,072 lines per location; trunking on Omni SV engineered to meet traffic requirements of the individual application.

Distribution • nationwide through GTE direct sales offices and distributors.

Service/Support/Training • service and support provided by GTE or authorized distributors • installation provided by GTE or authorized distributors • training provided by the installing company or distributor on the user level and by GTE in the technical installation and maintenance area • 1-year warranty parts and labor; maintenance contracts available from GTE or the installing distributor • local and remote maintenance available.

ANALYSIS

GTE's Omni Series of digital PBX systems encompasses 4 products that range from a 256-line system (Omni I) up to 50,000 lines (Omni V) utilizing sophisticated digital switching technologies for optimizing voice and data communications. The Omni has evolved from the company's earlier GTD family of digital PBXs dating back from the early 1970s, the GTD-120, GTD-1000, and GTD-4600. Several thousand of these systems are still in use today, although the company has ceased production on them. In their time, the GTD systems were considered among the best of the digital PBXs available. The newest product, the Omni Series, carries on this tradition.

Although the Omni was introduced in 1982, its presence was rather subdued in comparison with other more prominent systems, such as the AT&T System 85, Rolm CBX II, and InteCom IBX. GTE has been quietly assembling a comprehensive product line to fully address the opportunities available in the integrated voice and data marketplace. The latest series of product announcements came on September 12, 1984, when GTE unveiled an Integrated Voice Message System (IVMS), numerous Omni enhancements, and the formal announcement of the Omni SV, a large-scale PBX for applications with as many as 50,000 stations.

The IVMS provides a voice messaging store and forward capability that can be accessed by all Omni system users. A standalone unit designed for the Omni, the system will store up to 38 hours of voice messages and support 1,000 users. Like most voice messaging systems, the IVMS can be accessed from a standard 2500-type telephone.

In addition to the IVMS, GTE announced that Omni models II and III were upgraded from tape memory to disk memory subsystems to increase memory capacity, speed, faster system updates, and support for future enhancements. Networking capabilities of Omni II and III were enhanced to include facility restriction levels (FRL), traveling class marks (TCM), and authorization codes. Facility restriction levels automatically determine which lines, trunks, or network routes a user of a given telephone can access. Up to 8 levels of calling are available and can be allocated on a per phone basis. Traveling class marks establish and control caller privileges and access to features and public/private facilities in remote switch locations. With this feature a code is transmitted with the user call from switch to switch within a private network. Provision of these 2 features makes the Omni compatible with AT&T Electronic Tandem Network (ETN) technology. Authorization codes allow users to override the FRL of any phone to gain access to special features or public/private facilities. Up to 10,000 authorization codes can be programmed into an Omni system.

Automatic diagnostic and maintenance features of the Omni were enhanced with the introduction of Automatic Circuit Assurance (ACA). This feature produces an automatic report on suspected circuit failures. The Omni MERS (Most Economical Route Selection) feature was expanded to support access to OCCs such as GTE, Sprint, and MCI.

While the large-scale Omni SV had been rumored for some time during 1984, the system was officially previewed at the September 1984 TeleCommunications Association (TCA) conference. The Omni SV will provide cost-effective state-of-the-art communications for as few as 4,000 or as many as 50,000 users. The system is designed as a standalone system, remote service unit, or part of a private switching network. Advantages of the SV are the high degree of redundancy possible and its ability to service a wide range of customers. The Omni SV consists of 3 basic elements: a base unit, remote switching unit, and a multiplexer unit. The base unit provides station-to-station switching, connection to public and other private networks, and tandem switching, while functioning as a node. The base unit serves as host to remote switching or multiplexer units. Remote units with a line capacity of up to 3,072 ports function as smaller digital switches and can also serve as host to multiplexer units. The Omni SV has an operational radius of 200 miles allowing the base unit and the remote units to function as a single communications system for very large users. The system design of the Omni SV is, for the most part, derived from GTE's digital central office, the GTD-5 EAX. The advantage of building on the existing technology is the dependability associated with the successful (1 million lines installed) 5-EAX. In addition to the system's inherent dependability, users should expect highly competitive prices since most all research and development costs for the existing (GTD-5 EAX) product have been recovered. Major EAX-5 development for the Omni SV centers around the development of advanced features software. While much of the SV software is not yet in field trial, the system was previewed with advanced voice communications features, cost management features, administrative and maintenance programs, and data transmission speeds up to 19.2K-bps asynchronous and 64K-bps synchronous. The SV is scheduled for commercial release in September 1985.

The existing Omni systems (Omni I/II/III) are all stored program, distributed microprocessor-controlled switching systems using PCM (Pulse Code Modulation) transmission and TDM (Time Division Multiplexing) for circuit switching. The Omni systems use packet switching for internal data transmission under control of the common system processor. GTE claims its Omni design is innovative in the PBX market due to the system's dual-bus architecture. Traditional PCM voice switching has been complemented by a demand-assigned packet switching facility that can be looked at as a local area network cable on the backplane of the switch. By using the dual bus structure, GTE has combined the functions of a local area network with the cost-effective switching techniques provided by the PBX.

Omni systems can be equipped with redundant processors or configured as standalone control units. Critical electronics can be duplicated where required. Access to the processing units is via maintenance consoles that support diagnostic tests, maintenance procedures, and system configuration commands for moves and changes. Intel 8080 and 8085 processors with VLSI circuitry are

GTE Omni Family

Models I, II, III & V

incorporated into the system design to provide extremely high processing power, high reliability, low power consumption, and comprehensive internal diagnostic capabilities.

Data capabilities include a standard RS-232C interface for asynchronous devices transmitting at speeds up to 19.2K bps. In addition, the system will accept X.25 synchronous data streams at speeds up to 64K bps. Omni uses industry-proven switching techniques to switch voice traffic and packet switching techniques to switch data traffic. This is accomplished by an industry-unique dual-bus architecture that increases total switching capability, offers flexibility in configuring systems, provides the ability to switch a large number of data connections, accommodates multifunction terminals, and supports applications involving both local and remote users.

GTE Communications Systems, a part of GTE Corp, develops, manufactures, installs, and supports a wide range of advanced systems and equipment for voice, data, and video telecommunications. The company also designs and installs private networks for large multilocation organizations and offers an extensive line of residential telephones marketed nationally under the GTE brand name. The company employs more than 25,000 people at 22 major locations worldwide.

Strengths

Omni systems are well respected in the communications industry because of their voice and data capabilities and the software packages available for specific user applications. The basic features of the Omni should be sufficient for most users, but specialized packages for hotel/motel, hospital, ACD, CAS, and multisystem networking add greater value to the product. The data capabilities of the Omni are enhanced through use of the unique dual-bus architecture, which keeps data and voice separate when switched through the system. Station wiring is simplified with uniform 2-pair cable for all single-line and proprietary telephone instruments.

In short, the Omni product line is comprehensive, full-featured, and supports an extremely wide application range. System prices are competitive with the rest of the industry, and the company has made a full commitment to support the system and its evolution. Perhaps the best reason for using the Omni is the knowledge that GTE, the largest independent telephone organization in the U.S., is behind the system. GTE has every intention of remaining a major factor in the telecommunications industry throughout the 1980s and beyond, and the Omni is its flagship PBX product.

Limitations

The Omni has few limitations in design, operation, and price. Its major drawbacks are its late entry into the marketplace and the fact that it does not use a single system concept for expansion from smallest to largest systems. The top-end Omni SV does not use the same hardware as the Models I, II, and III. Earlier Omnis had smaller feature packages and were restricted by less powerful storage capabilities. The current models have overcome most of these limitations.

GTE Corporation is the telephone company in certain areas of the U.S., and it has been an important factor over the past 100 years in the development of telecommunications products and technology. In spite of the company's size, however, it has lived in the shadow of AT&T, both in terms of basic telephone service and for premises systems, such as PBXs and key telephone systems. GTE has been trying to establish a bigger presence in the end-user marketplace, and has found it difficult with an already crowded arena. The company's products are competitive with the major players in the industry, and the technical support available through the parent company is an important plus. In spite of all it has going for it, GTE simply does not have the market presence, at least in the PBX market, it needs to carve out a bigger share of the pie. The announcement of the large-scale Omni SV follows a major trend in the industry to use existing central office technology to compete for very large PBX/Centrex installations, particularly for multinational businesses or major Federal Government operations. This will help GTE's presence substantially, since several other major firms are going for the same lucrative market (AT&T, Ericsson, NEC, and Northern Telecom).

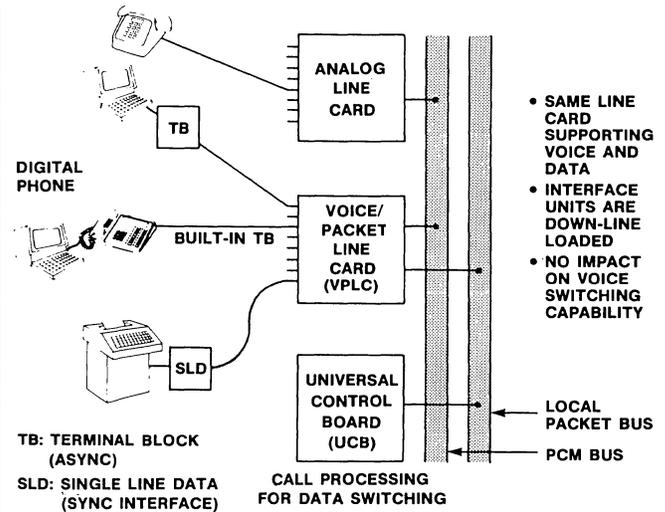


Figure 1 • Omni dual-bus architecture.

Another limitation GTE has is unfortunately a function of its telephone company operations. GTE, as a major provider of telephone service in the southeast and southwest U.S., can offer Centrex business communications service as an alternative to PBXs. In non-GTE service areas, it can only compete with its PBX product line. While this may not be considered a major liability, in these days of heavy competition and continuous price wars, every angle a supplier can use is worth the effort.

SOFTWARE

Terms & Support

Terms • all software is bundled into the Omni price. Optional software packages are installed for a one-time charge.

Support • Omni software is supported by GTE and its authorized distributors.

Software Overview

Omni software is used to control system operation, conduct diagnostic tests, and provide features. Omni features are software driven and can be classified into 4 areas: (1) station features, (2) special application (ACD/CAS/Healthcare/Hotel-Motel) features, (3) attendant features, and (4) system features. System software consists of the operating system, diagnostics, and customer database.

The operating system defines the operational parameters of the system and the functional operation. The distribution of calls, methods of equipment connection and route selection, and all hardware/software interfaces are controlled by the operating system.

Diagnostic software provides both online testing of the Omni and performance and error indications for use in system test and repair.

Customer database software provides system configuration data and various tables for user feature/class of service information.

Generic software (operating system) resident in system memory, controls all major call setup and call processing functions. Direction is received from the operating parameters incorporated into system database software. Each Omni system is supplied with a generic program on magnetic tape or disk depending on the storage device in the system. Contents of the generic program are loaded into system memory with the customer database program during system installation. The generic program also contains recent change software which is used when updating the system with periodic database changes.

GTE Omni Family Models I, II, III & V

□ Features Overview

All features are a function of one of the various software packages available on the Omni system. The system software varies depending on the size of the installed system. Feature packages for the Omni SV have not been released yet but it is expected to be equipped with the same complement of business features found in the present Omni systems.

□ System Features

General System Features

Standard Features • access codes: enables any dial-equipped telephone instrument to access up to 100 different selected features offered by the system • account code access: allows the station user to dial access this feature and enter a 1- to 8-digit account code (also known as client billing code) prior to dialing the called number; this information is recorded on the call record and output on MDR • allowable service codes: special service telephone number codes (such as 911 or 119 for emergency), and directory assistance, repair, etc. can be selectively allowed by the system for each trunk group • alternate trunk group selection: system can be directed to use 1 group of trunks for outgoing calls; if all trunks in that group are busy, an alternate trunk group (typically a 2-way trunk group) is automatically selected • attendant access: station users can be selectively allowed (with appropriate class of service marketing) to dial access to attendant (typically dial 0) • automatic call distribution (ACD): provides for even distribution of incoming calls, among pre-designated locations, during a heavy influx of incoming calls • automatic recovery: nonbattery-powered system will automatically recover and resume operation without human intervention after a power failure or after a momentary system failure • background music: provides background music, from a customer-provided source, over any of the 4 separate paging circuits whenever voice pages are not in progress • bad-line reporting: identifies defective/noisy circuits on a maintenance log, to simplify corrective maintenance • call overflow to UNA: during heavy incoming trunk traffic, system activates Universal Night Answer (UNA) mode at a predetermined call waiting level; enables UNA stations to assist the attendant(s) in responding to increased incoming traffic • code call access: provides interface to customer-provided coded signaling system • common control switching arrangement (CCSA) access: provides CCSA trunking operation through the use of tie trunks between a private network of PABXs to allow 7-digit dialing between any station in the network • diagnostic capabilities: system continually monitors ongoing operations • digit absorption: instructs the system to absorb (ignore) certain digits in a string of digits for outgoing trunk calls and matching digits absorbed by a central office switch • direct inward dialing (DID): system accepts and analyzes digits directly from another source and automatically completes the connection to the desired station • distinctive ringing: provides a different ringing sequence that distinguishes an incoming "outside" call from an "inside" call • duplex operation: includes a second standby-redundant common-control CPU that is constantly updated by the in-service CPU • E&M tie trunks: allows either 2-wire or 4-wire E&M tie trunks • flexible dialing patterns: permits user to define the system's dialing patterns to meet specific requirements • ground start/loop start dial trunks: interfaces both ground/loop start C.O. trunks • immediate ringing: system initiates ringing cycle in less than 1 second after the terminating connection is established • intercept: provides call interception on calls that normally would not be completed due to equipment failure, overload condition, temporary disconnect, vacant and unused lines, toll restriction, or changed number • key telephone system compatibility: supports key telephone systems via line ports • line lockout: provides automatic release of an off-hook station from the common equipment (after a predetermined time) when there is a failure to dial, failure to complete dialing, or failure to place the station on-hook • listed directory number (LDN) calls: incoming listed directory number calls normally routed to attendant consoles • message metering: performs message meter peg counter on answer and provides a message meter peg count indicator for any selected trunk group • multiple-listed directory numbers: more than 1 LDN can be used

with a single system • music-on-hold/camp-on: interface to music source for both music-on-hold (MOH) and music on camp-on • nailed trunk connections: directly connected or nailed trunks can be implemented with the system; used in conjunction with T1 carrier system trunking • night answer services: system can be configured to provide a number of night answer modes of operation • off-premise extensions: connects stations located outside PBX • paging: provides attendants and station users access to customer-owned voice paging equipment • power failure transfer: when system operation is interrupted by total loss of power or catastrophic failure, certain stations are directly connected to specific central office trunks • predetermined night answer (PNA): directs incoming trunk calls to 1 of 16 possible station or station hunt groups • recent change: allows customer or field service technician to update the customer database, such as adding stations or trunks, altering the class of service assigned to a station, etc. via appropriate input device • remote access: enables any outside DTMF telephone to be used to gain access to specific system features • specialized common carrier (SCC) access: interface to SCC transmission facilities • T1 carrier system trunk interface: allows a direct interface connection to North American T1-type carrier spans • tie trunks: trunks connecting PABX systems together can be either 2-wire E&M or 4-wire E&M type • universal night answer (UNA): any station with the appropriate COS can be used to dial the universal night answer pickup code to answer the call • WATS access: connects to both incoming and outgoing WATS trunks.

Restriction Features

Standard Features • class of service: programmed codes that determine station access to specific features and facilities • fully restricted station: station permitted to make and receive calls from within Omni only • inward restriction: DID calls blocked from completion to station; routed to alternate point • manual line service: attendant intervention required for all calls • toll restriction 0/1: outside calls requiring 0 or 1 prefix denied.

Account Code for MDR Option • requires dialing code for chargeback to specific business activities:

NA prch

Area Code Restriction Option • permits or denies station user outside trunk based on 3-digit area code:

NA

Authorization Code Option • requires dialing special code (password) before system will process call:

NA

Controlled Outgoing Restriction Option • permits attendant control of outgoing call restriction for stations:

NA

Toll Restriction Option • permits or denies station user outside trunk access based on area code and local exchange (NXX) code:

NA

Call Accounting Features

Standard Features • feature usage statistics: stores system usage data into Omni memory.

Message Detail Recording Option • outputs data on outside calls to printer, mag tape, diskette, or GTE distributor:

NA prch

Call Routing Features

Standard Features • attendant control of trunk group access: controls station access to outside trunks • class of call controlled routing: allows group of station users to dial an access code to reach any type of intercept, line (station or hunt group), or attendant.

PRCH: purchase price. NA: not available; price not disclosed by vendor. NC: no charge. Prices effective as of December 1984.

GTE Omni Family Models I, II, III & V

Most Economical Route Selection (MERS) Option •

Automatically selects the most economical route available to complete any call; selects WATS, FX, and local CO trunks (DDD) based on database entries regarding area codes (NPA), exchange codes, home-numbering plan, and time-of-day; if most expensive route (DDD) is selected, MERS notifies user with 300-ms burst of dial tone, allowing cancellation or continuation of the call by the user; MERS also provides both off-hook and on-hook (ringback) queuing with automatic number dialing:

NC prch

Trunk Call Queuing Access Option • provides automatic queuing for next available trunk when all routes available to station user are busy; off-hook queuing initiated automatically; ringback queuing initiated with an access code entry; separate access code also provided to cancel any trunk call queue in effect:

NC

Data Features

Data Communications Option • provides interface support for both asynchronous and synchronous data terminals • data privacy: prevents other stations or attendant from interfering with data call in progress • modem pooling provides for sharing of modems for both incoming and outgoing data calls • data speeds: up to 19.2K-bps asynchronous, 64K-bps synchronous; full-duplex:

NC prch

Network Features

Automatic Network Dialing Option • provides automatic dialing of all network calls; uses 3-digit code for off-premises locations:

NA prch

Satellite Operation Option • permits multiple locations in regional area to develop uniform numbering plan; includes automatic dialing, attendant consolidation, trunk consolidation, centralized CDR:

NA

Centralized Attendant Service Automatic Call Distribution (CAS/ACD) Option • groups attendants for multiple Omni locations in centralized site; incoming calls to branch Omnis routed to central site for answering, then returned to desired station at roiginally called location • routes incoming calls to group of agents in predetermined pattern; plays recorded message while calls waiting in queue:

2,500 to 22,000

Facility Restriction Levels (FRL) Option • network intelligence that determines which outside trunk facilities a station user can access:

NA

Traveling Class Marks (TCM) Option • network codes that are routed with calls over a tandem network that determine caller privileges at a distant switching location:

NA

Attendant Console Features

Standard Features • alphanumeric display: attendant console has 32-character alphanumeric display separated into 2 16-character displays • attendant busy/idle verification: attendant can dial access a verification test for any trunk to determine if that trunk is busy or idle • attendant conference: attendant has direct pushbutton control and indication for controlling progressive conferences in conference bridge circuit • attendant control of facility: attendant can apply or remove the restriction to control station access of any trunk group by dial access control • attendant direct trunk access: attendants can be allowed selectively to connect to any trunk by means of dial access • attendant flexible night connections: console assigned as night answer control unit can redefine destination number and night answer station number • attendant force release of a trunk: attendant can dial access a specific trunk to force release of that trunk's connection • attendant group speed calling list update:



GTE XT-300 Action Station

attendant can dial access group speed calling list and change/delete entry as required • automatic recall on hold: when attendant uses pushbutton hold feature to hold a call, the system can be directed to automatically recall attendant after a predetermined period of time • automatic timed recall on does not answer/busy: recalls the attendant after the does-not-answer/busy timing interval • bad-line reporting: identifies defective/noisy circuits requiring corrective maintenance • break-in: allows attendant to break-in to any active connection, except data-protected paths, 3-way conferences, or if attendant exclusion is in effect • call hold: console has direct pushbutton call holding capabilities for up to 4 loops • call splitting: console automatically splits both parties during attendant service operations • call transfer to another attendant: attendant can transfer any call to another attendant • call waiting indicator: LED indicator to alert when number of incoming calls in queue reaches preset threshold • camp-on: connect call to busy station; tone alerts station of camp-on • data link recovery: in a power failure console will automatically initiate a recovery when power is restored • dial through attendant: incoming calls can be directly extended to dial trunk facilities to allow calling party to perform digit dialing • exclusion: console can exclude source or destination during any attendant service operation • loop selection: all calls presented to console handled on 4 switched loops • message waiting activation/deactivation: console can change message waiting indicator status for any room • multiple console operation: permits multiple consoles to be utilized with the system • paging: attendant can access a paging system directly by using pushbutton control • priority calls: when priority call originated from a station, call is placed ahead of all incoming attendant calls waiting in the queue and a special cadence alerting chime is activated on all consoles • remote console operation: enables remote console operation • room-to-room blocking activation/deactivation: console can be allowed or disallowed direct pushbutton control of the room-to-room blocking feature • self-test diagnostics: console has built-in self-test diagnostics to aid maintenance technician in troubleshooting unit • series calling: directs system to return a specified trunk to the attendant when it becomes idle • time-of-day display: hour and minute information (24-hour clock method) displayed whenever console is idle • trouble number display: when minor faults occur in the system, alarm LED flashes to indicate condition to attendant • attendant MERS time period change option: each attendant can be selectively allowed dial access to the Most Economical Routing System (MERS) time period change activation or deactivation features; allows attendant to specify any 1 of 3 time periods and

GTE Omni Family Models I, II, III & V

then establish beginning and ending times that a predetermined MERS routine will be in effect.

Station Features

Standard Features • call forwarding—fixed: allows station user to have incoming calls forwarded to a specific destination if station is either busy or does not answer • call forwarding—variable: allows station user to change call forwarding destination at the time of feature activation • call hold: allows station user to place call on hold • call park: call placed in "park" condition can be retrieved by any other station in the system • call pickup—directed: allows station user to dial an access code and a station number to answer unanswered incoming call to specified station within predetermined pickup group • call pickup—group: station in a pickup group can answer any unanswered incoming call within group by dialing access code • call transfer: station can transfer incoming or outgoing call to another station • call waiting: allows calling party of an intrasystem call to a busy station to establish an off-hook camp-on condition; the busy station user hears an alerting tone • consultation with automatic hold: station can place call on automatic or soft hold and access system services, dial another station, or access a trunk line; at completion of consultation, station user can reestablish original 2-way connection • direct outward dialing: allows station user to access CO exchange network or tie trunks • do-not-disturb (DND) activation by station: allows station user to activate and cancel do-not-disturb feature • executive override: station users break into a completed 2-way connection; alerting tones heard by both parties before override connection completed • group speed calling: stations can access group speed calling feature that provides automatic dialing of up to 100 frequently used telephone numbers • hookswitch flash: allows station user to regain access to system features during an existing conversation • station camp-on and call-back: station user places a call to a busy station; when station becomes idle, system rings both parties • called number display service option: any intrasystem call diverted to this station, when another station number has been called, will have called station number displayed when display telephone instrument is taken off-hook • dictation access option: provides access to, and control of, customer-owned centrally located dictation recording equipment • meet-me conference option: up to 2 8-party conference circuits; all parties dial access conference bridge circuit at predetermined time • progressive conference option: station user dials conference circuit, then calls each station individually to be added in the conference.

Application Software

GTE has installed Omni in numerous application environments. Specialized packages available for hotel/motel and health care.

Hotel/Health Care Option • includes features for operations management: access codes; classes of service; do-not-disturb; maid service status; message waiting; message registration; room number correlation; room restriction from dialing; wake-up:
\$3,300 to \$10,500 prch

HARDWARE

Terms & Support

Terms • Omni is available on purchase and lease arrangements from GTE and its authorized distributors • equipment, installation, and maintenance prices will vary among distributors.

Support • equipment installed and maintained by GTE and its authorized distributors • GTE engineering support available to distributors and operating telephone companies in the event of major system problems • all distributors of the product have trained service and installation technicians.

Hardware Overview

The entry-level Omni I is packaged in a single cabinet that provides up to 256 stations and 64 trunks. A get-started file (one shelf) provides 136 stations and 36 trunks and allows easy expansion to the full 256-line configuration by adding an expansion module.

The Omni II/III is packaged in 2 types of equipment complexes,

the Common Equipment Complex (CEC) and the Peripheral Equipment Complex (PEC). The CEC contains the common control and digital switching networks. The PEC contains line, trunk, interface, and other peripheral circuits. The minimum system configuration contains 1 CEC and 1 PEC in a single cabinet (256 stations/128 trunks). The maximum system configuration contains 2 CECs for redundant (duplex) control and 8 PECs in 4 cabinets. The use of only 2 main types of equipment complexes for the modular design simplifies system expansion. This configuration also permits the use of common components in all Omni systems.

CECs and PECs, with associated ringing generators, battery packs, battery filters, and power supplies are contained in centrally located cabinets. The system configuration can range from a single line expansion cabinet for a minimum system configuration (256 ports) to the full complement of 2,048 ports in 4 cabinets, for a maximum system.

The CEC contains common processing and control circuits that perform all call setup processing and also control operation of the PECs. A system can be configured to operate in a simplex or duplex mode with 1 or 2 CECs, respectively. In duplex mode, 1 CEC is in primary active mode while the other is in secondary standby mode. Duplex mode provides a secondary backup CEC in the event of a failure on the primary CEC. The secondary CEC maintains established calls if the primary CEC fails.

The PEC is the analog/digital interface between the external environment and the internal digital circuits of the system. Each PEC can be equipped to handle approximately one-eighth of the system's maximum capacity of lines and trunks. Specific card slots in the PEC can be equipped to allow each PEC to support up to 256 stations or 100 trunks. The maximum for stations in the system is 2,048; the maximum for trunks is 800. The line and trunk maximums cannot be met simultaneously due to spacing limitations with Universal Card Slots.

Communications between the CEC and the PEC(s) is through common memory subsystems in the PECs. The PEC writes event information (line off-hook, digit received) into its common memory. The CEC fetches and analyzes the event information and writes directives (ring a line, release a trunk) into the appropriate area of common memory in the required PEC.

Representative System Configurations

Omni I Configuration • single-cabinet nonredundant system; up to 256 stations/64 trunks • configuration assumes voice-only, 20% feature phones.

Small System • 48 stations/6 trunks:
\$16,500 to \$31,250 prch

Medium System • 124 stations/15 trunks:
48,700 to 86,880

Large System • 220 stations/22 trunks:
86,700 to 152,500

Omni II Configuration • up to 4 cabinets; redundant system; up to 1,024 stations/400 trunks • assumes voice-only, 20% feature phones.

Small System • nonredundant; 256 stations/25 trunks:
99,400 to 175,200

Medium System • nonredundant; 515 stations/48 trunks:
199,800 to 352,000

Medium System • redundant; 515 stations/48 trunks:
247,300 to 440,000

Large System • nonredundant; 865 stations/75 trunks:
332,700 to 587,500

PRCH: purchase price; price ranges are approximate and include installation. NA: not available. Prices effective as of December 1984.

GTE Omni Family

Models I, II, III & V

Large System • redundant; 865 stations/75 trunks:
405,900 to 716,800

Omni III Configuration • up to 4 cabinets; redundant system; up to 2,048 stations/800 trunks • assumes voice-only, 20% feature phones.

Small System • redundant; 970 stations/88 trunks:
375,600 to 662,300

Medium System • redundant; 1,450 stations/115 trunks:
555,600 to 978,200

Large System • redundant; 1,770 stations/150 trunks:
682,600 to 1,200,000

Station Interface Circuit Board • up to 8 stations connected per board:
850

Off-Premise Station Interface Circuit Board • up to 8 stations per board; maximum loop limit 1300 ohms:
970

Featurephone Interface Circuit Board • up to 8 stations per board:
850

DTMF Receivers • provides 4 circuits for accepting DTMF (tone dialing) signaling internal to the system:
925

Trunk Interface Circuit Board • up to 4 circuits per board; local C.O., WATS, FX, OCC trunks supported:
665

Tie Trunk Interface Circuit Boards • up to 4 circuits per board; 2-wire or 4-wire E&M signaling.

2-Wire Circuit:
560

4-Wire Circuit:
1,330

8-Party Conference Circuit Board • up to 8 calls connected:
675

Paging Access Circuit Board • access to customer provided paging or central dictation system:
675

Recorded Announcement Circuit Board • provides recorded message for intercepted calls:
775

Station Equipment—Voice/Data

Attendant Console • primary function to service incoming calls and connect to designated internal station • place outside calls • provides information concerning system status • desktop unit • up to 8 per system:
\$2,100 prch

FeatureComm III/IV • electronic feature telephone • single-button feature access • 3-pair station wire • 8 or 16 buttons • 16- or 24-character LCD display • hands-free calling.

FeatureComm III • 8 buttons; 16-character LCD display:
640

FeatureComm IV • 16 buttons; 24-character LCD display:
715

Direct Station Display (DSS) Module • add-on unit with 30 programmable buttons for station/feature access:
70

XT-300 ActionStation • integrated voice/data terminal • 9-inch CRT with 80x24 characters per line • attached alphanumeric keyboard with 4 programmable function keys • 2 RS-232C ports • 2 telephone line jacks • hands-free dialing •

50-number speed call list; 8 logon procedures; 12 function key character strings:
1,495

Data Communications Equipment

Simultaneous voice and data communication support at data speeds of 19.2K-bps asynchronous and 64K-bps synchronous • eliminates modems for internal communications; reduces need for long-distance modems via modem pooling • supports X.25 packet switching • T1 interface • SNA/SDLC support • terminals connected either via Data Terminal Interface (DTI) or RS-232C integrated with proprietary stations.

T1 Interface • provides access to PCM channel banks for connection to digital T1 span lines:
\$400 to \$1,200 prch

Data Terminal Interface (DTI) • connects terminals to Omni; RS-232C interface:
450 to 700

Peripherals

Service Teleprinter • prints out various system reports, audit trails • functions as administration terminal in lieu of System Administration Terminal:
\$1,100 to \$1,400 prch

System Administration Terminal • CRT with keyboard used for system management functions • change class of service, pickup groups, hunting, MERS patterns:
1,495 to 1,895

Disk & Tape Subsystems • various 9-track, cassette, floppy disk, and hard disk systems available depending on application:
NA

Subsystems

Message Detail Recording • includes hardware and software to record outgoing call activities • output must be sent to auxiliary printer • system calculates call costs.

Single-Processor Systems:
\$5,300 prch

Redundant-Processor Systems:
6,800

Integrated Voice Message System • standalone voice message system • up to 38 hours of storage • up to 1,000 users:
NA

SYSTEM MAINTENANCE & DIAGNOSTICS

System Reliability • redundant CPUs • error-correcting memory • redundant critical electronics • reserve memory power • backup battery • automatic program load on Omni Models II, III, and V.

System Diagnostics • system continuously diagnoses operation • automatic circuit assurance identifies faulty trunk lines • major/minor alarm indications at attendant console and equipment cabinets • audit trail generated by system service teleprinter • remote diagnostics by GTE or authorized distributor.

System Maintenance • normally performed by GTE or authorized distributor • larger systems typically include inventory of line cards, trunk cards, phones, cable, test equipment, etc for user or vendor maintenance • modem usually provided on larger systems for remote testing.

System Management • users can change various functions such as pickup groups, trunk routing patterns, busy out defective trunks, perform station relocations • system administration terminal or teleprinter required.

• END

Harris Digital Telephone Systems 400/1200 PBX Series

Models 400-2, 400-4, 1201, 1202, 1203, 1204, 1205 & 1200LX

■ PROFILE

Function • stored program computerized branch exchange systems for switching voice and data.

Applications Supported • office automation • general business • healthcare • retailers • hotel/motel • banking • military • education • service sector • resale common carriers.

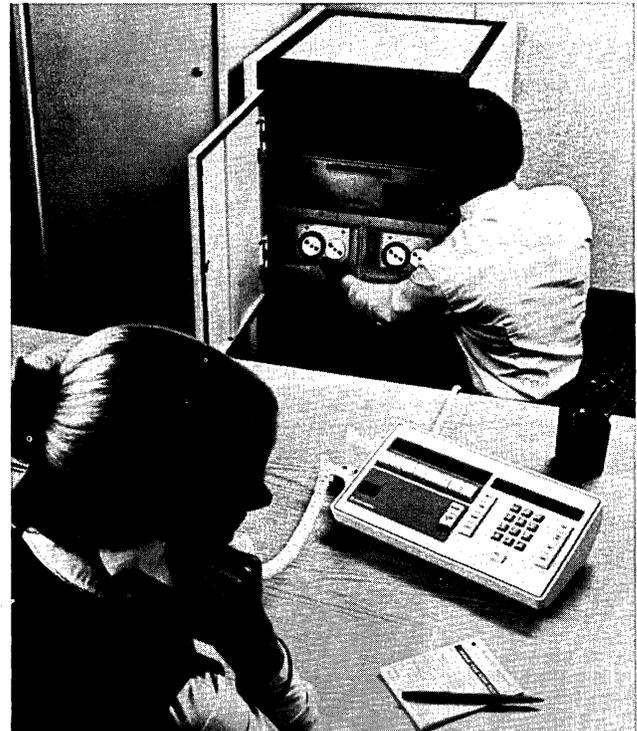
System Parameters • switching technology: digital switching using TDM adaptive delta modulation • architecture: centralized processor tied to high-speed bus • common control: stored program • transmission: 4-wire internal switching • wiring plan: 2-pair for 500/2500 sets; 4-pair for electronic sets; 25-pair for attendant console • data switching capability: 9600-bps full-duplex at station.

Traffic Capacity • 5.6 to 36 CCS per line, depending on model • grade of service: P.01 • simultaneous conversations: 140 • nonblocking architecture: D1203—yes; other models: no.

Trunks/Stations/Consoles • D400-2: 32 trunks, 184 stations, 1 console • D400-4: 55 trunks, 384 stations, 2 consoles • D1201: 48 to 80 trunks, 216 to 400 stations, 2 consoles • D1202: 128 trunks, 800 stations, 4 consoles • D1203: 24 trunks, 96 stations, 1 console • D1204: 120 trunks, 720 stations, 4 consoles • D1205: 56 trunks, 264 stations, 2 consoles • figures represent systems configured for touch-tone service • trunks supported: central office—1-way (in/out), 2-way; DID; FX; tie lines; OCC; AUTOVON; CCSA • attended and unattended operation.

Voice Equipment • vendor supplied: analog and digital telephones • nonvendor equipment supported: all rotary (500 type) and Touch-Tone (2500 type) telephones • electronic feature telephones: Precedent; Harris 410 • digital telephones: none.

Data Equipment • vendor supplied: none • nonvendor equipment supported: terminals that support BSC, ASCII • data rates: asynchronous 110 to 9600 bps; full duplex • modems: all types • multiplexers: all types • data modules: data terminal interface (DTI) for standard phones • interfaces supported: RS-232C • printers: service printer • data storage: digital cassette unit, diskette subsystem, magnetic tape subsystem • data terminals: ASCII, TTY • computers: minicomputers, personal computers.



Subsystem Support • automatic call distributors: uniform call distribution (UCD) • call detail recording: Detailed Station Message Accounting; Private Network Automatic Number Identification • hotel/motel management systems: interfaces to most management systems.

Communications/Networking • abbreviated dialing • off-network dialing • on-network dialing • dialed digit translation • route optimization • tandem switching • satellite operation protocols: BSC, ASCII • asynchronous to 9600 bps.

First Delivery • 1975.

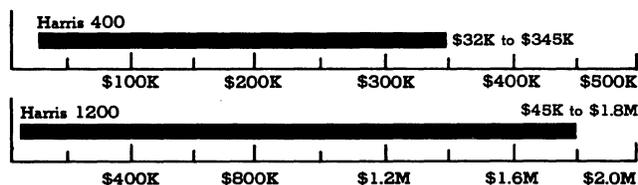
Systems Delivered • over 8,000 systems, all models.

Installation Interval • 12 to 16 weeks ARO.

Comparable Systems • American Telecom Focus, Anderson Jacobson IOX, AT&T Dimension, Systems 75 and 85, Ericsson Prodigy and MD110, Executone Summit, GTE Omni, InteCom IBX, IPC 160 DPXIII, ITT 3100, Mitel SX-200 and SX-2000, NEC NEAX 12A and 2400, Northern Telecom SL-1, Siemens Saturn, TIE/Communications Mercury, United Technologies/Lexar UTX.

Environmental Specifications • temperature: 50 degrees to 80 degrees Fahrenheit (normal), 32 degrees to 122 degrees Fahrenheit (maximum) • humidity: 30 to 60 percent (normal), 20

PURCHASE PRICE RANGE hardware & software



HARRIS 400/1200 PURCHASE PRICING bar graphs cover price ranges between "small" and "large" configurations; installation and first year's maintenance included • Harris 400 systems range from 8 trunks/40 stations to 50 trunks/350 stations; up to 2 consoles • Harris 1200 systems range from 10 trunks/60 stations to 100 trunks/780 stations; up to 4 consoles • larger configurations possible with D1200LX.

Harris Digital Telephone Systems 400/1200 PBX Series

Models 400-2, 400-4, 1201, 1202, 1203, 1204, 1205 & 1200LX

to 80 percent (maximum) • power: 115 VAC (+10% to 15%) at 60 Hz; 208 VAC (+10% to 15%) at 60 Hz; all systems 50 VDC (+17% to 8%); separately fused outlet 30-amp service per cabinet • dimensions: D400-2—42x26x38.2 (WxDxH), D400-4—64.25x26x38.25 (WxDxH), D1201—24.25x27.5x71 (WxDxH); D1202—46.25x27.5x71 (WxDxH); D1203—24.25x27.75x38 (WxDxH); D1204—46.25x27.5x71 (WxDxH); D1205—24.25x27.5x71 (WxDxH); D1205LX—same as D1202 • weight: D400-2—450 pounds; D400-4—650 pounds; D1201—650 pounds; D1202—1250 pounds; D1203—406 pounds; D1204—1190 pounds; D1205—595 pounds; D1200LX—same as D1202 • floor loading: 100 pounds per square foot • minimum equipment room dimensions: 8x10x8 feet (WxDxH) • FCC registration number BB988K-62939-PF-E; ringer.

Vendor • Harris Digital Telephone Systems; One Digital Drive, Novato, CA 94947 • 415-472-2500.

Distribution • nationwide and worldwide through Harris direct sales offices and independent dealers and distributors.

Service/Support/Training • service, support, and training by Harris or distributor • installation by Harris or distributor; subcontractors • warranty one-year parts and labor; maintenance contracts available • local and remote maintenance.

■ ANALYSIS

The Harris D1200 dates back to 1975, and has shared the digital PBX spotlight with the likes of the Rolm CBX and Northern Telecom SL-1 over the past 10 years. While the CBX and SL-1 have achieved their large followings primarily with traditional business applications, the D1200 has taken a slightly different path. It has been successfully installed in business, healthcare, hotel/motel, and government markets, but has also achieved popularity as a resale carrier switch and a small rural central office system. These systems typically have high trunking requirements, complex call routing patterns, and very high uptime. The D1200 has filled these needs very successfully, and has achieved an international reputation for reliability.

To better serve the needs of small to medium users, Harris brought out the D400 in 1983. It uses the same circuit boards and software as the 1200, and is designed to fit into networks built around the 1200.

The PBX industry continually moves in the direction of total voice and data integration. The 400/1200 data communications capabilities are less sophisticated than the likes of the InteCom IBX, AT&T Systems 75/85, NEC NEAX 2400, and Rolm CBX, but this has not eroded the company's market share. Harris Digital Telephone Systems is a consistent performer, filling market needs with high-quality and highly reliable equipment. Most users do not have data requirements higher than 9600 bps, and in this sense the 400/1200 satisfies the need just as well as the competition. Perhaps the company should develop a digital telephone set, where voice is digitized at the set before it arrives at the switch. It already has an electronic telephone, the Precedent, that provides the typical features users desire today.

Networking is another 400/1200 specialty. Designed to reside within complex tandem switching networks, the 400/1200 has a powerful automatic route selection (ARS) program, with the ability to service multiple network routing patterns. The reverse signaling feature assures a high level of network call completions by sending signals ahead of the call in progress to determine if the projected routes are available. If the desired routes are not available, and the network has alternate routes, reverse signaling, in conjunction with ARS, will seek out the alternate route and complete the call. The 1200 typically functions as a major switching node, and the 400 operates as a satellite PBX. Network switching features are available on both the 400 and 1200, which ensures a high level of network intelligence. To provide a better level of network information, the 400/1200 adds Private Network Automatic Number Identification (PNANI) to the SMDR function. This produces greater call detail as a call is routed through various sections of the network. It can be an extremely important aid in determining the optimum network configuration. Both the 400 and 1200 support call routing parameters imposed by Equal Access legislation.

While the rest of the PBX industry buys millions of dollars of

advertising space to ballyhoo voice and data communications products, Harris quietly keeps installing the 400/1200 in a wide variety of applications. Systems typically are installed through a nationwide distributor network, and the company has formed special marketing teams to address large network users, as well as the resale carrier industry. With an installed base of over 8,000 systems, Harris has a solid position in the industry, even though there are some who would call the system dated in its design. The company's track record speaks for itself.

□ Strengths

The 400/1200 systems are highly reliable, well-supported PBX systems that have attracted a loyal following. Their strengths include redundancy of major components (1204/1205), excellent networking capabilities, flexible configurations, ease of installation, ease of administration (via a CP/M-based personal computer), and an extensive feature list. Systems have been used successfully in rural central office applications, which demand high-quality and reliable switching equipment. The attendant console is easy to operate, and is the same unit that has been used ever since the D1200's introduction back in 1975, a strong testimonial to an excellent design. The systems have the support of Harris Corporation, a \$1.8 billion manufacturer of electronics and communications equipment. The company has brought out refinements to the 400/1200 over the last 3 years to enhance its networking and administrative capabilities, such as look ahead signaling and Equal Access call routing and screening.

□ Limitations

The 400/1200 uses adaptive delta modulation (ADM) to convert analog voice signals to digital bit streams. This technique is not as efficient as pulse coded modulation (PCM), used extensively throughout the PBX industry. This doesn't represent a problem to users with modest data communications requirements, but if a user has substantial data facilities, particularly T1 span lines, ADM will not support the formats used in T1. This means users will have to acquire interface units to bridge the gap.

Normal station line cards have 8 circuits per board. Data station cards provide 4 circuits, which will limit the ultimate capacity of a system when a high concentration of data lines is required. Data speeds up to 9600 bps asynchronous are supported. Synchronous communications is not supported.

Both the 400 and 1200 use a centralized processor design, rather than a distributed architecture, as is the trend today. While this design has worked well over the years, it does mean a user has to plan on some sort of battery backup, in case of a power outage. Two of the 1200 models, the 1204 and 1205, have redundant processors as standard, but these also represent an additional investment to the user. A distributed architecture means system functions can continue in the event of a processor failure, albeit at a degraded level. If the main processor in a 400/1200 fails, the entire system goes down.

The 400/1200 models fall victim to the telephone industry's **no standard syndrome**, a function of the uniqueness of each system design. In the computer industry, a user can easily price out a system. A PBX user does not normally have this luxury, since system pricing is controlled by so many different factors, such as vendor overhead, discounts, maintenance costs, training costs, installation costs, and spare parts.

Users can upgrade within the 400 product line from Model 2 to Model 4 simply by adding a cabinet and more line cards. They cannot, however, upgrade directly to a 1200 without replacing the cabinets and system control circuit boards. Fortunately this is about all that is required, since both systems use the same software and line/trunk circuit cards. Users can field upgrade within the 1200 product line.

■ SOFTWARE

□ Terms & Support

Terms • all software is bundled into the 400/1200 system price with the exception of optional features.

Support • System software is supported by Harris and its associated dealers and distributors • field-developed software is

Harris Digital Telephone Systems 400/1200 PBX Series

Models 400-2, 400-4, 1201, 1202, 1203, 1204, 1205 & 1200LX

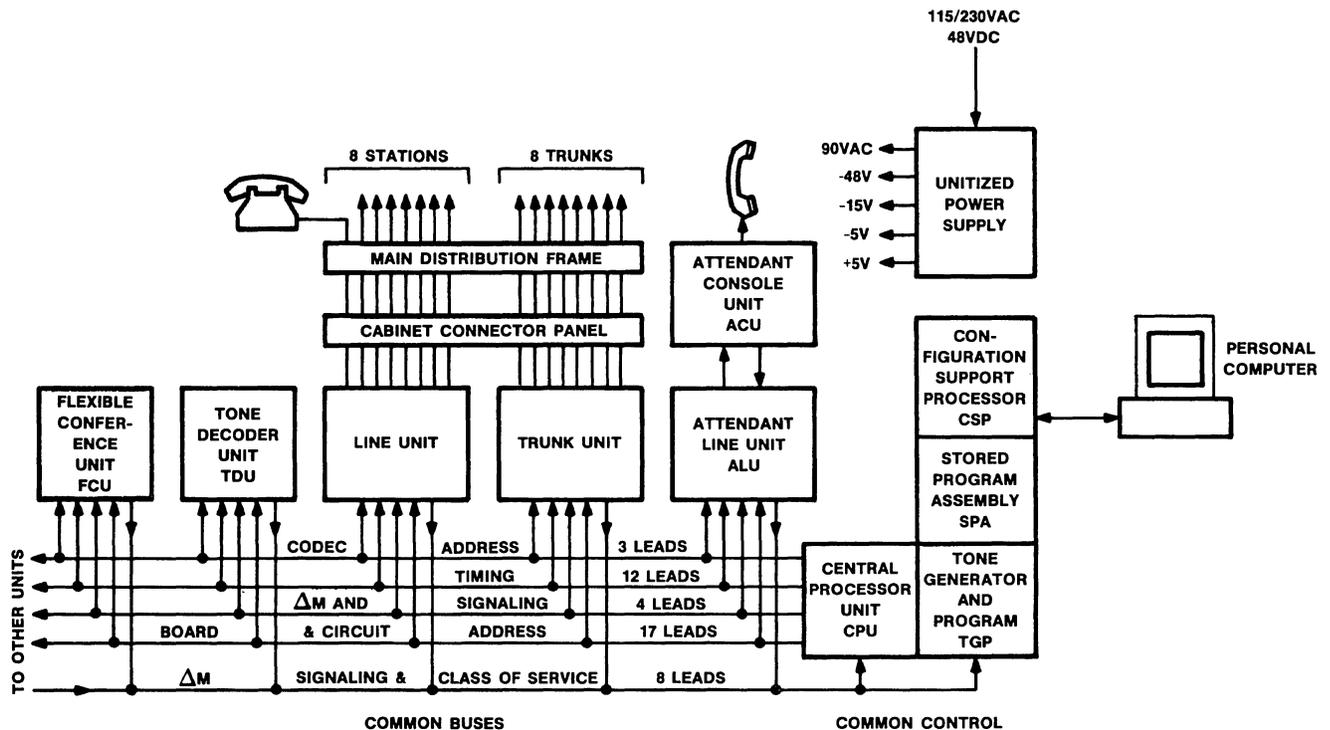


Figure 1 • Harris 400/1200 System Block Diagram.

supported by the individual dealer or distributor that authors the programs.

□ Software Overview

Harris 400/1200 software is used to control operations, conduct self-test functions, and provide features. It should be noted that all features of the 400/1200 family are software driven and targeted at 4 areas: (1) System Features; (2) Attendant's Features; (3) Station Features; and (4) Network Features. System software consists of the Operating System, Self-Test, and Configuration Tables.

The operating system defines major parameters and functions. The distribution of calls and methods of route selection and optimization are also controlled by the operating system.

The self-test provides online testing of the 400/1200 system performance. Error table printouts are available upon request. System fault error codes are stored in the 400/1200 memory and made available to local or remote access.

The configuration tables contain information unique to each 400/1200 installation. These tables may be changed or moved. The tables are used to define station characteristics and control assignments.

Diagnostic software is used to diagnose problems not found by the self-test programs. They are recorded serially on magnetic tape.

□ Features Overview

All features are a function of various feature packages • Feature Package (FP) 5 is the latest release and supports all previous FPs • FP 5 provides a high level of network communications support plus enhanced user administration features • all releases will run partially or totally in all 400/1200 models • **all standard features are bundled into the system price** • optional features are extra-cost items.

General System Features

Standard Features • attendant console: incoming calls all

processed by attendant console • distinctive ringing: station ringing cycles signal type of call • flexible numbering of stations: stations can be numbered with either 3 or 4 digits • foreign exchange (FX) service: access to FX trunks • intercept treatment: calls to vacant or unassigned stations receive distinctive signal • line lockout with warning: stations left off-hook after predetermined length of time are first sent a howler tone, followed by release from the PBX • listed directory number (LDN) service: access to local C.O. trunks • multiple LDN: access to more than one local trunk group with indication at console • night service: after hours calls handled either by connecting trunks directly to stations or by dialing a special code to answer an incoming call • off-premises stations: connection for stations not located in same building as PBX • power failure transfer: prearranged stations are connected to trunks for service in a power outage remote maintenance and testing service: system to provide real-time diagnostics of system for both user and system supplier • rotary dial calling: dial telephones supported • tie trunk service: access to tie trunks • touch-tone calling: tone dial telephones supported • touch-tone to dial pulse conversion: converts tone signals to rotary dial pulses for connection to rotary dial central offices • trunk answer from any station: night service feature, users answer incoming calls by dialing special code • WATS service: access to WATS trunks, both oncoming and outgoing.

Automatic Program Load Option • provides floppy disk as alternate system loading device if system goes down; requires floppy disk hardware interface and drive; can be ordered after system installation as field upgrade: NA prch

Direct Inward Dialing Option • designated group of trunks that can complete incoming call directly to station without attendant assistance: NA

PRCH: purchase price. NA: not available; price not disclosed by vendor. NC: no charge. Prices are approximate and are effective as of January 1985.

Harris Digital Telephone Systems 400/1200 PBX Series

Models 400-2, 400-4, 1201, 1202, 1203, 1204, 1205 & 1200LX

Direct Inward System Access Option • provides direct access into 400/1200 via trunk; user dials authorization code to access system features:

_____ NA

Facilities Administration & Control (Editor) Option • provides detailed information on system facilities activities:

_____ NA

Loudspeaker Paging Option • interface to customer-provided paging system:

_____ NA

Music-On-Hold Access Option • interface to customer-provided music source:

_____ NA

Radio Paging Access Option • interface to customer-provided radio paging system:

_____ NA

Recorded Telephone Dictation Access Option • interface to customer-provided telephone dictation system:

_____ NA

Reserve Power Option • independent power source for temporary power during a short-term outage:

_____ NA

Speed Calling Option • provides directory of frequently called numbers accessed by special dial code:

_____ NA

Station Rearrangement & Change (Editor) Option • permits user-controlled station moves and feature changes:

_____ NA

Uniform Call Distribution (UCD) Option • routes incoming calls to designated stations according to preset pattern:

_____ NA

Restriction Features

Standard Features • class of service: group of features and restrictions assigned to a station • code restriction: denies selected station lines completion of dialed outgoing exchange network calls to selected offices and area codes • data privacy: station user will deny other potential users the ability to override or gain access to the used line; restrictions released when station placed on-hook • data restriction: station or group denies other users ability to gain access to the station or group; attempted bridge-on is routed to a tone • fully restricted station: denies the ability to place or receive anything but station-to-station calls • inward restriction: stations prevented from receiving incoming common control switching arrangement (CCSA), tie trunk, and exchange network calls; either direct dialed or attendant completed • originating restriction: prohibits station line from originating calls • outward restriction: call attempts are routed to the intercept tone; station can not use CO, FX, CCSA trunks • station-to-station restriction: internal calls only are restricted • termination restriction: stations cannot receive calls at any time • toll restriction: prohibits users of particular trunks from dialing any number except specified office codes and area codes • miscellaneous trunk restriction: denies dial access from preselected station lines to preselected trunk groups.

Account Code for SMDR Option • requires dialing code for chargeback to specific business activities:

_____ NA prch

Area Code Restriction Option • permits or denies station user outside trunk based on 3-digit area code:

_____ NC

Authorization Code Option • requires station user to dial special access code prior to dialing desired facility:

_____ NA

Controlled Outgoing Restriction Option • permits attendant control of outgoing call restriction for stations:

_____ NC

Toll Restriction Option • permits or denies station user outside trunk access based on area code and local exchange (NXX) code:

_____ NC

Call Routing Features

Standard Feature • Route Advance routes outgoing calls to alternate facilities when the first-choice trunk group is busy.

Automatic Alternate Routing Option • automatic routing of tie trunks over alternate trunk groups:

_____ NA prch

Automatic Overflow to DDD Option • optional routing of private network calls via off-net facilities from a point on the network where all on-net routes are busy or none are provided:

_____ NA

Automatic Route Selection Option • provides automatic routing of outgoing calls over alternate customer facilities based on the Direct Distance Dialing (DDD) number; incorporates the functions of and replaces the code restriction and route advance features:

_____ NA

Trunk Queuing Option • outgoing trunk calls to busy trunk group are placed in queue, then called back by system when trunk available:

_____ NA

Call Accounting Features

Standard Feature • features usage statistics; stores system usage data into memory.

Private Network Automatic Number Identification (PNANI) Option • identifies network calls to centralized SMDR:

_____ NA prch

Station Message Detail Recording (SMDR) Option • provides station or attendant identity, starting time, duration, and trunk group used for outgoing and/or incoming calls:

_____ NA

Station Message Register Option • records number of local message unit calls generated by hotel/motel guest phone:

_____ NA

Traffic Measurement Option • records additional detail on internal call activity in 400/1200:

_____ NA

Network Features

CCSA Access Option • access from the inward dialing from CCSA network, outward dialing from PBX without attendant assistance:

_____ NC prch

Centralized Attendant Service Option • groups attendants for multiple 400/1200 locations in centralized site; incoming calls to branch systems routed to central site for answering, then returned to desired station at originally called location:

_____ NA

Reverse Signaling Option • assures network call completion by sending signal through network ahead of call to verify availability of desired routes:

_____ NA

Satellite Operation Option • permits multiple locations in regional area to develop uniform numbering plan; includes automatic dialing, attendant consolidation, trunk consolidation, centralized SMDR:

_____ NC

Tandem Tie Trunk Switching Option • allows tie trunk-to-tie trunk, tie trunk-to-CCSA, and tie trunk-to-exchange network connections through the switching system dialed directly by the remote PBX station user:

_____ NA

Time of Day Routing Option • completes call routing as a

Harris Digital Telephone Systems 400/1200 PBX Series

Models 400-2, 400-4, 1201, 1202, 1203, 1204, 1205 & 1200LX

function of the time of day; important when operating in multiple time zones:

NA

Data Features

Standard Features • data privacy: denies other stations ability to override or gain access to data line while in use • data restriction: denies access to station or trunk group while data is being transmitted.

Data Communications Access Option • permits connection of customer-provided data equipment to PBX stations/trunks via standard modems:

NA prch

Data Switching Option • permits direct connection of data devices to PBX via data interfaces and data ports for switching to other devices:

NA

Attendant Console Features

Standard Features • alphanumeric display for console: LED displays provide call information and status • attendant control of trunk group access: restriction of station access to specific trunk groups • attendant direct station selection (DSS) with busy lamp field (BLF): single-button connection of calls to stations, visual display of busy condition of station • attendant lockout: prevents attendant from reentering connected station call • attendant transfer: calls can be transferred by attendant • attendant call waiting: extending call to a busy station sends special tone to user alerting of a waiting call • attendant verification of busy stations: attendant can check on status of a station line • calling number display to attendant: displays either station number calling or type of incoming trunk call • class of service display to attendant: displays station class of service to attendant • direct trunk group selection: attendant can directly access trunk group by depressing specific button on console • hospital and hotel/motel console: special versions of standard console with feature activation buttons for specific functions • interposition calling and transfer: calls between attendants can be arranged, as well as call transfer • night console position: console arranged to handle night service • privacy: automatic splitting of attendant from incoming call while talking with called station • serial call: attendant can establish a series of station calls from a single incoming call, with the original call always returning to the attendant after completing each call • splitting: incoming call on hold while attendant talks with station • straightforward outward completion: attendant dials call for station user, then releases • switched loop operation: calls coming into console handled on one of several loops, which can be reused for next call • through dialing: attendant passes dial tone through to station user, who then dials a call • timed reminder: unanswered calls extended from console return to console for further handling after predetermined time • trunk group busy/warning indicators: LED indicator that tells when all trunks in a group are in use (busy) or when a predetermined number of trunks in a group are busy (warning) • trunk identification by attendant: trunk type in use on a call identified by display • trunk-to-trunk connections: attendant can connect incoming or outgoing trunk call with outgoing trunk call • 2-party hold: attendant can put call on hold that uses 2 facilities for call.

Message Waiting Service Option • remotely lights a lamp on a station to indicate message waiting:

NA prch

Station Features

Standard Features • add-on conference: permits an internal extension to add one inside or outside call to an existing conversation • call hold: places call on hold • call park: places call on hold within 400/1200 for retrieval at another station • call pick-up: stations can answer another phone either by dialing a code and the ringing extension, or by dialing the pick-up code and answering a ringing station in the same pick-up group • call transfer: station can transfer a call to another station • call waiting: station on a call can answer a second call after being alerted to the incoming call by a special tone • direct outward dialing:



Precedent Electronic Telephone

permits station to originate outside call without operator • automatic camp-on: station user trying to reach busy extension dials code and stays on line until busy station frees up • camp-on callback: station user trying to reach busy extension dials code and hangs up; system calls back once busy extension frees up • do not disturb: prevents incoming calls to a station • executive override: designated stations can break into existing conversations or can override the do not disturb feature • forwarding: calls can be diverted to another extension • message reminder: station user can leave a callback message on a Precedent telephone • privacy: prevents call from interruptions such as camp-on or barge-in tones • queuing: permits station to access busy trunk facility by dialing a code and either staying on the line (standby) or hanging up (callback) • station speed calling: users can program their extensions with frequently dialed numbers • system speed calling: users can access additional numbers stored in 400/1200 memory • trunk select: stations can access specific trunk lines.

Application Software

Harris has installed the 400/1200 system in numerous application environments. To date, application packages are available for the following industries: health care; retailers; all commercial areas; military; lodging; service sector; resale communications services; telcos.

HARDWARE

Terms & Support

Terms • Harris 400/1200 models are available for purchase or on a 1-, 2-, 3-, or 5-year lease • lease rates include maintenance • purchase prices include installation • prices will vary based on distributor costs, such as discounts, overhead, maintenance, installation, training, and spare parts.

Support • equipment can be installed by Harris distributors and Telcos • service and maintenance is based on the policies established by individual dealers and distributors.

Overview

Harris Digital 400/1200 systems are all stored program controlled, modular in design, and use the same architecture.

Harris Digital Telephone Systems 400/1200 PBX Series

Models 400-2, 400-4, 1201, 1202, 1203, 1204, 1205 & 1200LX

Basic equipment units of the 400/1200 are the cabinets, attendant console, and auxiliary shelf. System cabinets contain all control components, circuit boards for trunks and stations, and power supplies. The auxiliary shelf contains 12 card slots for plug-in boards handling specific functions, such as power failure transfer and paging access. Although many components, such as trunk and station circuit boards, are common throughout both product lines, a 400 cannot be directly field-upgraded to a 1200. A complete swapout of cabinets and control functions must take place.

The 400 is available in 2 versions, the 400-2 and 400-4. Model 2 uses a single cabinet, and contains 2 telecom equipment shelves and 1 common equipment shelf. It supports up to 32 trunks and 184 stations. Model 4 uses 2 cabinets with 4 telecom equipment shelves and 1 common equipment shelf, and supports up to 55 trunks and 384 stations. The 400-2 can be field upgraded to the 400-4. The 400 runs all the same software as the larger 1200, and is designed to operate in networks based on Harris Digital systems.

The 1200 is available in 5 standard versions and 1 expanded version whose configurations are based on specific engineering requirements. The 1201 is a single-cabinet system that can support either 2 or 3 equipment shelves, 48 to 80 trunks, 216 to 400 stations, and up to 2 consoles. The 1202 is a 2-cabinet system with up to 6 equipment shelves, up to 128 trunks and 800 stations, and up to 4 consoles. Both the 1201 and 1202 are nonredundant. The 1203 is a single-cabinet, nonredundant system with 1 equipment shelf and up to 24 trunks, 96 stations, and 1 console. The 1204 and 1205 have a high level of redundancy built into their design and are targeted at applications where minimal downtime is required. The 1204 is a 2-cabinet system with 6 equipment shelves, and supports up to 120 trunks, 720 stations, and 4 consoles. The 1205 is a single-cabinet system with up to 3 equipment shelves, 56 trunks, 264 stations, and 2 consoles. Rotary dial versions of these systems have slightly higher upper configuration limits, since no DTMF equipment is necessary.

System functions are under control of the system processor, which is found in the common control section of the switch. Additional functions handled by common control include the system control programs, implemented in EPROM; the tone generator, which produces all system tones; system memory, implemented in RAM, for the system database; and a secondary control area for use with specialized functions like automatic route selection (ARS), tandem switching, and station message detail recording (SMDR).

Various plug-in circuit boards are used to build each system, including station cards, trunk cards, attendant console cards, conference cards, and DTMF decoder cards. Each station and trunk card includes a codec (coder-decoder) for converting analog voice signals to digital bit streams and back.

Specialized operations like station message detail recording require additional equipment, such as tape drives, peripheral processors, and hard copy units. The 400/1200 can interface personal computers with the system's administrative programs, making it easy to modify and update numerous switching, class of service, and network routing parameters.

Data communications is supported up to 9600 bps asynchronous, using interface modules to connect data terminals to a 400/1200 data station line. Normal analog circuit boards provide 8 circuits, whereas data circuit boards provide only 4 circuits, which must be considered when planning a system that will support data.

Station equipment supported includes standard 500 and 2500 telephones, plus the Precedent electronic telephone. As a major manufacturer of data and office equipment, there is a large variety of Harris products that can connect to a 400/1200 station line.

Aside from redundant components in the 1204 and 1205, the 400/1200 models offer both on-site and remote maintenance, with a comprehensive roster of diagnostic routines. Memory is nonvolatile; there is no need to reload the system software after a power outage.

Representative System Configurations

D400 Configuration • 1- or 2-cabinet nonredundant system •

Model 2 supports up to 32 trunks/184 stations; 1 console • **Model 4** supports up to 55 trunks/384 stations; 2 consoles • field upgrade from Model 2 to Model 4.

Small System • 20 trunks/160 stations, 1 console; 140 single-line 2500 telephones; 20 electronic telephones; no data communications:

\$105,300 to \$117,900 prch

Large System • 35 trunks/250 stations; 2 consoles; 220 single-line 2500 telephones; 30 electronic telephones; no data communications:

166,730 to 195,230

D1200 Configuration • **D1201**: single-cabinet, nonredundant system; up to 80 trunks, 400 stations, 2 consoles • **D1202**: 2-cabinet, nonredundant system; up to 128 trunks, 800 stations, 4 consoles • **D1203**: single-cabinet, nonredundant system; up to 24 trunks, 96 stations, 1 console • **D1204**: 2-cabinet, redundant system; up to 120 trunks, 720 stations, 4 consoles • **D1205**: single-cabinet, redundant system; up to 56 trunks, 264 stations, 2 consoles • **D1200LX**: multiple-cabinet, redundant system; variable configurations possible for specific applications; supports line sizes up to approximately 3,000 ports • systems field upgradeable.

Small System (D1203) • 12 trunks/80 stations; 1 console; 80 single-line 2500 telephones; no data communications:

51,300 to 62,600

Medium System (D1201) • 30 trunks/270 stations; 1 console; 210 single-line 2500 telephones; 60 electronic telephones; DID; SMDR; ARS; no data communications:

203,500 to 256,300

Large System (D1204) • 65 trunks/580 stations; 2 consoles; redundant; 500 single-line 2500 telephones; 80 electronic telephones; DID; SMDR; ARS; 10 percent data communications:

551,480 to 680,850

Resale System (D1200LX) • used for resale communications carrier; redundant; 650 trunks/30 stations; 3 CRT/console control centers; ARS; SMDR:

513,400 to 574,600

Station Line Units • plug-in board that provides interface between station sets and system bus • standard unit connects 8 stations; 600 ohms loop resistance • long loop line unit supports off premises stations with 1200-ohm loop resistance; 8 circuits per board • hotel/motel unit supports 8 stations with added support for message waiting lamps on telephones • 9600-bps unit used for data communications; up to 9600 bps supported; 4 circuits per board:

Standard Line Unit:

1,270 to 1,350

Long Loop Unit:

1,380 to 1,440

Hotel/Motel Unit:

1,300 to 1,400

9600-bps Unit:

1,850 to 1,975

Trunk Units • plug-in board that provides interface between trunk lines and system bus • 8 circuits per board • 4 types available: loop start, ground start, DID, and E&M (tie lines) • ground start unit required for data transmission; can be strapped for 600 or 900 ohms impedance • loop start unit can be strapped for 600 or 900 ohms impedance • DID unit supports instant/wink/delay start, 600 or 900 ohms impedance; requires 2 slots in 1200, 1 slot in 400 • E&M unit used for tie lines; 2-wire or 4-wire; 600 or 900 ohms impedance:

Loop Start Unit:

2,550 to 2,940

PRCH: purchase price; price ranges are approximate and include installation and first year's maintenance. Prices effective as of January 1985.

Harris Digital Telephone Systems 400/1200 PBX Series

Models 400-2, 400-4, 1201, 1202, 1203, 1204, 1205 & 1200LX

Ground Start Unit:	2,640 to 3,165
DID Unit:	3,550 to 4,100
E&M Unit:	4,100 to 4,500
Attendant Line Unit • connects console to 400/1200:	780 to 930
Flexible Conference Unit • used for establishing station or attendant conference calls; available in 8-port or 16-port versions:	890 to 1,300
DTMF Receiver • converts tone signals to binary format for processing by common control • 4 circuits per board:	1,100 to 1,350
Auxiliary Shelf Unit • provides 12 plug-in board slots for ancillary functions • rack or wall mounting:	785 to 850
Power Supply • converts AC commercial service to 48V DC • versions available for each 400/1200 model, depending on number of cabinets and shelves:	980 to 1,300
Battery Backup • provides auxiliary DC power for 400/1200:	1,100 to 2,500
 <input type="checkbox"/> Station Equipment—Voice/Data	
Attendant Console • services incoming calls for completion to desired stations • place outgoing calls • provides information concerning call status • 8 switched loops for call processing • displays station calling, class of service, time of day, major/minor alarms • requires 25-pair cabling:	\$2,950 to \$3,200 prch
Precedent • electronic feature telephone • requires 2-pair cabling • 36 feature buttons • 16-character display • handsfree operation • speed dial storage capability of 38 numbers • internal 1K-byte RAM:	495 to 575

Auxiliary Data Interface Unit • connects data terminals to 400/1200 • requires 9600-bps station circuit boards in 400/1200 • supports RS-232C interface:

350 to 475

Peripherals

Service Teleprinter • instructs system computer when moves, changes, ARS route modifications are made • connected to cabinet in local mode • used for running system diagnostics:

\$1,450 to \$1,700 prch

Data Cartridge Unit • used for SMDR record storage • 4-track, 1600 bpi • maximum 40,000 call records:

8,500 to 11,000

Magnetic Tape System • 6800 bpi, 9-track • reel-to-reel unit • 7-inch reel stores up to 120,000 call records; 8.5-inch reel stores up to 240,000 call records:

18,500 to 24,000

Subsystems

D400/1200 can interface to industry-standard ACD, messaging, voice mail, SMDR, hotel/motel management systems.

■ SYSTEM MAINTENANCE & DIAGNOSTICS

System Reliability • redundant CPUs • error-correcting memory • redundant critical electronics • reserve memory power • backup battery • automatic program load.

System Diagnostics • system continuously diagnoses operation • major/minor alarm indications at attendant console • audit trail generated on system service teleprinter • remote diagnostics by Harris distributor service centers.

System Maintenance • normally performed by Harris authorized distributor • larger systems typically include inventory of line cards, trunk cards, phones, cable, test equipment, etc for customer or vendor maintenance.

System Management • users can change such functions as pick-up groups and call routing perform station relocations • system CRT or teleprinter used.

• END

Hitachi DX Family Models DX & EDX

■ PROFILE

Function • stored program computerized digital exchange (DX) for switching voice and data.

Applications Supported • hotel/motel • education • manufacturing • retail • government.

System Parameters • switching technology: digital time-space-time (TST) switching using PCM • architecture: centralized processor that can be duplicated, tied to serial system bus (highway) • common control: stored program; floppy disk as auxiliary memory • transmission: 4-wire internal, 2-wire external; 2,048M bps per highway; EDX—4 highways maximum, DX—16 highways maximum • wiring plan: standard stations—1 pair; electronic stations—2 pair • data switching capability: on-premise full-duplex.

Traffic Capacity • EDX—12 CCS per line at 240 lines; DX—10 CCS per line at 1,024 lines; 50 percent internal/external calling traffic ratio • grade of service: P.01 • simultaneous conversations EDX—128; DX 30/40—256; nonblocking arrangement available.

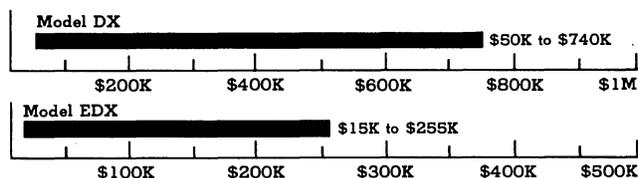
Trunks/Stations/Consoles • EDX 2.0 hotel/motel package: 64 trunks/240 stations or 120 multifunction phones; 2 attendant consoles; 4 video display units • EDX 2.1 business package: 76 trunks/400 stations or 200 multifunction phones; 2 attendant consoles; 10 video display units • DX 3.0: 256 trunks/1,274 stations, up to 300 multifunction phones; 8 attendant consoles; 12 video display units • trunks supported: central office—1-way (in/out), 2-way; DID; FX; tie lines; OCC attended and unattended operation.

Voice Equipment • vendor supplied: analog and digital phones; attendant console • nonvendor equipment supported: all rotary (500-type) and touch-tone (2500-type) telephones; read-only and KSR serial printers; recorded announcement systems; night bells; paging systems; electronic cash register; property management system (PMS), personal computers • electronic feature telephones; Hitachi Inteliset.

Data Equipment • vendor-supplied: personal communication terminal • nonvendor equipment supported: terminals that support ASCII serial interface • data rates: asynchronous or synchronous 50 to 9.6K bps; 300-baud serial data interface for cash register—compatible with IHS, HIS, EECO, Quantel, PMS interfaces—from 300 to 9.6K bps; operating modes—character, half-duplex, asynchronous, 7-bit ASCII • modems: all GDC103 or equivalent; 50 to 9600 bps synchronous or asynchronous; serial interface • interfaces supported: RS-232C, RS-449 printers; service printer • data storage: floppy diskette, hard disk subsystems • data terminals: ASCII.

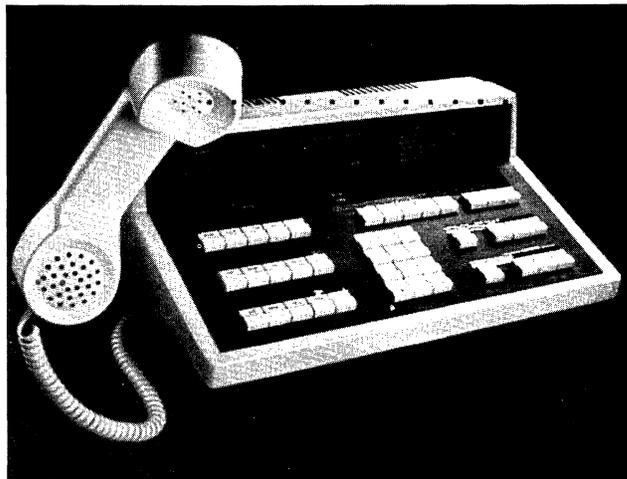
PURCHASE PRICE RANGE

hardware & software



HITACHI DX/EDX PURCHASE PRICING bar graphs cover price ranges between "small" and "large" configurations; installation and first year's maintenance included • EDX small configuration consists of 20 stations/5 trunks; large consists of 190 stations/30 trunks • DX small configuration consists of 80 stations/18 trunks; large consists of 850 stations/160 trunks • primary configuration is for hotel/motel systems.

Hitachi DX Attendant Console



Subsystem Support • call detail recording systems • electronic directory system • Welcomm: hotel/motel management system • interfaces to centralized management and property management systems.

Communication/Networking • abbreviated dialing • on-network dialing • dialed digit translation • route optimization • tandem switching • transmission rates: 9.6K-bps synchronous or asynchronous.

First Delivery • September 1982.

Systems Delivered • over 200 nationwide, all models.

Installation Interval • 6 to 8 weeks ARO (includes engineering time at Hitachi).

Comparable Systems • EDX: Rolm VSCBX; American Telecom Focus; AT&T Dimension 400 and System 75; Ericsson Prodigy; Executive Eclipse, GTE Omni S1; Harris/Digital D1200; IPC Technologies 160 DPX; ITT 3100; Mitel SX-200; NEC NEAX 2400; Northern Telecom SL-1S; Siemens Saturn II; Solid State Systems D-Tel; TIE/Communications Data Star • DX 30/40: American Telecom Focus; Anderson Jacobson IOX, AT&T Systems 75 and 85; CXC Rose; Ditrans 580 DSS; Ericsson MD 110, Executone Summit; GTE Omni SIII; Harris/Digital D1200; InteCom IBX; Mitel SX-2000; NEC NEAX 2400; Northern Telecom SL-1; Siemens Saturn III; TIE/Communications Mercury; United Technologies/Lexar UTX; Ztel PNX.

Environmental Specifications • temperature: 50 degrees to 104 degrees Fahrenheit • humidity: 40 to 80 percent relative humidity • power: 48 VDC +10 percent or -5 percent; 15 amperes at 200 lines, peripherals powered by 110 VAC at 60 Hz • air conditioning: none required, convection cooled • dimensions: 29x24x80 inches (WxDxH) per cabinet • weight: 330 to 616 pounds • floorloading: 80 to 100 pounds per square foot • minimum equipment room dimensions: 8x10x8 feet (WxDxH).

Vendor • Hitachi America Limited, Telecommunications Research & Sales Division; 2990 Gateway Drive, Suite 1000, Norcross/Atlanta, GA 30071 • 404-446-8820.

Distribution • nationwide and worldwide through Hitachi direct

Hitachi DX Family Models DX & EDX

sales offices and independent dealers and distributors • major U.S. distributors: Hitachi America; RCA Service Co, Cherry Hill, NJ; and Universal Communications Systems, Roanoke, VA • distributed worldwide through Hitachi International Sales Divisions, Japan.

Service/Support Training • service, support, and user training by Hitachi or distributor; technical training by Hitachi only • installation by distributor or subcontractors • warranty varies with distributors; usually 1 year • local and remote maintenance.

■ ANALYSIS

The predecessor of the DX family of systems was the Hitachi EX-10, a leader in the hotel/motel communications industry. The analog EX-10 supported both business and hotel/motel applications packages, utilizing standard ASCII terminals and printers with a magnetic tape cartridge used to store and control the operating program.

In 1982, Hitachi offered its first digital PABX for sale in North America, which replaced the earlier EX-10 in the hotel/motel market. Early in 1984, the DX 30/40 business package was introduced, followed by the EDX models for smaller applications.

The flexible configuration of the DX family covers a broad application range. The EDX covers small- to medium-size systems, ranging from 100 to 400 stations. The DX covers medium to large sizes ranging from 200 to 1,200 lines. The EDX and DX share the same architecture and most features through the latest software release, 2.1. Duplicate central control is optional in the DX, but not available in the EDX. When the DX was introduced with Release 1 software, it contained the basics for a strong digital business switch, although its primary strength was guest-oriented communications with little or no data or administrative capabilities. Internal I/O data transmission was 9600 bps, and standard loop or ground start C.O. trunks were supported for external operation. The strong point for the early DX was its self-contained guest call charging feature. This feature, together with least cost routing (LCR) and a front desk video terminal, relieved hotel owners from purchasing separate call accounting systems and most of the manual posting of telephone charges on guest bills at checkout.

The first prototype business package was developed for Nissan Motors in Tennessee, and now includes DID trunks, E&M tie trunks, and in the near future, data networking interfaces and various data and packet-switching interfaces.

The DX series uses Super PLH (Programming Language/Hitachi) software that consists of the operating system program and 6 subsystem programs that control all PBX functions. Subsystem programs include the peripheral call processing program, central call processing program, fault processing program, visual display (VDU) program, and applications exchange program for special applications such as call reminder and message waiting.

Similarly, the hardware structure is divided into 5 categories that consist of the control processor, communication control section, and the switching network, which are all connected to the system data bus. The other sides of the network, the interface section and peripheral section, are connected to the Highway bus.

The control processor consists of the CPU, which uses the Hitachi 16-bit microprocessor (HD 68000) running on an 8-MHz clock. The HD 68000 microprocessor provides a 16M-byte direct memory addressing range, 32-bit data and addressing registers, 56-instruction set, 7-level interrupt capabilities, and various error traps. The second part of the control processor is the memory package. 256K words of memory are contained in 1 module using Hitachi 64K-bit memory elements (HM 4864). One word is 22 bits in length (2 8-bit bytes and a 6-bit error correction code). Communications control consists of the floppy disk controller, I/O controller, RS-232C, current-loop selector, remote maintenance selector, and inter-bus channel (IBCH). The switching network contains the signal receiver and distributor, which interfaces the switching network with the central processor. A module interface control package is provided for every speech path module in the system. The interface equipment consists of all lines, receivers, trunks, and supervisory circuit boards that interface directly with the highway and/or

peripherals such as telephones and video displays.

DX and EDX cabinet configurations are developed from a customer database sent into Hitachi. There is no set configuration package that can be purchased. This procedure adds to the total flexibility of the EDX/DX system design in which each system is custom made, including such features as call charging and ICR.

Data capabilities currently include a 300-baud electronic cash register interface, a 9600-baud PMS interface, house computer interface, a 9600-baud video display terminal, a 300-baud maintenance printer and 2 600-baud report printers. A data interface circuit is being developed and is expected in Release 2.3 software. This data interface will permit transfer of data between 2 terminals at 64K bps for voice and data with a data terminal input of 9600-baud synchronous or asynchronous. Other items in the works include off-net calling, tandem tie trunk connections, enhanced Inteliset multifunction phone that supports multiple lines, and a voice message system interface. Since the DX/EDX's primary application is hotel/motel, it is appropriate to examine the similarities and differences between Hitachi and its major H/M competitors.

NEC NEAX Family—The major difference between the DX 30/40 and the NEAX-12A and 22VS is that NEAX provides guest call charging via peripheral call accounting equipment based on the NEC Astra minicomputer. Guest call charging on the DX is part of the Welcomm software package. NEAX has "split access", which provides separate guest and administrative trunk groups for the same access digit dialed. This feature suggests the need for additional trunking to accommodate outgoing calls (in multiple groups) rather than sharing a single group of trunks that helps keep costs down.

ROLM CBX—At first glance, Rolm appears to have a comprehensive H/M package according to its advertising. Closer examination turns up limitations (i.e., auto-wakeup and guest call charging are extra-cost options). Room status is not available. DX-30/40 has auto-wakeup, guest call charging, and room status included in the basic software. Property management interface compatibility with HIS, IHS, EECO, and Qantel is available in Release 2.

Northern Telecom SL-1—Guest call charging is provided with peripheral gear such as the Sykes Datatronics InnVoice or Datapoint Cash Systems. Welcomm has guest call charging in the standard software package. Northern Telecom's SL-1 has room occupancy status, but does not have comparable information provided by DX regarding housekeeping status (i.e., clean, dirty, ready for inspection, maid in room, maintenance required, etc). Using the SL-1 to call another room, a guest must dial an access code and the desired room number. DX eliminates the access code, thus allowing the guest to simply dial the desired room number.

American Telecom Focus—If a user elects to purchase Focus software package C4, it is possible to connect the Focus guest call charging feature, Call Collector. Call Collector can support 350 guest rooms and 150 administration stations. The Focus hotel/motel system is expandable to 1,200 lines. For guest call charging above 350 guest lines, another vendor's peripheral call accounting unit must be used. The standard guest call charging feature on the DX can support an entire system "maxed out" at 1,024 lines. Focus does not have a room status feature. With DX, the hotel manager can monitor both room vacancy and cleanliness.

Siemens SD-232—To obtain guest call charging with the SD-232, another vendor's call accounting system (i.e., Summa Four) must be used. Both EDX and DX have guest call charging standard. The only form of room status SD-232 permits is if the customer elects to use message registration and has the EMR (electronic message registration) console. EDX offers both room status and maid status features. Hitachi also offers the Inteliset (proprietary electronic feature set), PMS interface, and MICROS electronic cash register interface.

Hitachi's greatest product successes over the years have been in the lodging industry, and the extensive cadre of features in Welcomm is testament to that expertise. Hitachi first appeared in the U.S. in the late 1960s and early 1970s with a series of crossbar PBX systems that were used extensively by interconnect

Hitachi DX Family Models DX & EDX

companies. The products earned a reputation for reliability, which is very important in the lodging industry. The company is certainly not on the leading edge of technology, as they only recently introduced a digital PBX system and have yet to introduce integrated voice/data telephones, but in their primary market, Hitachi is indeed one of the major players.

□ Strengths

Hitachi DX and EDX systems are constantly being upgraded to fit today's business environment. Most hotel/motel applications can be easily supported with Welcomm. This means the hotel/motel only has to buy one system to take care of most lodging requirements. With the imminent introduction of data features, both the DX and EDX will be expanding their presence in the business marketplace. Hitachi totally supports its products and any problem that occurs will be rectified, no matter what level of support is required from Hitachi.

□ Limitations

One limitation of the EDX/DX is that some software changes cannot be accomplished on site. This sometimes means a whole new database must be generated by Hitachi America. Management reports in the business package consist of only a report by extension or a chronological report. Even though call records are stored, department and other management reports are not available at this time. The multifunction phone does not yet support multiline appearances. Key telephone equipment must be connected to the PBX if multiple-line appearances on any phone are desired. The DX/EDX does not yet have extensive data communications capabilities which will limit its appeal to the business market considerably.

■ SOFTWARE

□ Terms & Support

Terms • all call processing software is bundled into the system price with the exception of call charging and least cost routing options.

Support • EDX/DX software is supported by Hitachi and its associated dealers.

□ Software Overview

EDX/DX software is used to control operations, conduct all self-test functions, and provide features. The software package consists of the operating system, central call processing program, peripheral call processing program, system administration program, fault processing program, visual display unit program, and exchange applications processing program.

□ Features Overview

All features are a function of various software releases. Release 2.0 provides hotel/motel features including several levels of guest restrictions and call charging. Release 2.1 offers all hotel/motel features plus a full set of business features with electronic directory, video displays, and call storage. Releases 2.2 and 2.3 will incorporate data switching and multiline electronic phones.

□ System Features

General System Features

Standard Features • auxiliary equipment access: used for connecting terminal CRT displays, printers, and other devices to any of 16 RS-232C current-loop interfaces • paging access: interface to customer-provided paging system • remote maintenance: maintenance printer can be remotely located via a modem • rotary dial service: supports rotary dial phones • power failure transfer connects specific stations to trunks in power outage • direct-in lines: allows separate calls on CO lines to ring directly to predetermined stations • direct inward dialing (DID): permits incoming trunk calls completed to station, bypassing attendant • distinctive ringing: different station ringing patterns to distinguish CO calls, internal calls, or feature function • DTMF dialing: supports tone dial telephone sets • DTMF to DP conversion: converts DTMF tones to dial pulses when call is made

Hitachi Video Display Unit



to a rotary dial trunk group • duplicated common control: 2nd CPU for redundancy • immediate ringing: ringing signal sent immediately to called party when dialing completed • intercept tone: if originating call cannot be completed by DX, calling party will receive intercept tone or be connected to attendant • mixed dialing: allows standard DTMF station proprietary Inteliset, or rotary dial stations to operate on DX • multiple trunk group: allows more than one group of trunks to be accessed for outgoing calls • night service: allows stations to answer calls when attendant console is switched to night mode • recall dial tone: signal heard when switchhook is depressed on a phone to invoke system features • through dialing: allows station user to dial outside number after attendant connects trunk to station • tie trunk access: allows connections to another PBX via dedicated circuits • automatic program load: system program automatically booted during power up • least-cost routing: automatically selects most inexpensive trunk group for outgoing calls.

Restriction Features

Standard Features • class of service: access to local/toll/international calling can be allowed or restricted on a per-station basis; 8 classes provided in system • internal room-to-room blocking: guest stations cannot call any other rooms but can make outside calls.

Call Accounting Features

Standard Features • station message detail recording/call charging: system captures outgoing call data, calculates costs for each call • call storage (only on Release 2.1 business package): up to 10,000 call records can be stored • call reports: detailed summaries of calling activities • traffic measurement: provides trunk group, trunk usage, CCS, busy time, and answer time statistics.

Data Features (Available With Release 2.3)

Standard Features • data transmission interface RS-232C interface; up to 9600-bps data rates; synchronous or asynchronous • data privacy: prevents access or signaling to data station when in transmit mode.

Hitachi DX Family Models DX & EDX

Hitachi Inteliset



Call Routing Features

Standard Features • DDD overflow warning signal: alerts user that system is about to use a high-cost facility with special tone • outgoing trunk queuing: when all outgoing trunks busy, station can activate queuing call back; station signaled back when facility available • least cost routing: automatically selects most economical available facility for outgoing calls • control of trunk access: outside calls from stations can be restricted by either the CRT console or attendant console • long trunk call warning: alerts attendant when trunk call has continued beyond a preset time period.

Network Features

Standard Features • digit translation: provides digit translation on network calls • tandem network connections: supports access codes, routing of tandem networks; tandem tie routing details programmed in LCR.

Attendant Console Features

Standard Features • attendant override/busy: allows attendant to override • busy station when extending call • attendant override/do not disturb: allows attendant to override a station do not disturb mode when extending call • attendant override/line lockout: allows attendant to override a station in lockout condition • automatic recall: calls that have been camped-on, extended but not answered, and placed on hold will ring back to attendant after predetermined time • call queuing: allows attendant to answer calls in order of arrival • call supervision: allows attendant to supervise status of a call until call ends • called number status: lamp display indicates when attendant attempts but is blocked when extending or originating a call • camp-on: allows attendant to camp-on a call to a busy station • console test: allows attendant to initiate test of console lamps and keys • number check: allows attendant to display circuit number of currently connected trunk • splitting: allows attendant to talk privately with a trunk or station extension, alternating between both • switched-loop operation: calls to console connected through dedicated-loop circuit, which frees up after each connection completed • time of day setting: allows attendant to set time of day • transfer: after answering an

attendant recall, this allows attendant to transfer incoming or outgoing calls.

Station Features

Standard Features • attendant recall: allows station to call attendant while on outside call • call coverage: forwards calls to alternate stations; programmed through maintenance/administration terminal • call hold: allows a station to place a call on hold • call pickup (directed): allows station to dial access code and extension number of ringing station to answer the call at that phone • call pickup (group): allows station to dial pickup code and answer call ringing within specific group of phones • call waiting: called party hears tone to alert of a camped-on call • consultation hold/add-on/transfer: allows station user while on inside or outside call to dial another station for the purpose of conferencing or transfer • direct outward dialing (DOD): allows station user to directly dial outside call bypassing attendant • do not disturb: denies all incoming calls to station • flexible station numbering: allows stations to be assigned numbers in accordance with customized numbering plan • hotline: allows station to be automatically connected to predetermined second station upon going off hook • manual originating station: specific stations connected to attendant when station goes off hook • message waiting: station users alerted by message waiting lamp on telephone when messages are being held by attendant • single digit service: allows station user to call service departments, such as plant security, by dialing single or double digits • speed calling (group): allows group of stations to speed dial number that is common to that group of phones • speed calling (system): speed call list provided in DX for all users.

Enhanced Station Features (Inteliset) • display: allows station user on a call to identify source of several incoming calls • hunt group (least-busy Inteliset): call to a hunt group including Intelisets will terminate at least busy set.

Application Software

Hitachi and its distributors have installed the DX system in various application environments, including health care, retail, hotel/motel, and manufacturing.

HARDWARE

Terms & Support

Terms • DX and EDX systems are available for direct sale and 3-, 5-, 7-, or 10-year lease-purchase options • maintenance availability depends on distributor • purchase prices include installation.

Support • equipment installed by distributors • service and maintenance based on policies established by individual distributors.

Overview

The Hitachi DX family includes 2 specific product sizes and 2 application software packages. The original DX switch was developed to replace the analog EX-10. The current DX ranges in size from a 1-cabinet 256-station/80-trunk system to a 3-cabinet system with 1,024 stations/200 trunks, depending on the configuration. The DX was not competitive at lower line sizes, so the single-cabinet EDX was introduced to the marketplace. The EDX can be equipped with up to 240 stations and 64 trunks and uses many of the DX components. The DX and EDX have concentrated initially on the hotel/motel market, but are now competing more aggressively in the business applications market.

Commonality of components is an important part of the DX/EDX. Circuit boards for stations (8 circuits per board) and trunks (4 circuits per board) can be used in both products. Upgrading from EDX to DX requires changing the cabinet and central control, but line/trunk cards can be reused. Up to 3.5M bytes of memory can be installed in the DX, and 64K RAM components manufactured by Hitachi are used. Standard memory backup is a floppy diskette drive, with a 10M-byte hard disk as an option for larger configurations.

Hitachi DX Family Models DX & EDX

□ Representative System Configurations

EDX Configuration • single-cabinet nonredundant system.

Small System (Hotel/Motel) • 50 stations/15 trunks; 1 console:
\$42,600 to \$48,500 prch

Small System (Business) • 50 stations/9 trunks; 1 console:
47,500 to 52,400

Large System (Hotel/Motel) • 175 stations/36 trunks; 1 console:
137,500 to 156,700

Large System (Business) • 175 stations/20 trunks; 1 console:
144,300 to 161,800

DX Configuration • 1 to 3 cabinets • redundant system • up to 8 attendant consoles • up to 12 communications consoles.

Small System (Hotel/Motel) • 180 stations/38 trunks; 1 console; 1 communications console:
159,500 to 179,300

Small System (Business) • 180 stations/20 trunks; 1 console:
163,600 to 183,400

Large System (Hotel/Motel) • 700 stations/140 trunks; 2 consoles; 3 communications consoles:
610,000 to 684,600

Large System (Business) • 700 stations/85 trunks; 2 consoles; 2 communications consoles:
655,600 to 732,400

Station Line Circuit Board • 8 circuits per board:
750 to 900

CO Trunk Line Circuit Board • 4 circuits per board; local CO, FX, WATS, OCC supported:
950 to 1,350

Tie Trunk Circuit Board • 4 circuits per board; 2-wire or 4-wire E&M circuits:
1,200 to 1,750

Direct Inward Dialing (DID) Circuit Board • 4 circuits per board:
1,600 to 2,200

Paging Trunk Circuit Board • 4 circuits per board:
900 to 1,200

□ Station Equipment—Voice/Data

Attendant Console • primary function to service incoming calls

PRCH: purchase price; price ranges are approximate and include installation. Prices effective as of December 1984.

and connect to desired internal station • place outgoing calls • provides information concerning call status • desktop unit • digital display • busy lamp field:
\$3,000 to \$3,200 prch

Inteliset • electronic feature telephone • single-line or multiline capabilities • single-button feature access • 16-character LCD display • 2-pair wiring:
300 to 450

Station Number Display • displays calling station number • includes control card:
900 to 1,100

Video Display Unit (VDU) • functions as front desk console with Welcomm package • CRT with detachable alphanumeric keyboard • screen 80 characters x 25 lines; green phosphor; blinking • ASCII keyboard with 10 program function keys; numeric pad; cursor control:
2,600 to 2,800

□ Data Communications Equipment

Simultaneous voice and data communications support not yet available • using modems, system can handle data speeds up to 9600-bps synchronous and asynchronous.

□ Peripherals

Report Printer • used for generating reports from PBX, either for system functions or Welcomm reports:
\$500 to \$850 prch

Automatic Wake-Up • calls stations at designated time; plays recorded message:
1,300 to 1,500

■ SYSTEM MAINTENANCE & DIAGNOSTICS

System Reliability • redundant CPUs • error-correcting memory • redundant critical electronics • reserve memory power • backup battery • automatic program load.

System Diagnostics • system continuously diagnoses operation • major/minor alarm indications at attendant console • audit trail generated on system service teleprinter • remote diagnostics by distributor service centers.

System Maintenance • normally performed by authorized distributor • larger systems typically include inventory of line cards, trunk cards, phones, cable, test equipment, etc, for customer or vendor maintenance.

System Management • users can change such functions as pick-up groups and call routing, perform station relocations • system CRT or teleprinter used.

• END

InteCom Integrated Business Exchange (IBX)

Models IBX S/10, IBX S/40 & IBX S/80

■ PROFILE

Function • stored program computerized branch exchange (PBX) systems for switching voice and data • digital switching technology • TDM/PCM • 2-pair wiring for interfacing standard keysets • up to 8,192 nonblocked connections • redundancy on all models.

Communications/Networks • route optimization; Foreign Exchange (FX); WATS access; DDD; transmission rates to 9600 bps; AUTOVON; satellite communications; voice-band data transmission; centralized attendant service; automatic call distribution; 2- or 4-wire transmission; X.25 network; T1 facility; tandem network; Electronic Switched Network (ESN); 2-pair station wiring; 57.6K-bps internal synchronous speed; 19.2K-bps internal asynchronous speed; LANmark Local Area Network; Ethernet connection.

Trunks/Stations/Consoles • IBX S/10: from 250 to 2,048 trunks; from 250 to 3000 lines; up to 16 attendant consoles • IBX S/40: from 100 to 4,000 trunks; up to 6,000 lines; up to 16 attendant consoles • IBX S/80: up to 8,192 trunks; from 256 to 1,200 lines; up to 250 attendant consoles.

Voice Equipment • Vendor Supplied: Standard Telephone Equipment (STE), proprietary 2500-type Touch-Tone telephone; Integrated Terminal Equipment (ITE) 12, 12-button, touch-pad feature telephone; ITE 15D, 15-button, touch-pad feature telephone with a 24-character alphanumeric display; ITE 21, 21-button, touch-pad feature telephone; ITE 24D, 24-button, touch-pad feature telephone with a 24-character alphanumeric display; ITE 30, 30-button, touch-pad feature telephone; Attendant Console (ATDC), consists of 3 units, Display Field, Keyboard, CRT Display • **Equipment Supported;** all 2500-type Touch-Tone telephones.

Data Equipment • Vendor Supplied: Data Interface Unit (DIU), communication interface connected by 2-pair wire to IBX ITE line card, conforms to RS-232C specifications and is suitable for connecting DTE Devices; Data Option Board (DOB), interfaces EIA RS-232C or RS-449 data devices, supports both voice and data communication; Modem Pooling, eliminates the need for dedicated modems, consists of originate-only modems, terminate-only modems, or dual-mode as well as dual-speed modems; InteNet Packet Controllers (IPCs), Format and protocol conversion performed by microprocessor-controlled IPC, can be accessed by any port; present family consists of Machine Keyboard Origination (MKO IPC), 3270 IPC, X.25 IPC, and Word



Processing IPC; LANmark Packet Switching, allows local network or Ethernet communication network access; Computer to PBX Interface (CPI), allows minicomputer and mainframe access to PBX operation • **Equipment Supported:** teleprinter terminals; CRT terminals; microcomputers; minicomputers; line printers; magnetic tape; disks.

Applications Supported • office automation; word processing; dictation; facsimile • hotel/motel • health care • retail • general business • banking • service sector.

First Delivery • IBX S/10: 1984 • IBX S/40: 1981 • IBX S/80: 1983.

Systems Delivered • to date, InteCom has installed over 50 systems.

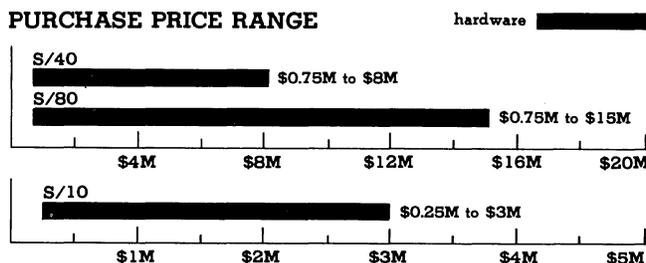
Comparable Systems • competition for the IBX S10: AT&T Dimension 400, 600, and System 75 and 85; Mitel SX-200; ROLM CBX; ITT TD-500; Anaconda-Ericsson Prodigy • competition for the IBX S40: AT&T Dimension 600 and System 85; Mitel SX-2000; ROLM CBX; Siemens Saturn; Ericsson MD 110; NEC Neax-22 • competition for the IBX S80: AT&T System 85; Mitel SX-2000; ROLM CBX; Siemens Saturn III; United Technologies UTX; Northern Telecom SL-1XN.

Environmental Specifications • cabinets for all models of the IBX family are the same physical dimensions: 58"W x 31"D x 75"H, 450- to 600-pound cabinet weight; power requirements, single-phase, 120V 3-wire 60-Hz power; environment, relative humidity: 20 to 80 percent, ambient temperature: 50 to 85 degrees Fahrenheit.

Vendor • InteCom Inc; 601 InteCom Drive, Allen, TX 75002 • 214-422-5450.

Distribution • nationwide and worldwide through direct sales offices, distributors, and selected Bell Regional Holding Companies (Atlantic Bell, Southern Bell included) • in Europe through Italtel (Italian Post, Telephone & Telegraph).

PURCHASE PRICE RANGE



INTECOM IBX SYSTEMS S/10, S/40 & S/80 PURCHASE PRICING bar graph covers price ranges between small and large configurations for hardware products • small S/10 configuration ranges from 256 to 3,000 ports • medium S/40 configuration ranges from 100 to 6,000 ports • large S/80 configuration ranges from 100 to 1,000 ports • ports support any combination of stations and trunks • maintenance and installation prices are not included.

InteCom Integrated Business Exchange (IBX)

Models IBX S/10, IBX S/40 & IBX S/80

■ ANALYSIS

InteCom's family of digital PBX systems encompass telephone switching systems for predominantly medium- to large-scale applications. These systems support the majority of 2500-type telephones (except rotary dialed stations). Models consist of a basic dual-cabinet configuration which is upgradeable to a multicabinet system based on the customer's needs. Station capacity ranges from 250 to 12,000 devices.

Prior to the announcement of the IBX S/10 in November 1983, InteCom did not produce a PBX system for the medium-sized marketplace. This gap was filled by the 250- to 3,000-line S/10. It is fully compatible with the other 2 models and uses all the system enhancements along with the networking capabilities of its big brothers.

The S/10 is scheduled for availability in the second quarter of 1984. It will be marketed through its own sales force and through General Electric Supply Company, a large distributor. InteCom's LANmark software will be available with the switch which currently supports Ethernet with 3270 compatibility expected next year. Also available with the S/10 is InteCom's InteMail voice messaging capability.

The S/10 is controlled by a 32-bit Perkin-Elmer PE3205 minicomputer. It can directly access up to 4M bytes of real memory and has a disk capacity of 50M bytes. This controller is the same unit that is used by the larger S/40 and S/80.

The IBX S/40 has been the work horse of the InteCom family since 1981. This PBX was InteCom's first and it was designed with both data and voice in mind. It was InteCom that started the "3rd Generation" concept with its nonblocking, data and voice technology. The S/40 was not designed as a voice system with data add-ons; it was conceived as a total data processing system with telecommunication features.

The S/40 is a totally redundant system (similar to the S/10 and S/80). It not only duplicates the essential electronics, but the CPU, memory, and I/O ports are also duplicated if the user so desires. The S/40 has auxiliary storage capacity up to 83M bytes to support the system. This storage is used for recordkeeping in support of the 6,000-line capacity of the S/40.

The largest member of the family is the IBX S/80. It is developed around the same architecture as its other family members. The only difference is that the capacity is increased to 12,000 lines and over 8,000 ports.

It has the capability of controlling up to 256 attendant consoles. There are 3 different models of the S/80: S/80, S/80T Shared Tenant Application, and M80 Tandem Switching Exchange. The S/80T provides the ability to lease voice and data communication service to businesses in a multitenant office facility. It can interconnect with commercially available network offerings as well as advanced digital transmission facilities. Distributed switching using fiber-optic cable allows the S/80T to effectively serve high-rise buildings as well as multibuilding complexes. It can be distributed to serve building sites in a 70-square mile area surrounding the main switch. A Remote Switching Partition (RSP) is used when the central and remote sites are unable to be connected via distributed switching. The RSP is controlled by the main switch which allows central control of system databases and added system flexibility up to a 27,000-foot radius. The M/80 is a switching system designed for common carrier applications. It provides the growth and reliability required in applications where revenue depends on a carrier's ability to provide sustained service to an ever increasing market. It is a 4-wire digital switch system with a nonblocking switch matrix. The capacity ranges from 100 to 7,936 ports in a multicabinet configuration of 5 through 24 cabinets.

The models consist of single modules which are used to upgrade cabinet configurations packaged according to customer requirements. These modules are intelligent and contain their own microprocessor control to facilitate distributed processing. The microprocessor chosen for the control of these modules is the Zilog Z80. This popular 8-bit microprocessor is second- and third-sourced by multiple vendors.

There is considerable controversy in the industry on the subject of

blocking versus nonblocking systems. A blocking system is one in which a group of stations are assigned a number of trunks for incoming and outgoing calls. With this arrangement, trunks can become fully utilized under heavy traffic conditions, and a busy signal will be heard. A nonblocking system is one in which every station has a trunk assigned to it, therefore, a busy condition can never occur. Obviously, a nonblocking system is preferred, but is more expensive and can only be justified by user requirements.

The InteCom family can be totally nonblocking depending on its configuration. This is only true when the number of stations equals the number of trunks because the total number of ports is equal to the sum of the number of trunks and lines. If the number of stations exceeds the number of trunks, the system will be essentially nonblocked and contention and a busy signal can occur.

InteCom system switching is performed by Pulse Code Modulation (PCM) time division multiplexing (TDM) technologies. The PBX interfaces with outside trunks, tie trunks, and station equipment. Every call and feature is supervised and controlled by the computer. All communication within the PBX systems take place over the I/O Bus. The path is between the computer to the remainder of the PBX, back to the computer. When redundant computers are used, one computer system will monitor the other and automatically assume control of the PBX when the primary computer malfunctions. Ongoing operation will continue without interruption.

The time division multiplexing control group is an interface between the computer and the audio cards in the PBX. The TDM eliminates the need for large numbers of hardwired connections because a single voice connection is time sliced into thousands of time periods. The sampling speed is so high, a constant voice pattern is heard by the user.

The memory and memory control is comprised of circuit packs which consist of program memory (ROM) and variable data memory (RAM). The memory consists of 17 bits (16 bits for data and 1 bit for parity). When the PBX is configured for the customer, the configuration tape is read into the RAM for operation under control of the ROM.

All InteCom stations and attached devices use either 2- or 4-pair wires. The number of wires used depends on the unique device. 2 wires are used for analog, 2 wires are used for power, and 4 wires are used for digital. The number of wires used for each device is dependent on the design of the subsystem.

InteCom was founded in 1978 by former employees of the PBX manufacturer, Danray, which is now part of Northern Telecom. In 1979, Exxon bought control of the company, and in 1982, InteCom went public and Exxon reduced its holdings from 50.8 to 41.2 percent.

In mid-April 1984, InteCom and Wang Laboratories Inc announced a joint venture. The companies agreed in principle that Wang would spend \$89 million in the next year to purchase 5 million shares, totaling 15 percent of outstanding stock in InteCom. Wang is already a well established leader in the office automation and data processing industry. Both companies will benefit from this alliance which allows both companies to continue with their strengths and enhance one another.

The joint venture will be a strong link for InteCom in its efforts with Local Area Networking. It will also enable Wang to refocus its R&D efforts on other areas than telecommunications and the link with the PBX.

InteCom has enjoyed tremendous growth in the past 3 years; it currently employs approximately 1,200 people and is now a worldwide distributor of PBX systems.

□ Strengths

InteCom was the first vendor in the PBX marketplace to establish itself as a manufacturer of combined data and voice PBX systems. It has been successful in its efforts to develop a concept that forced the other mature vendors into developing a technology that would combat InteCom's marketing and technical strategy.

Family members are all upgradable or downgradable because of the commonality of parts used in the systems. The only difference

InteCom Integrated Business Exchange (IBX)

Models IBX S/10, IBX S/40 & IBX S/80

among the systems is line and station capacity. Unlike its competitors, InteCom developed its entire system around the Perkin-Elmer PE 3205 minicomputer. This 32-bit mini has outstanding growth potential and can be expanded to hundreds of millions of bytes of auxiliary storage if needed. The high data transfer rates accomplished by this processor allow extremely large blocks of data to be moved through the system's 32-bit bus structure.

InteCom was primarily a vendor of large-scale PBX systems until the introduction of the S/10. This low-end system will allow InteCom to penetrate medium-sized industries that comprise the bulk of the industries requirements. The S/10 is physically a 2-cabinet system that can be expanded to multiple cabinets depending on users requirements.

A strong commitment to communication networking has also been introduced within the new IBX family. The ability to use IBM 3270 protocols and high-speed communication links further enhances the product line. T1 (1.544M bps) access allows the IBX to use the latest in transmission technology.

InteCom has also made great strides in formalizing agreements with major computer vendors to design equipment that will integrate the IBX family. To date, the following vendors allow interworking capabilities with the IBX: Digital Equipment Corporation (DEC); Wang; Hewlett-Packard; and Data General. These companies represent over 70 percent of the installed minicomputer base in the U.S. and allow InteCom to penetrate the marketplace that uses these computers.

Nonblocking PBXs are considered to be the wave of the future. The "4th Generation" PBXs all claim to be nonblocking; InteCom's IBX S/10, S/40, and S/80 function as nonblocking PBXs. The S/10 can support up to 2,048 nonblocking ports, while the S/40 and S/80 support 4,000 and 8,000 nonblocking ports, respectively.

The family also uses fiber-optics extensively throughout the system. This allows the PBX to transmit data at extremely high data rates (up to 10M bps) and wide frequency bandwidths with a minimum amount of noise and interference. This technique is truly the latest in state-of-the-art design for this type of interaction between man and machine.

The merger with Wang Laboratories will enhance InteCom's position in the marketplace. The expertise gained by the office automation giant will enable InteCom to gain an even stronger footing in the automated office. Because Wang is very strong in the word processing industry and electronic mail, this alliance will strengthen InteCom's proven ability to supply a total system to the end user for both his data processing and teleprocessing requirements.

By developing systems that can be used and sold by the newly established Bell Regional Holding Companies, InteCom has moved to allow a competitor to sell its own equipment. Four of the seven Bell RHCs have signed agreements with InteCom to market its product. Realizing the tremendous potential in the European marketplace, InteCom has also made agreements with the French Postal Service to represent it Overseas. These moves can only enhance an already strong and upcoming company in the future.

With Exxon's support gave InteCom the needed boost in the beginning of its existence, it is now making giant strides in the financial community. A company must be financially solvent and continuously growing in order to survive in the business world of today. InteCom made almost 300 percent more earnings during its last fiscal year over the previous year. Its backlog increased to over \$305 million. The number of employees increased from approximately 350 in the first quarter of 1982 to approximately 1,200 in the last quarter of 1983.

Limitations

InteCom has also fallen into the "no standard" syndrome. It is difficult to configure a system from an outsider's or novice's perspective. Users are totally dependent on distributors for the product in their area. The prices that are quoted and the support that is given to the customer is determined by the individual distributor. The markup that is passed on to the customer is dependent on the distributor's overhead.

The IBX Systems are minicomputer controlled and use fairly large devices for their support peripherals. The physical cabinet space and air conditioning requirements are higher with InteCom when compared with its competitors, i.e., Northern Telecom and AT&T-IS. The need for space could be a problem area for the medium-size user.

The IBX family members combined data and voice systems, therefore, they are not the most inexpensive of systems. The added expense of combining both data and voice must be shared by all users whether or not all require data support. However, this may not present a problem because the majority of InteCom customers will be both voice and data users.

Although all InteCom documentation states the IBX is a nonblocking family, this can be contested in the event that the number of stations exceeds the number of trunks. By definition, this violates the nonblocking architecture, however, for those users that have an equal number of trunks and stations, the unit is truly nonblocking.

When considering the IBX family for IBM emulation, be sure to check the controller emulation. The 3270 Format and Protocol Conversion only provides the capability for selected asynchronous terminals to emulate the IBM 3277 workstation. The IPC emulates the IBM 3271 Model 2 controller and communicates to the IBM host front-end processor.

SOFTWARE

Terms & Support

Terms • with the exception of optional features, all standard software is bundled into the PBX system price.

Support • PBX system software is supported under InteCom Inc and its associated dealers and distributors • field developed software is supported by the individual dealer that authors the program.

Programming Overview

The PBX software controls operations, conducts self-test functions, and implements features. It should be noted that features of the InteCom IBX PBX family are software driven and targeted at 3 areas: System Features; Attendant Features; and Station Features. System software consists of the Operating System, Self-Test, and Configuration Tables.

The operating system defines major parameters and capabilities. The distribution of calls and methods of route selection and optimization is also controlled by the operating system.

The self-test provides online testing of the PBX system performance. Error table printouts are available upon request. System fault error codes are stored in the PBX memory and made available to local or remote access.

The configuration tables contain information that is unique to each InteCom System installation, and are used to define station characteristics and control assignments. These tables may be changed or moved.

Diagnostic software diagnoses problems not found by the self-test programs. They are used by the field service representative to further aid them in the repair of the system.

IBX S/10 Operating System

The S/10 features are extracted from the on-board ROM (Read Only Memory) of the system. They are intended for operation with the IBX family. The functions are identical to the S/40 and S/80 systems.

General System Features

Standard Features • Access to Paging: provides switching and trunk circuitry to interface to loudspeaker or radio-paging equipment • Access to Recorded Telephone Dictation: access to and control of external dictation trunks and customer provided equipment • Automatic Daily Routines: allows service personnel to select maintenance routines for checking PBX operation • Automatic Conversion: allows the upgrading of software operating system and features to be automatically converted to

InteCom Integrated Business Exchange (IBX)

Models IBX S/10, IBX S/40 & IBX S/80

the new format • **Automatic Set Relocation:** allows the reassigning of a station to any other group via a code for the console • **Auxiliary Signaling:** lights, bells, buzzers, etc, can be connected to the system for special requirements • **CCSA Access:** common control switching arrangements to selected networks • **Class of Service:** allows the system to define the features and services that can be accessed by a station assigned the COS • **Distinctive Permanent Signal Treatment:** any station left off-hook for approximately 11 seconds without talking will automatically be disconnected from the line • **Flexible Attendant DN:** allows service change of the DN that provides access to the attendant • **Flexible Station Numbering:** allows any station to be associated with any line circuit in the family • **Foreign Exchange (FX) CO Access:** provides access to distant central offices via foreign exchange trunks • **Hold and Conference Release On Abandon:** release of line when an outside party hangs up on a line on hold • **Immediate Ringing:** called party provides ringing within 1 second of dial completion • **Manual Line Service:** station access to a called party via attendant, no dial tone • **Night Service:** permits incoming calls normally directed to the attendant console to be routed to preselected station when the console is unattended • **Off-Premise Stations:** remote stations accessed by PBX stations • **Power Fail Transfer:** provides service to the exchange network for a number of prearranged stations during a power or system failure • **Radio Paging Access:** allows attendant or station users to access paging equipment that signals individuals with pocket radio receivers • **Recall Dial Tone:** provides indication to station user that the switchhook has been successfully used to generate a flash to request a service feature during an established call • **Reserve Power:** provides independent power source to maintain PBX service for a limited time during a power failure • **Ring Validation:** allows the ring time duration to be specified on CO trunk group basis • **System Alarm Indication:** LED associated with PBX system faults • **Tandem Switching:** allows calls from other systems through exchange network switching • **Tie Trunk:** allows interconnection of switching machines within a subscriber's private communication network • **Uninterruptible Power Source:** provides up to 8 hours of power using separate batteries during power failures • **WATS Access:** provides access to or from a WATS serving office • **Wide Frequency Tolerant Power Plant:** permits user of ac sources which are not as closely regulated for power consumption.

Attendant Administration Option • allows limited service change activity such as charges to rotary and touch-tone assignments from the attendant console:

NA prch

Centralized Attendant Service (CAS) Option • designed for facilities located in same geographic area; each location has separate telephone system and centralized attendant, attendants are grouped together at 1 central location:

NA

Multicustomer Operation Option • up to 32 stations may have their own independent features:

NA

Music Package Option • allows attendant and station access to music on hold:

NA

Recorded Announcement (RAN) Option • provides a means of responding automatically to incoming calls by prerecorded announcements:

NA

Reserve Power Option • allows an additional power source to be accessed when the primary power supply fails:

NA

Network Numbering Plan Option • supports tandem and network switching; 7-digit number provided in conjunction with Uniform Alternate Routing (UAR) package:

NA

Satellite Directory Group Option • method of accessing directory numbers on another PBX or Centrex:

NA

Dialing Features

Standard Features • **Code Calling Access:** attendant and station access code for an abbreviated dialing signal code • **Dial Access to Attendant:** allows station users to reach attendant by dialing 0 • **Direct Inward Dialing (DID):** allows designated trunks to be assigned to specific stations • **Direct Outward Dialing (DOD):** stations can access trunks by dialing a trunk access code • **Intercept Treatment with Reorder Tone:** dialing of unassigned number will return a reorder tone • **Multilink Intercom with Privacy:** 24-link network for private connections • **Near Immediate Ringing:** tone ringing or alerting buzz applied to a station within 0.5 seconds of the last digit of the directory number being dialed • **Pooled Facilities-Dial Access:** station connected to an idle line belonging to a common pool of outside lines • **Special Dial Tone:** distinctive dial tone that recognizes call transfer, conference, or ring again • **Station to Station Calling:** station can call another station within the same customer group without attendant assistance • **Through Dialing:** outside line transferred from one station to another, allowing the latter station to dial out • **Touch-Tone Calling:** signals used for dialing internal or external calls • **Two-Digit Dialing:** all stations and attendants may be assigned any station number or access code between 11 and 89.

Authorization Code Option • abbreviated code which enables station user to access designated trunks:

NA prch

Dial Intecom Option • gains access to system speakers for internal calling:

NA

Direct Inward System Access (DISA) Option • allows a station user to access the public network and be allowed use of a subset of system resources:

NA

Restriction Features

Standard Features • **Access Restrictions:** control of station access to designated trunks and call groups • **Code Restrictions:** allows specification of area and exchange codes which are to be restricted from use by stations • **Line Lockout:** an off-hook condition that lasts for a predetermined time period is logged and the transmission path is released for use of other calls • **Outward Restriction:** call attempts are routed to the intercept tone; station may not use CO, FX, CCSA trunks • **Private Line Service:** when a station goes off-hook, another station is prevented from entering the connection • **Toll Restrictions:** denies station user dial access to the toll network or toll operator • **Trunk Group Access Restriction (TGAR):** code assigned to each station which defines the trunk or trunk groups the station may access.

Routing Features

Standard Features • **Call Forward:** station may have calls directed to another station automatically • **Emergency Transfer Control:** assignment of CO trunks to specified stations during a power transfer • **Intercept:** allows calls that cannot be completed to be routed to the attendant • **Off-Premise Extension:** allows a station to be located remote from the central control location • **Route Advance:** routes outgoing calls to alternate facilities when the first choice trunk group is busy • **Trunk Access From Any Station (TAFAS):** allows incoming calls to be directed to designated stations when attendant is not present.

Attendant Overflow Option • allows specified calls to be automatically rerouted to a customer-specified Directory Number (DN) when the attendant is busy:

NA prch

Automatic Call Distribution (ACD) Option • used for large number of incoming calls; means of receiving, concentrating, queuing, and uniformly distributing a high volume of incoming

NA PRCH: purchase price differs among distributors and dealers and vary accordingly, it is not applicable or available.

InteCom Integrated Business Exchange (IBX)

Models IBX S/10, IBX S/40 & IBX S/80

calls to answering stations; can be ordered with PBX system or a standalone unit:

NA

Hunting Features

Standard Features • Hunting: routes a call to a busy station to the next idle station in a group • Circular Hunting: occurs over all DNs in the hunt chain, regardless of the starting point • Linear Hunting: hunting starts at the called DN and ends with the last DN in the chain; unless the first station in the hunt chain is called, only a portion of the group will be tested • Secretarial Hunting: a specific DN, generally a secretarial position, is used as the last DN in two or more hunt chains • Short Hunting: hunting takes place over the DNs assigned to one station only; hunting continues over the assigned stations until encountering a feature key, an unassigned key, or the key specified as the Last Hunt Key (LHK) • Station Hunting: routes incoming calls to first idle station in a preselected group; selection is made by initially attempting to route calls to first member of the group.

Accounting Features

Standard Features • Remote Administration: allows off-premise control of specified operations • Traffic Measurement: storing of traffic data on a system or customer basis.

Automatic Identification of Outward Dialing (AIOD) Option • allows billing of outgoing tolls to individual extension numbers:

NA prch

Automatic Number Identification (ANI) Option • automatically identifies a station originating an outgoing toll call and its destination, and transmits the information to a recording office:

NA

Call Detail Recording (CDR) Option • outputs data on external calls to a printer and/or magnetic tape:

NA

History File Option • allows users to allocate an area of protecting data store for use as a history file where system messages can be stored until a printout is requested:

NA

S/10 Attendant Console Features

Standard Features • Alarm Lamps: indicators that allow the attendant to see if a major or minor alarm has occurred • Alphanumeric Display for Attendant Position: allows attendant to process call; identification of the source of an incoming or recalled call; calling extension class of service or trunk number • Attendant Control of Trunk Group Access: attendant restricts station dial access to outgoing trunk groups by dialing an activation code and the access code of the trunk group to be restricted • Attendant Direct Station Selection (DSS) with Busy Lamp: calls from console placed to station within PBX by depressing a key associated with the desired station line; lamp shows status of each station attendant lockout; attendant denied the ability to reenter an established connection held on an attendant position, unless recalled by a station user • Attendant Interposition Transfer: allows calls to be transferred from one attendant to another attendant in the same customer group • Automatic Timed Reminders: automatically alerts the attendant when a call extended through the console has not been answered within the preselected time • Automatic Release: automatically releases incoming calls when transferred from one call to another • Barge-In: allows the attendant to establish a talking connection with any apparently busy trunk or special service • Busy Verification: allows the attendant to establish a talking connection with any busy directory number to verify that the directory number is actually busy and in working order • Call Selection: allows attendant to answer incoming calls either in the order in which they are received or by selecting a call type from the Incoming Call Identification (ICI) lamps • Call Transfer: a user connected to another party can transfer that party to another extension by means of a transfer code, followed by the extension number • Calling Number Display to Attendant: provides the attendant with digit display of the station number of any station

seeking attendant assistance • Cancel: terminates a start call and automatically reconnects the answering position to the original calling facility • Camp-On: allows the attendant to complete an incoming call to a busy directory number • Conference Call: allows up to 6 stations to establish a communications link • Control of Trunk Group Access: attendant control of station access to CO trunk lines • Emergency Transfer Control: calls assigned to preselected station when a power failure exists • Incoming Call Identification (ICI): indicators which show the status of the incoming call sequence • Intercept Treatment Tone: provides a continuous tone alternating between a high and low pitch to indicate a restricted or unassigned code has been dialed or that a denial has been made • Listed Directory Number (LDN) Service: a maximum number of DID or CCSA calls to the local telephone directory number are directed to the attendant • Lockout: denies the attendant the ability to reenter an established call completed through and held on the console • Manual Release: releases the answering position from any active call • Multiple Console Operation: permits each user to use up to 16 attendant consoles using circular hunting • Multiple Listed Directory Number: each station may have up to 4 listed directory numbers on DID trunks • Night Service Control: permits incoming calls normally directed to the attendant to be routed to a preselected station when the console is unattended • Non-Locking Keys: keys which cannot be locked by a special attendant key-dial pad, DN, pick-up, volume hold • Position Busy: enables the attendant to render the console busy and prevent the assignment of incoming calls to the position • Pushbutton Dialing: ability to use pushbuttons to dial numbers in lieu of rotary dialing • Return Coverage on Busy: allows camped-on party to be returned to the attendant after a finite period of time • Return Coverage of Don't Answer: returns party to attendant if station is left unanswered • Secrecy: automatically splits the source and destination when a call is established through an attendant loop • Serial Calls: allows an attendant to complete an incoming call to two or more stations in succession without requiring the called station users to recall the attendant • Splitting: allows the attendant to select and talk privately to either party of a call completed through the console, or the recall of a completed call that is held on a console loop • Straightforward Outward Completion: attendant can place outgoing call for user without the user hanging up • Switched Loop Operation: each call requiring attendant assistance is automatically switched to one of the set of idle loops on an available attendant position • Through Dialing: allows station users to complete outgoing calls on trunks by dialing the desired number after the attendant has selected the trunks facility.

Automatic Dialing Option • allows an attendant to dial a directory number of up to 16 digits by pressing a single key:

NA prch

Speed Call Option • allows an attendant to place a call to directory numbers by dialing a 1- or 2-digit code:

NA

Do-Not-Disturb Option • attendant can put any directory number in this position which allows the station to make calls, but appears to be busy to all incoming calls:

NA

Display/Change Date Option • allows the attendant to change the master date for traffic and diagnostic purposes:

NA

Display/Change Time Option • allows the attendant to change the master time clock for traffic and diagnostic reporting:

NA

S/10 Station Features

Standard Features • Attendant Recall: allows a station user to recall the attendant by pressing a key or flashing the switchhook • Automatic Preselection: station may use the directory number or feature associated with key 0 by lifting the handset • Call Pickup: allows a station user to answer calls directed to other stations in the call pickup group • Call Status Indicators: 8 key/lamp pairs that display the status of the call associated with the key • Call Transfer: allows a station user on any 2-party call to hold the

InteCom Integrated Business Exchange (IBX)

Models IBX S/10, IBX S/40 & IBX S/80

existing call and originate another call to a third party • Call Waiting: informs a station user, when on an established call, that another call is waiting to be connected • Code Calling Access: user establishes predetermined codes to page parties frequently away from work areas • Common Audible Signaling: provides ringing at stations when a call is presented to any idle appearance of a DN on a station • Conference: allows a station, while on any established call, to hold the existing call and originate another call to another party or parties • Distinctive Alert: allows station users to distinguish between outside calls and inside calls • Handsfree Operation: allows voice communication without a handset or headset • Hold: station user can, without assistance from the attendant, hold an established call, and originate or receive a second call • Line Lockout with Warning: provides 10 second intercept tone, holds line out of service when a station line remains off-hook for longer than 10 seconds without dialing • Loudspeaker/Amplifier: access to system loudspeaker/amplifier for tone ring, tone buzzing, voice message signals • Manual Signaling: station is denied dial tone; station may receive calls but all call originations must be made via the attendant • Multiple Appearance Directory Number: allows the same multiple appearance directory number to be allocated to SL-1 and 500- or 2500-type stations • On-Hook Dialing: station user may originate a call by selecting a DN and dialing without lifting the handset • Prime Directory Number: key 0 on all stations designated as the prime key as the directory number assigned to this key is the prime directory number • Privacy: a station user goes off-hook, this feature prevents another station user from entering the connection • Privacy Release: allows a third party to enter an established call of a private connection • Release: allows the station user to release an active call without going on-hook • Station Call Transfer: any station user may transfer any call to any other station • Station-to-Station Calling: direct dial to other stations without attendant assistance • Tone Buzzing: enables the station user, when off-hook, to be alerted by a buzzing tone through the loudspeaker of the station • Tone Ringing: adjustable ringing tone is used to alert an idle station user of an incoming call • Bridging: 2500-type stations may be connected parallel to the system.

Automatic Dialing Option • allows a station user to dial a directory number of up to 16 digits by pressing a single key:

_____ **NA prch**

Call Forwarding Option • enables a station user to divert all calls to another extension:

_____ **NA**

Override Option • specified user can break into a conversation in progress:

_____ **NA**

Ring Again Option • allows a station user, on encountering a busy directory number, to have the system monitor the directory number, and when it becomes free, to alert the calling station and ring the called station:

_____ **NA**

Speed Call Option • allows a station user to place calls to directory numbers by dialing a 1- or 2-digit code:

_____ **NA**

IBX S/40 Operating System

The S/40 features are extracted from the on-board ROM (Read Only Memory) of the system. They are intended for operation with the IBX family. The functions are identical to the S/10 and S/80 systems.

General System Features

Standard Features • Access to Paging: provides switching and trunk circuitry to interface to loudspeaker or radio-paging equipment • Access to Recorded Telephone Dictation: access to and control of external dictation trunks and customer provided equipment • Automatic Daily Routines: allows service personnel to select maintenance routines for checking PBX operation • Automatic Conversion: allows the upgrading of software operating system and features to be automatically converted to

the new format • Automatic Set Relocation: allows the reassigning of a station to any other group via a code for the console • Auxiliary Signaling: lights, bells, buzzers, etc can be connected to the system for special requirements • CCSA Access: common control switching arrangements to selected networks • Class of Service: allows the system to define the features and services that can be accessed by a station assigned the COS • Distinctive Permanent Signal Treatment: any station left off-hook for approximately 11 seconds without talking will automatically be disconnected from the line • Flexible Attendant DN: allows service change of the DN that provides access to the attendant • Flexible Station Numbering: allows any station to be associated with any line circuit in the family • Foreign Exchange (FX) CO Access: provides access to distant central offices via foreign exchange trunks • Hold and Conference Release On Abandon: release of line when an outside party hangs up on a line on hold • Immediate Ringing: called party provides ringing within 1 second of dial completion • Manual Line Service: station access to a called party via attendant, no dial tone • Night Service: permits incoming calls normally directed to the attendant console to be routed to preselected station when the console is unattended • Off-Premise Stations: remote stations accessed by PBX stations • Power Fail Transfer: provides service to the exchange network for a number of prearranged stations during a power or system failure • Radio Paging Access: allows attendant or station users to access paging equipment that signals individuals with pocket radio receivers • Recall Dial Tone: provides indication to station user that the switchhook has been successfully used to generate a flash to request a service feature during an established call • Reserve Power: provides independent power source to maintain PBX service for a limited time during a power failure • Ring Validation: allows the ring time duration to be specified on CO trunk group basis • System Alarm Indication: LED associated with PBX system faults • Tandem Switching: allows calls from other systems through exchange network switching • Tie Trunk: allows interconnection of switching machines within a subscriber's private communication network • Uninterruptable Power Source: provides up to 8 hours of power using separate batteries during power failures • WATS Access: provides access to or from a WATS serving office • Wide Frequency Tolerant Power Plant: permits use of ac sources which are not as closely regulated for power consumption.

Attendant Administration Option • allows limited service change activity such as charges to rotary and touch-tone assignments from the attendant console:

_____ **NA prch**

Centralized Attendant Service (CAS) Option • designed for facilities located in same geographic area; each location has separate telephone system and centralized attendant, attendants are grouped together at 1 central location:

_____ **NA**

Multicustomer Operation Option • up to 32 stations may have their own independent features:

_____ **NA**

Music Package Option • allows attendant and station access to music on hold:

_____ **NA**

Recorded Announcement (RAN) Option • provides a means of responding automatically to incoming calls by prerecorded announcements:

_____ **NA**

Reserve Power Option • allows an additional power source to be accessed when the primary power supply fails:

_____ **NA**

Network Numbering Plan Option • supports tandem and network switching; 7-digit number provided in conjunction with Uniform Alternate Routing (UAR) package:

_____ **NA**

Satellite Directory Group Option • method of accessing directory numbers on another PBX or Centrex:

_____ **NA**

InteCom Integrated Business Exchange (IBX)

Models IBX S/10, IBX S/40 & IBX S/80

Dialing Features

Standard Features • Code Calling Access: attendant and station access code for an abbreviated dialing signal code • Dial Access to Attendant: allows station users to reach attendant by dialing 0 • Direct Inward Dialing (DID): allows designated trunks to be assigned to specific stations • Direct Outward Dialing (DOD): stations can access trunks by dialing a trunk access code • Intercept Treatment with Reorder Tone: dialing of unassigned number will return a reorder tone • Multilink Intercom with Privacy: 24-link network for private connections • Near Immediate Ringing: tone ringing or alerting buzz applied to a station within 0.5 seconds of the last digit of the directory number being dialed • Pooled Facilities-Dial Access: station connected to an idle line belonging to a common pool of outside lines • Special Dial Tone: distinctive dial tone that recognizes call transfer, conference, or ring again • Station-to-Station Calling: station can call another station within the same customer group without attendant assistance • Through Dialing: outside line transferred from one station to another, allowing the latter station to dial out • Touch-Tone Calling: signals used for dialing internal or external calls • Two-Digit Dialing: all stations and attendants may be assigned any station number or access code between 11 and 89.

Authorization Code Option • abbreviated code which enables station user to access designated trunks:

NA prch

Dial InteCom Option • gains access to system speakers for internal calling:

NA

Direct Inward System Access (DISA) Option • allows a station user to access the public network and be allowed use of a subset of system resources:

NA

Restriction Features

Standard Features • Access Restrictions: control of station access to designated trunks and call groups • Code Restrictions: allows specification of area and exchange codes which are to be restricted from use by stations • Line Lockout: an off-hook condition that lasts for a predetermined time period is logged and the transmission path is released for use of other calls • Outward Restriction: call attempts are routed to the intercept tone; station may not use CO, FX, CCSA trunks • Private Line Service: when a station goes off-hook, another station is prevented from entering the connection • Toll Restriction: denies station user dial access to the toll network or toll operator • Trunk Group Access Restriction (TGAR): code assigned to each station which defines the trunk or trunk groups the station may access.

Routing Features

Standard Features • Call Forward: station may have calls directed to another station automatically • Emergency Transfer Control: assignment of CO trunks to specified stations during a power transfer • Intercept: allows calls that cannot be completed to be routed to the attendant • Off-Premise Extension: allows a station to be located remote from the central control location • Route Advance: routes outgoing calls to alternate facilities when the first choice trunk group is busy • Trunk Access From Any Station (TAFAS): allows incoming calls to be directed to designated stations when attendant is not present.

Attendant Overflow Option • allows specified calls to be automatically rerouted to a customer-specified Directory Number (DN) when the attendant is busy:

NA prch

Automatic Call Distribution (ACD) Option • used for large number of incoming calls; means of receiving, concentrating, queuing, and uniformly distributing a high volume of incoming calls to answering stations; can be ordered with PBX system or a standalone unit:

NA

Hunting Features

Standard Features • Hunting: routes a call to a busy station to the

next idle station in a group • Circular Hunting: occurs over all DNs in the hunt chain, regardless of the starting point • Linear Hunting: hunting starts at the called DN and ends with the last DN in the chain; unless the first station in the hunt chain is called, only a portion of the group will be tested • Secretarial Hunting: a specific DN, generally a secretarial position, is used as the last DN in two or more hunt chains • Short Hunting: hunting takes place over the DNs assigned to one station only; hunting continues over the assigned stations until encountering a feature key, an unassigned key or the key specified as the Last Hunt Key (LHK) • Station Hunting: routes incoming calls to first idle station in a preselected group; selection is made by initially attempting to route calls to first member of the group.

Accounting Features

Standard Features • Remote Administration: allows off-premise control of specified operations • Traffic Measurement: storing of traffic data on a system or customer basis.

Automatic Identification of Outward Dialing (AIOD) Option • allows billing of outgoing tolls to individual extension numbers:

NA prch

Automatic Number Identification (ANI) Option • automatically identifies a station originating an outgoing toll call and its destination, and transmits the information to a recording office:

NA

Call Detail Recording (CDR) Option • outputs data on external calls to a printer and/or magnetic tape:

NA

History File Option • allows users to allocate an area of protecting data store for use as a history file where system messages can be stored until a printout is requested:

NA

S/40 Attendant Console Features

Standard Features • Alarm Lamps: indicators that allow the attendant to see if a major or minor alarm has occurred • Alphanumeric Display for Attendant Position: allows attendant to process call; identification of the source of an incoming or recalled call; calling extension class of service or trunk number • Attendant Control of Trunk Group Access: attendant restricts station dial access to outgoing trunk groups by dialing an activation code and the access code of the trunk group to be restricted • Attendant Direct Station Selection (DSS) with Busy Lamp: calls from console placed to station within PBX by depressing a key associated with the desired station line; lamp shows status of each station attendant lockout; attendant denied the ability to reenter an established connection held on an attendant position, unless recalled by a station user • Attendant Interposition Transfer: allows calls to be transferred from one attendant to another attendant in the same customer group • Automatic Timed Reminders: automatically alerts the attendant when a call extended through the console has not been answered within the preselected time • Automatic Release: automatically releases incoming calls when transferred from one call to another • Barge-In: allows the attendant to establish a talking connection with any apparently busy trunk or special service • Busy Verification: allows the attendant to establish a talking connection with any busy directory number to verify that the directory number is actually busy and in working order • Call Selection: allows attendant to answer incoming calls either in the order in which they are received or by selecting a call type from the Incoming Call Identification (ICI) lamps • Call Transfer: a user connected to another party can transfer that party to another extension by means of a transfer code, followed by the extension number • Calling Number Display to Attendant: provides the attendant with digit display of the station number of any station seeking attendant assistance • Cancel: terminates a start call and automatically reconnects the answering position to the original calling facility • Camp-On: allows the attendant to complete an incoming call to a busy directory number • Conference Call: allows up to 6 stations to establish a communications link • Control of Trunk Group Access: attendant control of station access to CO trunk lines • Emergency Transfer Control: calls

InteCom Integrated Business Exchange (IBX)

Models IBX S/10, IBX S/40 & IBX S/80

assigned to preselected station when a power failure exists • Incoming Call Identification (ICI): indicators which show the status of the incoming call sequence • Intercept Treatment Tone: provides a continuous tone alternating between a high and low pitch to indicate a restricted or unassigned code has been dialed or that a denial has been made • Listed Directory Number (LDN) Service: a maximum number of DID or CCSA calls to the local telephone directory number are directed to the attendant • Lockout: denies the attendant the ability to reenter an established call completed through and held on the console • Manual Release: releases the answering position from any active call • Multiple Console Operation: permits each user to use up to 16 attendant consoles using circular hunting • Multiple Listed Directory Number: each station may have up to 4 listed directory numbers on DID trunks • Night Service Control: permits incoming calls normally directed to the attendant to be routed to a preselected station when the console is unattended • Nonlocking Keys: keys which cannot be locked by a special attendant key-dial pad, DN, pick-up, volume hold • Position Busy: enables the attendant to render the console busy and prevent the assignment of incoming calls to the position • Pushbutton Dialing: ability to use pushbuttons to dial numbers in lieu of rotary dialing • Return Coverage on Busy: allows camped-on party to be returned to the attendant after a finite period of time • Return Coverage of Don't Answer: returns party to attendant if station is left unanswered • Secrecy: automatically splits the source and destination when a call is established through an attendant loop • Serial Calls: allows an attendant to complete an incoming call to two or more stations in succession without requiring the called station users to recall the attendant • Splitting: allows the attendant to select and talk privately to either party of a call completed through the console or the recall of a completed call that is held on a console loop • Straightforward Outward Completion: attendant can place outgoing call for user without the user hanging up • Switched Loop Operation: each call requiring attendant assistance is automatically switched to one of the set of idle loops on an available attendant position • Through Dialing: allows station users to complete outgoing calls on trunks by dialing the desired number after the attendant has selected the trunks facility.

Automatic Dialing Option • allows an attendant to dial a directory number of up to 16 digits by pressing a single key:
NA prch

Speed Call Option • allows an attendant to place a call to directory numbers by dialing a 1- or 2-digit code:
NA

Do-Not-Disturb Option • attendant can put any directory number in this position which allows the station to make calls, but appears to be busy to all incoming calls:
NA

Display/Change Date Option • allows the attendant to change the master date for traffic and diagnostic purposes:
NA

Display/Change Time Option • allows the attendant to change the master time clock for traffic and diagnostic reporting:
NA

S/40 Station Features

Standard Features • Attendant Recall: allows a station user to recall the attendant by pressing a key or flashing the switchhook • Automatic Preselection: station may use the directory number or feature associated with key 0 by lifting the handset • Call Pickup: allows a station user to answer calls directed to other stations in the call pickup group • Call Status Indicators: 8 key/lamp pairs that display the status of the call associated with the key • Call Transfer: allows a station user on any 2-party call to hold the existing call and originate another call to a third party • Call Waiting: informs a station user, when on an established call, that another call is waiting to be connected • Code Calling Access: user establishes predetermined codes to page parties frequently away from work areas • Common Audible Signaling: provides ringing at stations when a call is presented to any idle appearance of a DN on a station • Conference: allows a station,

while on any established call, to hold the existing call and originate another call to another party or parties • Distinctive Alert: allows station users to distinguish between outside calls and inside calls • Handsfree Operation: allows voice communication without a handset or headset • Hold: station user can, without assistance from the attendant, hold an established call and originate or receive a second call • Line Lockout with Warning: provides 10 second intercept tone, holds line out of service when a station line remains off-hook for longer than 10 seconds without dialing • Loudspeaker/Amplifier: access to system loudspeaker/amplifier for tone ring, tone buzzing, voice message signals • Manual Signaling: station is denied dial tone; station may receive calls but all call originations must be made via the attendant • Multiple Appearance Directory Number: allows the same multiple appearance directory number to be allocated to SL-1 and 500- or 2500-type stations • On-Hook Dialing: station user may originate a call by selecting a DN and dialing without lifting the handset • Prime Directory Number: key 0 on all stations designated as the prime key and the directory number assigned to this key is the prime directory number • Privacy: a station user goes off-hook, this feature prevents another station user from entering the connection • Privacy Release: allows a third party to enter an established call of a private connection • Release: allows the station user to release an active call without going on-hook • Station Call Transfer: any station user may transfer any call to any other station • Station-to-Station Calling: direct dial to other stations without attendant assistance • Tone Buzzing: enables the station user, when off-hook, to be alerted by a buzzing tone through the loudspeaker of the station • Tone Ringing: adjustable ringing tone is used to alert an idle station user of an incoming call • Bridging: 2500-type stations may be connected parallel to the system.

Automatic Dialing Option • allows a station user to dial a directory number of up to 16 digits by pressing a single key:
NA prch

Call Forwarding Option • enables a station user to divert all calls to another extension:
NA

Override Option • specified user can break into a conversation in progress:
NA

Ring Again Option • allows a station user, on encountering a busy directory number, to have the system monitor the directory number, and when it becomes free, to alert the calling station and ring the called station:
NA

Speed Call Option • allows a station user to place calls to directory numbers by dialing a 1- or 2-digit code:
NA

IBX S/80 Operating System

The S/80 features are extracted from the on-board ROM (Read Only Memory) of the system. They are intended for operation with the IBX family. The functions are identical to the S/10 and S/40 systems.

General System Features

Standard Features • Access to Paging: provides switching and trunk circuitry to interface to loudspeaker or radio-paging equipment • Access to Recorded Telephone Dictation: access to and control of external dictation trunks and customer provided equipment • Automatic Daily Routines: allows service personnel to select maintenance routines for checking PBX operation • Automatic Conversion: allows the upgrading of software operating system and features to be automatically converted to the new format • Automatic Set Relocation: allows the reassigning of a station to any other group via a code for the console • Auxiliary Signaling: lights, bells, buzzers, etc can be connected to the system for special requirements • CCSA Access: common control switching arrangements to selected networks • Class of Service: allows the system to define the features and services that can be accessed by a station assigned the COS • Distinctive

InteCom Integrated Business Exchange (IBX)

Models IBX S/10, IBX S/40 & IBX S/80

Permanent Signal Treatment: any station left off-hook for approximately 11 seconds without talking will automatically be disconnected from the line • Flexible Attendant DN: allows service change of the DN that provides access to the attendant • Flexible Station Numbering: allows any station to be associated with any line circuit in the family • Foreign Exchange (FX) CO Access: provides access to distant central offices via foreign exchange trunks • Hold and Conference Release On Abandon: release of line when an outside party hangs up on a line on hold • Immediate Ringing: called party provides ringing within 1 second of dial completion • Manual Line Service: station access to a called party via attendant, no dial tone • Night Service: permits incoming calls normally directed to the attendant console to be routed to preselected station when the console is unattended • Off-Premise Stations: remote stations accessed by PBX stations • Power Fail Transfer: provides service to the exchange network for a number of prearranged stations during a power or system failure • Radio Paging Access: allows attendant or station users to access paging equipment that signals individuals with pocket radio receivers • Recall Dial Tone: provides indication to station user that the switchhook has been successfully used to generate a flash to request a service feature during an established call • Reserve Power: provides independent power source to maintain PBX service for a limited time during a power failure • Ring Validation: allows the ring time duration to be specified on CO trunk group basis • System Alarm Indication: LED associated with PBX system faults • Tandem Switching: allows calls from other systems through exchange network switching • Tie Trunk: allows interconnection of switching machines within a subscriber's private communication network • Uninterruptable Power Source: provides up to 8 hours of power using separate batteries during power failures • WATS Access: provides access to or from a WATS serving office • Wide Frequency Tolerant Power Plant: permits use of ac sources which are not as closely regulated for power consumption • Attendant Administration Option • allows limited service change activity such as charges to rotary and touch-tone assignments from the attendant console:

NA prch

Centralized Attendant Service (CAS) Option • designed for facilities located in same geographic area; each location has separate telephone system and centralized attendant; attendants are grouped together at 1 central location:

NA

Multicustomer Operation Option • up to 32 stations may have their own independent features:

NA

Music Package Option • allows attendant and station access to music on hold:

NA

Recorded Announcement (RAN) Option • provides a means of responding automatically to incoming calls by prerecorded announcements:

NA

Reserve Power Option • allows an additional power source to be accessed when the primary power supply fails:

NA

Network Numbering Plan Option • supports tandem and network switching; 7-digit number provided in conjunction with Uniform Alternate Routing (UAR) package:

NA

Satellite Directory Group Option • method of accessing directory numbers on another PBX or Centrex:

NA

Dialing Features

Standard Features • Code Calling Access: attendant and station access code for an abbreviated dialing signal code • Dial Access to Attendant: allows station users to reach attendant by dialing 0 • Direct Inward Dialing (DID): allows designated trunks to be assigned to specific stations • Direct Outward Dialing (DOD): stations can access trunks by dialing a trunk access code •

Intercept Treatment with Reorder Tone: dialing of unassigned number will return a reorder tone • Multilink Intercom with Privacy: 24-link network for private connections • Near Immediate Ringing: tone ringing or alerting buzz applied to a station within 0.5 seconds of the last digit of the directory number being dialed • Pooled Facilities-Dial Access: station connected to an idle line belonging to a common pool of outside lines • Special Dial Tone: distinctive dial tone that recognizes call transfer, conference, or ring again • Station-to-Station Calling: station can call another station within the same customer group without attendant assistance • Through Dialing: outside line transferred from one station to another, allowing the latter station to dial out • Touch-Tone Calling: signals used for dialing internal or external calls • Two-Digit Dialing: all stations and attendants may be assigned any station number or access code between 11 and 89.

Authorization Code Option • abbreviated code which enables station user to access designated trunks:

NA prch

Dial InteCom Option • gains access to system speakers for internal calling:

NA

Direct Inward System Access (DISA) Option • allows a station user to access the public network and be allowed use of a subset of system resources:

NA

Restriction Features

Standard Features • Access Restrictions: control of station access to designated trunks and call groups • Code Restrictions: allows specification of area and exchange codes which are to be restricted from use by stations • Line Lockout: an off-hook condition that lasts for a predetermined time period is logged and the transmission path is released for use of other calls • Outward Restriction: call attempts are routed to the intercept tone; station may not use CO, FX, CCSA trunks • Private Line Service: when a station goes off-hook, another station is prevented from entering the connection • Toll Restrictions: denies station user dial access to the toll network or toll operator • Trunk Group Access Restriction (TGAR): code assigned to each station which defines the trunk or trunk groups the station may access.

Routing Features

Standard Features • Call Forward: station may have calls directed to another station automatically • Emergency Transfer Control: assignment of CO trunks to specified stations during a power transfer • Intercept: allows calls that cannot be completed to be routed to the attendant • Off-Premise Extension: allows a station to be located remote from the central control location • Route Advance: routes outgoing calls to alternate facilities when the first choice trunk group is busy • Trunk Access From Any Station (TAFAS): allows incoming calls to be directed to designated stations when attendant is not present.

Attendant Overflow Option • allows specified calls to be automatically rerouted to a customer-specified Directory Number (DN) when the attendant is busy:

NA prch

Automatic Call Distribution (ACD) Option • used for large number of incoming calls; means of receiving, concentrating, queuing, and uniformly distributing a high volume of incoming calls to answering stations; can be ordered with PBX system or a standalone unit:

NA

Hunting Features

Standard Features • Hunting: routes a call to a busy station to the next idle station in a group • Circular Hunting: occurs over all DNs in the hunt chain, regardless of the starting point • Linear Hunting: hunting starts at the called DN and ends with the last DN in the chain; unless the first station in the hunt chain is called, only a portion of the group will be tested • Secretarial Hunting: a specific DN, generally a secretarial position, is used as the last DN in two or more hunt chains • Short Hunting: hunting takes place

InteCom Integrated Business Exchange (IBX) Models IBX S/10, IBX S/40 & IBX S/80

over the DNs assigned to one station only; hunting continues over the assigned stations until encountering a feature key, an unassigned key, or the key specified as the Last Hunt Key (LHK) • Station Hunting: routes incoming calls to first idle station in a preselected group; selection is made by initially attempting to route calls to first member of the group.

Accounting Features

Standard Features • Remote Administration: allows off-premise control of specified operations • Traffic Measurement: storing of traffic data on a system or customer basis.

Automatic Identification or Outward Dialing (AIOD) Option • allows billing of outgoing tolls to individual extension numbers:
_____ **NA prch**

Automatic Number Identification (ANI) Option • automatically identifies a station originating an outgoing toll call and its destination and transmits the information to a recording office:
_____ **NA**

Call Detail Recording (CDR) Option • outputs data on external calls to a printer and/or magnetic tape:
_____ **NA**

History File Option • allows users to allocate an area of protecting data store for use as a history file where system messages can be stored until a printout is requested:
_____ **NA**

S/80 Attendant Console Features

Standard Features • Alarm Lamps: indicators that allow the attendant to see if a major or minor alarm has occurred • Alphanumeric Display for Attendant Position: allows attendant to process call; identification of the source of an incoming or recalled call; calling extension class of service or trunk number • Attendant Control of Trunk Group Access: attendant restricts station dial access to outgoing trunk groups by dialing an activation code and the access code of the trunk group to be restricted • Attendant Direct Station Selection (DSS) with Busy Lamp: calls from console placed to station within PBX by depressing a key associated with the desired station line; lamp shows status of each station attendant lockout; attendant denied the ability to reenter an established connection held on an attendant position, unless recalled by a station user • Attendant Interposition Transfer: allows calls to be transferred from one attendant to another attendant in the same customer group • Automatic Timed Reminders: automatically alerts the attendant when a call extended through the console has not been answered within the preselected time • Automatic Release: automatically releases incoming calls when transferred from one call to another • Barge-In: allows the attendant to establish a talking connection with any apparently busy trunk or special service • Busy Verification: allows the attendant to establish a talking connection with any busy directory number to verify that the directory number is actually busy and in working order • Call Selection: allows attendant to answer incoming calls either in the order in which they are received or by selecting a call type from the Incoming Call Identification (ICI) lamps • Call Transfer: a user connected to another party can transfer that party to another extension by means of a transfer code, followed by the extension number • Calling Number Display to Attendant: provides the attendant with digit display of the station number of any station seeking attendant assistance • Cancel: terminates a start call and automatically reconnects the answering position to the original calling facility • Camp-On: allows the attendant to complete an incoming call to a busy directory number • Conference Call: allows up to 6 stations to establish a communications link • Control of Trunk Group Access: attendant control of station access to CO trunk lines • Emergency Transfer Control: calls assigned to preselected station with a power failure exists • Incoming Call Identification (ICI): indicators which show the status of the incoming call sequence • Intercept Treatment Tone: provides a continuous tone alternating between a high and low pitch to indicate a restricted or unassigned code has been dialed or that a denial has been made • Listed Directory Number (LDN)

Service: a maximum number of DID or CCSA calls to the local telephone directory number are directed to the attendant • Lockout: denies the attendant the ability to reenter an established call completed through and held on the console • Manual Release: releases the answering position from any active call • Multiple Console Operation: permits each user to use up to 16 attendant consoles using circular hunting • Multiple Listed Directory Number: each station may have up to 4 listed directory numbers on DID trunks • Night Service Control: permits incoming calls normally directed to the attendant to be routed to a preselected station when the console is unattended • Nonlocking Keys: keys which cannot be locked by a special attendant key-dial pad, DN, pick-up, volume hold • Position Busy: enables the attendant to render the console busy and prevent the assignment of incoming calls to the position • Pushbutton Dialing: ability to use pushbuttons to dial numbers in lieu of rotary dialing • Return Coverage on Busy: allows camped-on party to be returned to the attendant after a finite period of time • Return Coverage of Don't Answer: return party to attendant if station is left unanswered • Secrecy: automatically splits the source and destination when a call is established through an attendant loop • Serial Calls: allows an attendant to complete an incoming call to two or more stations in succession without requiring the called station users to recall the attendant • Splitting: allows the attendant to select and talk privately to either party of a call completed through the console, or the recall of a completed call that is held on a console loop • Straightforward Outward Completion: attendant can place outgoing call for user without the user hanging up • Switched Loop Operation: each call requiring attendant assistance is automatically switched to one of the set of idle loops on an available attendant position • Through Dialing: allows station users to complete outgoing calls on trunks by dialing the desired number after the attendant has selected the trunks facility.

Automatic Dialing Option • allows an attendant to dial a directory number of up to 16 digits by pressing a single key:
_____ **NA prch**

Speed Call Option • allows an attendant to place a call to directory numbers by dialing a 1- or 2-digit code:
_____ **NA**

Do-Not-Disturb Option • attendant can put any directory number in this position which allows the station to make calls, but appears to be busy to all incoming calls:
_____ **NA**

Display/Change Date Option • allows the attendant to change the master date for traffic and diagnostic purposes:
_____ **NA**

Display/Change Time Option • allows the attendant to change the master time clock for traffic and diagnostic reporting:
_____ **NA**

S/80 Station Features

Standard Features • Attendant Recall: allows a station user to recall the attendant by pressing a key or flashing the switchhook • Automatic Preselection: station may use the directory number or feature associated with key 0 by lifting the handset • Call Pickup: allows a station user to answer calls directed to other stations in the call pickup group • Call Status Indicators: 8 key/lamp pairs that display the status of the call associated with the key • Call Transfer: allows a station user on any 2-party call to hold the existing call and originate another call to a third party • Call Waiting: informs a station user, when on an established call, that another call is waiting to be connected • Code Calling Access: user establishes predetermined codes to page parties frequently away from work areas • Common Audible Signaling: provides ringing at stations when a call is presented to any idle appearance of a DN on a station • Conference: allows a station, while on any established call, to hold the existing call and originate another call to another party or parties • Distinctive Alert: allows station users to distinguish between outside calls and inside calls • Handsfree Operation: allows voice communication without a handset or headset • Hold: station user can, without assistance from the attendant, hold an established call, and

InteCom Integrated Business Exchange (IBX)

Models IBX S/10, IBX S/40 & IBX S/80

originate or receive a second call • Line Lockout with Warning: provides 10-second intercept tone, holds line out of service when a station line remains off-hook for longer than 10 seconds without dialing • Loudspeaker/Amplifier: access to system loudspeaker/amplifier for tone ring, tone buzzing, voice message signals • Manual Signaling: station is denied dial tone; station may receive calls but all call originations must be made via the attendant • Multiple Appearance Directory Number: allows the same multiple appearance directory number to be allocated to SL-1 and 500- or 2500-type stations • On-Hook Dialing: station user may originate a call by selecting a DN and dialing without lifting the handset • Prime Directory Number: key 0 on all stations designated as the prime key and the directory number assigned to this key is the prime directory number • Privacy: a station user goes off-hook, this feature prevents another station user from entering the connection • Privacy Release: allows a third party to enter an established call of a private connection • Release: allows the station user to release an active call without going on-hook • Station Call Transfer: any station user may transfer any call to any other station • Station-to-Station Calling: direct dial to other stations without attendant assistance • Tone Buzzing: enables the station user, when off-hook, to be alerted by a buzzing tone through the loudspeaker of the station • Tone Ringing: adjustable ringing tone is used to alert an idle station user of an incoming call • Bridging: 2500-type stations may be connected parallel to the system.

Automatic Dialing Option • allows a station user to dial a directory number of up to 16 digits by pressing a single key:
NA prch

Call Forwarding Option • enables a station user to divert all calls to another extension:
NA

Override Option • specified user can break into a conversation in progress:
NA

Ring Again Option • allows a station user, on encountering a busy directory number, to have the system monitor the directory number, and when it becomes free, to alert the calling station and ring the called station:
NA

Speed Call Option • allows a station user to place calls to directory numbers by dialing a 1- or 2-digit code:
NA

Application Software

InteCom Inc has installed its family members in numerous applicator environments; to date, InteCom has application packages for the following industries: office automation; word processing; tenant services; health; government; retail; hotel/motel; and the service sector.

HARDWARE

Terms & Support

Terms • the PBX models are available for purchase or lease on a 1-, 2-, 3-, or 5-year lease • lease rates do not include maintenance.

Support • equipment can be installed by InteCom and authorized distributors • service and maintenance is based on the policies established by individual dealers or distributors.

Overview

The 3 models of the InteCom IBX PBX family are computer-based systems designed for stored program activities using TDM/PCM digital switching for voice and data. The range of stations supported varies from 250 (S/10) to over 12,000 (S/80). As user requirements change, the addition of like systems with the appropriate configuration can be installed. Existing operation will not be altered unless requested by the customer.

All InteCom IBX PBX family members support voice and data switching and can connect to the Tandem Switching System.

InteCom Inc also supplies its users with selected peripherals and electronic telephones, as specified by the user.

The major components that make up the InteCom IBX family are: system modules; attendant consoles; station devices; equipment cabinets; and peripheral equipment.

Representative System Configurations

S/10 Configuration • a dual-cabinet nonredundant system.
 256 Trunks/400 Stations:
\$240,000 to \$400,000 approx prch

500 Trunks/1,000 Stations:
600,000 to 1,000,000

S/40 Configuration • a multicabinet, nonredundant system.
 100 Trunks/500 Stations:
400,000 to 500,000

400 Trunks/900 Stations:
720,000 to 900,000

S/80 Configuration • a multicabinet, redundant system.
 500 Trunks/1,200 Stations:
960,000 to 1,200,000
 1,250 Trunks/2,500 Stations:
2,000,000 to 2,500,000

Station Equipment—Voice/Data

IBX Attendant Console • primary function to service incoming calls originating outside the IBX 10, 40, or 80 System; connects incoming calls to appropriate internal stations • places outgoing calls • provides information concerning status and types of calls handled • desktop unit:
NA prch

IBX STE • Standard Telephone Equipment • DTMF proprietary 2500-type Touch-Tone telephone:
NA

IBX ITE 12 • Integrated Terminal Equipment • 12-button touch-pad feature telephone:
NA

IBX ITE 15D • Integrated Terminal Equipment • 15-button touch-pad feature telephone with a 24-character alphanumeric display:
NA

IBX ITE 21 • Integrated Terminal Equipment • 21-button touch-pad feature telephone:
NA

IBX ITE 24D • Integrated Terminal Equipment • 24-button touch-pad feature telephone with 24-character alphanumeric display:
NA

IBX ITE 30 • Integrated Terminal Equipment • 30-button touch-pad feature telephone:
NA

Computer to PBX Interface (CPI) • jointly announced with Digital Equipment Corporation (DEC) • multiplexed interface for a bidirectional data communication link between a PBX and host computer • allows DEC, Data General, and Hewlett-Packard to connect to Rolm, InteCom, Mitel, and Northern Telecom:
NA

APPROX PRCH: approximate purchase price range based on average cost per line; does not include discounts, maintenance, or installation. NA: not available; vendor refuses to disclose pricing. Pricing established by individual dealers and distributors and differ accordingly. Approximate purchase prices effective as of August 1984.

InteCom Integrated Business Exchange (IBX)

Models IBX S/10, IBX S/40 & IBX S/80

Data Communication

Data Interface Unit (DIU) • communication interface connected by 2-pair wire to IBX ITE line card • conforms to RS-232C specifications and is suitable for connecting DTE Devices:

NA prch

Data Option Board (DOB) • interfaces EIA RS-232C or RS-449 data devices • provides both voice and data communications:

NA

Modem Pooling • eliminates the need for dedicated modems • consists of originate-only modems, terminate-only modems, or dual-mode, as well as dual-speed modems:

NA

InteNet Packet Controllers (IPC) • format and protocol conversion made possible with IPC • microprocessor controlled and can be accessed by any port.

3270 IPC:

NA

X.25 IPC:

NA

Word Processing IPC:

NA

LANmark Packet Switching • allows local network or Ethernet communication network access:

NA

3270 Protocol Converter • allows ASCII terminals to access asynchronous, bisynchronous, and SNA/SDLC host databases • connects to SL-1 with Add-on Data Modules (ADM) or

Asynchronous Interface Module (AIM):

NA

Asynchronous Interface Module • connected to asynchronous ASCII terminals and can originate or answer calls • does not require telephone set • requires 2-pair wiring • does not interface to Data modules:

NA

Peripherals

Teleprinters • used for system diagnostic reporting • lists moves and changes within the system • can be used with remote PBX:

NA prch

67M-Byte Hard Disk • used for auxiliary storage of records:

NA

CRT Terminals • used for data management and accounting features • over 17 different vendors identified with compatible CRT terminals:

NA

Magnetic Tape • 45 ips, 1600-bpi tape used for initial program loading, database backup and offloading CDR data:

NA

Subsystems

Automatic Call Distributor (ACD) • used to increase the incoming calls to accommodate voice and data extensions • designed to distribute incoming calls equally through a variety of routing options:

NA prch

• END

Inter-Tel Key Systems

Models Phoenix/Hitec 412, 616, 824, 1232, 1648; Hitec 2480; Phoenix 2456 & 32/128

■ PROFILE

Function • electronic key telephone systems for switching voice and data.

Applications Supported • targeted at small- to medium-sized businesses with up to 128 telephones • general businesses: accounting services, healthcare, financial firms, insurance, legal offices, real estate, travel agencies.

System Parameters • all systems except the 412 and 824 are digital with time division switching • all systems use distributed processing with stored program • microprocessor controlled • 2-pair, 4-pair cable • modular connections.

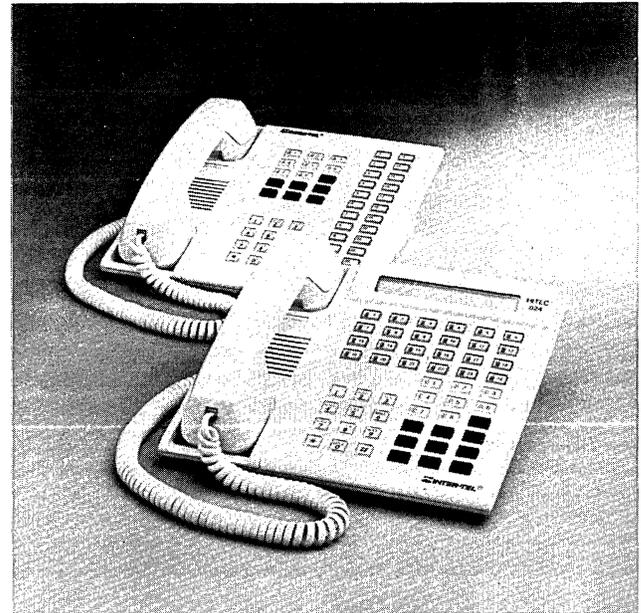
Traffic Capacity • Model 412: 5 simultaneous conversations • Model 616: 11 simultaneous conversations • Model 824: 10 simultaneous conversations • Model 1232: 17 simultaneous conversations • Model 1648: 24 simultaneous conversations • Models 2456 and 32/128: 32 simultaneous conversations.

Trunks/Stations/Consoles • Model 412: 4 trunks/12 stations • Model 616: 6 trunks/16 stations/2 consoles • Model 824: 8 trunks/24 stations • Model 1232: 12 trunks/32 stations/2 consoles • Model 1648: 16 trunks/48 stations/6 consoles • Model 2456: 24 trunks/56 stations/4 consoles • Model 32/128: 32 trunks/128 stations/4 consoles.

Voice Equipment • vendor supplied: electronic key telephone sets (KTS), 616 keysets, 824S and 824D keysets, 1232 keysets, 2480 keysets • handsfree unit • doorphone unit • nonvendor equipment supported: standard 2500 telephones.

Data Equipment • vendor supplied: none • nonvendor equipment supported: for Models 2456 and 32/128: modular duplex jack plate, modems, data terminals, personal computers, host computers, RS-232C jack.

First Delivery • 1984.



Systems Delivered • over 10,000 systems, all models.

Installation Interval • 12 to 16 weeks ARO.

Comparable Systems • AT&T Information Systems ComKey, Merlin • Comdial Maxkey • Executone Equity II, Encore, Command 8/16 and 20/56 • ITT EKS-701, EKS-801 • Iwatsu Omega III and IV • NEC Electra 616 and 1648 • TIE Businesscom and Ultracom • Toshiba Strata.

Environmental Specifications • all models • temperature: 32 to 80 degrees Fahrenheit • humidity: 20 to 85 percent noncondensing • air conditioning: required • dimensions: Model 412: 11x15x4 (HxWxD); Model 616: 11.5x9.5x11.25 (HxWxD); Models 824 and 1232: 19x14x9 (HxWxD); Model 1648: 20x22x12 (HxWxD); Models 2456 and 32/128: 25.5x27.18 (HxWxD); • weight: 15 to 100 pounds (depending on model) • power: 105-125 VAC, 60 Hz (all models).

Vendor • Inter-Tel Inc; 6505 West Williams Field Road, Chandler, AZ 85224 • 602-961-9000 or 800-523-8180.

Canadian Headquarters • none; contact headquarters.

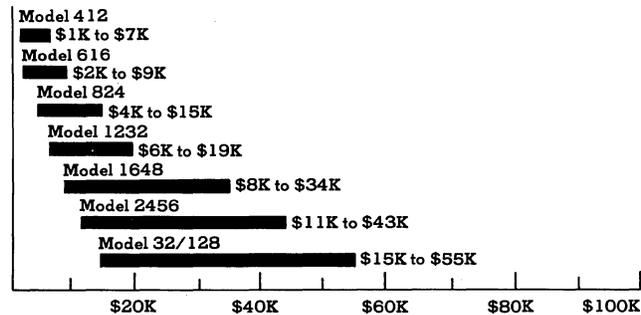
Distribution • nationwide through direct sales and dealers • 180 Hitec dealers • 80 Large Volume Dealers (LUD) for Phoenix • 8 direct sales offices.

Service/Support/Training • service, support, and training provided by Inter-Tel Inc and its approved dealers • system installation by Inter-Tel and its dealers • maintenance contracts available after first year • warranty 1 year parts and labor on purchased systems.

GSA Schedule • no.

PURCHASE PRICE RANGE

hardware & software



INTER-TEL PHOENIX-HITEC PURCHASE PRICE bar graphs cover price ranges between "small" and "large" configurations; installation and first year's maintenance included • Model 412 supports up to 4 trunks/12 stations • Model 616 supports up to 6 trunks/16 stations/2 DSS/BLF consoles • Model 824 supports up to 8 trunks/24 stations • Model 1232 supports up to 12 trunks/32 stations/2 DSS/BLF consoles • Model 1648 supports up to 16 trunks/48 stations/6 DSS/BLF consoles • Model 2456 supports up to 24 trunks/56 stations/4 DSS/BLF consoles • Model 32/128 supports up to 32 trunks/128 stations/4 DSS/BLF consoles.

Inter-Tel Key Systems

Models Phoenix/Hitec 412, 616, 824, 1232, 1648; Hitec 2480; Phoenix 2456 & 32/128

■ ANALYSIS

Inter-Tel Inc introduced a series of electronic key systems called Phoenix-Hitec in 1984. Depending on the dealer, the system will be called either Phoenix or Hitec. Both systems function identically. The only difference is the design of the electronic key telephones (EKT). The systems are designed for small- to medium-sized businesses needing 4 lines/12 stations up to 32 lines/128 stations. Data switching is available with the larger 2456 and 32/128 models. The 412 model offers as standard features speed dialing, on-hook dialing, and paging, as well as the optional "Door Mate." The Door Mate unit enables the user to monitor an unattended area from any telephone. Intercom calls can also be placed from the unit.

A summary of the models and their features follows. The 412 is an analog system using space division switching. It offers a maximum of 4 lines/12 stations. Any or all stations can be programmed to handle incoming calls. Direct station selection (DSS), handsfree operation, intercom, music-on-hold, paging, privacy, and speed dialing are basic features. The "Door Mate" option and power failure transfer enhance the system's list of features.

The Model 616 is a digital system. It has a maximum of 6 lines/16 stations. It offers all basic features plus an attendant console, and battery backup, as well as power transfer feature, message center, speaker phones, and station message detail recording (SMDR).

The other analog system is the Model 824. It has a maximum of 8 lines/24 stations. This system incorporates features in the 412 and 616, plus trunk queuing. The user has the option of telephone sets with a liquid crystal display (LCD) or the standard 824D electronic keyset.

The 1232 is a larger version of the 616, and is a digital system with a maximum of 12 lines/32 stations. The Phoenix Models 2456 and 32/128 are collectively referred to as the Hitec Model 2480 system. Their maximum capacities are 24 lines/56 stations and 32 lines/128 stations. They use the 2480 electronic key telephone and are capable of data switching. Direct Inward System Access (DISA) is available with these systems, allowing use of WATS and long-distance lines from outside the system. A system traffic analysis is available when used in conjunction with the optional printer.

Phoenix-Hitec technology, except for Models 412 and 824, is digital using time division switching, distributed processing, and stored program control. The proprietary telephones have microprocessors that handle various call processing functions.

The Phoenix-Hitec product line replaces Inter-Tel's previous MPK I and II, and SPK I and II series which first appeared in 1978. The Phoenix-Hitec line offers users advanced features housed in a small, streamlined system that is competitively priced with other key systems.

Competition in the small- to medium-sized key system market is intense, and Inter-Tel has achieved an impressive sales record so far. Its digital products join only a few others, in terms of technology. Perhaps some of Inter-Tel's biggest competition will come from AT&T's Merlin, which recently added 2 models, the 1030 and 3070. Inter-Tel plans a small system to compete with Merlin at the low end in mid-1985. The company doesn't see AT&T as a threat, and believes the established players will eventually squeeze AT&T out as a major contender. The company's major effort, for the present, is beefing up its service organization to dealers and distributors.

□ Strengths

The Phoenix-Hitec's ability to offer sophisticated features found usually in larger PBXs is an asset to its design. On-hook dialing, system-wide paging capabilities, monitoring areas with the "Door Mate" feature plus data switching provides a high level of efficiency and technology without forcing users into a larger phone system. Digital switching (except for Models 412 and 824) makes the product line unique among most of its peers, who use analog techniques. The Key Switching Unit (KSU) is compact, and requires minimal floor space. The largest model, the 32/

128, requires no more than 4 square feet for the KSU. The telephones are essentially intelligent terminals with their own microprocessors for station programming. Modular design makes the system easy to install and its solid state network provides years of maintenance-free service.

□ Limitations

The Inter-Tel product line covers the traditional key system marketplace very well, and in this capacity it has few rivals. Upgradability from smaller to larger systems requires the replacement of the main KSU, certain printed circuit boards, and telephone sets. Some systems are analog and some are digital. The company should concentrate on a uniform technology, although for most applications this will not present a problem. Only one system, the 824, has a telephone with digital display. This is an excellent feature, and could benefit users at the other line sizes, too.

■ SOFTWARE

□ Terms & Support

Terms • software provided as part of basic system • software bundled with system price • feature modules available separately.

Support • software is supported by Inter-Tel and authorized distributors.

□ Software Overview

Phoenix-Hitec software controls all system operations and provides features. Features are either built into the system or are user-programmable. Operating features are implemented in Read-Only Memory (ROM) while customer-programmable activities are performed in Random Access Memory (RAM). The central processor module provides up to 32K bytes of ROM storage, 6K bytes of RAM storage, an RS-232C port, music-on-hold circuitry, and battery backup for database protection.

□ Features Overview

Features are provided through the system's Printed Circuit Boards (PCBs) and are activated at the electronic key telephone (EKT). Systems come equipped with **Basic Features**. **Optional Features** can be installed initially, then activated as needed. For a detailed description of specific features, refer to the Glossary in section 1100 of this volume.

□ General System Features

Standard Features • automatic callback; automatic hold release; automatic timeout on intercom calls; battery backup; busy lamp field (BLF); distinctive ringing; direct station selection/busy lamp field (DSS/BLF); DTMF/dial pulse signaling; exclusive hold; external tone signals; flexible ringing; handsfree answerback on intercom; handsfree dialing and monitoring; hold; intercom tone/voice signaling; message waiting; multiline access; music-on-hold; night transfer; paging access; off-premises extensions; outgoing call restriction-0/1; outgoing call restriction-toll; privacy; power failure transfer; privacy with release; recall/flash button for feature access; single-line telephone access; system speed dialing; zone paging; diagnostic routines.

Attendant Console Option • Models 616, 1232, 1648, 2456, 32/128 • depending on system capacity, the attendant unit provides service for up to 32 lines/128 stations • an integral busy lamp field (BLF) indicates which stations are available:

\$600 to \$1,000 approx prch

Data Access Option • Model 32/128 • system can be configured for data switching by adding STN A and B circuits and COU 1 and 2 circuits:

500

Direct Inward System Access (DISA Option) • Models 2456, 32/128 • allows an off-premise telephone to access the system

APPROX PRCH: approximate purchase price. **NA:** not available; price not disclosed by vendor. Prices effective as of March 1985.

Inter-Tel Key Systems

Models Phoenix/Hitec 412, 616, 824, 1232, 1648; Hitec 2480; Phoenix 2456 & 32/128

and call an intercom number or access a C.O. line to place a call:

NA

Door Mate Option • Models 412 and 824 • monitors remote areas and serves as a talkback unit:

100 to 150

Message Center Option • Models 616, 1232, 1648, 2456, 32/128: centralized point where messages can be retrieved at a later time:

NA

Station Message Detail Recording Option • Models 616, 824, 1232, 1648, 2456, 32/128 • accumulates individual, department, system usage for subsequent processing • RS-232C output:

14,000 to 16,000

■ HARDWARE

□ Terms & Support

Terms • Phoenix-Hitec models are available for direct purchase or for 24/48-month lease plans • lease rates include maintenance • installation rates are separate from equipment cost • end-user pricing will vary based on costs such as distributor markups, discounts, and overhead; installation, maintenance, and training costs will also impact price.

Support • equipment supported by Inter-Tel and its dealers • training by Inter-Tel and dealers • maintenance by replacement.

□ Overview

The Phoenix-Hitec systems are digital systems with time division switching except for the analog Models 412 and 824. All systems use distributed processing with intelligent keyset terminals. The central processor is housed in the Key System Unit (KSU) and printed circuit boards (PCB) provide the system's feature capabilities. Depending on the size of the system, the central processor capacity is as follows: Models 616 and 1232 uses 24K-byte ROM and 2K-byte RAM, Model 824 has 48K-byte ROM and 14K-byte RAM, Model 1648 uses 36K-byte ROM and 12K-byte RAM, Models 2456 and 32/128 provide up to 32K-byte ROM and 6K-byte RAM. System capacities are 4 lines/12 stations for Model 412, 6 lines/16 stations for Model 616, Model 824 has 8 lines/24 stations, Model 1232 has 12 lines/32 stations, Model 2456 has 24 lines/56 stations, and Model 32/128 has a maximum of 32 lines/128 stations.

The KSU for all models contains the power supply, battery charger, PCBs and MDF (Main Distribution Frame). The MDF contains the RS-232C port, keyset connections, and equipment hook-ups for external paging and multifunction relays.

The PCBs which control and coordinate system functions for all Phoenix-Hitec models are the CPU PCB, COI or COU PCB, STN or KTI PCB, MOD PCB 5x12 Crosspoint Matrix PCB, Door Mate Matrix PCB and CNF PCB.

There is one CPU PCB (Central Processing Unit-Printed Circuit Board) per system. COI (Central Office Interface) or COU (Central Office Unit) provides circuitry for 4 C.O. lines. The COI also interfaces 12 keysets and interfaces with the 5x12 Crosspoint Matrix PCB. This PCB is used in the analog system 412 and 824. STN (Station Line) PCB has circuitry for up to 8 station sets. Depending on the type of STN board, keysets, industry-standard 2500 sets, and/or single-line electronic sets can be plugged into the system. KTI PCB (Key Telephone Interface) comes in either a 4-channel or 8-channel card in Models 412 and 824.

MOD I PCB is optional and contains the circuitry for DISA, remote access, and 2 DTMF decoding circuits for single-line sets. MOD II PCB provides the same features as MOD I plus circuitry for 3 external paging zones and 5 talkback speakers. There is also a night transfer contact to activate electrical devices. The 5x12 Crosspoint Matrix serves as a tie between KTSs and the C.O. lines. The optional Door Mate Matrix PCB adds the Door Mate feature to the system. The CNF PCB provides circuitry for up to four 3-way conferences and the DISA feature. It does not require connection to the MDF. Circuit boards plug into prewired

backplanes. System expansion occurs by adding more circuit boards.

Telephone sets currently used with the Phoenix-Hitec systems vary according to the capacity of the system. Key telephone sets are equipped with an 8-ohm speaker for handsfree operation. Direct station selector (DSS), 10-number speed dialing, station volume control, and toll restriction programming are handled through the telephone set. Data switching is available in Model 32/128 feature. The STN B and COU circuits are designated for the data line feature. Compatible equipment is then attached via applicable interfaces.

□ Representative System Configurations

Model 412: up to 4 lines/12 stations • **Model 616:** up to 6 lines/16 stations • **Model 824:** up to 8 lines/24 stations • **Model 1232:** up to 12 lines/32 stations • **Model 1648:** up to 16 lines/48 stations • **Model 2456:** up to 24 lines/56 stations • **Model 32/128:** up to 32 lines/128 stations.

Model 412 • control unit, basic features, Door Mate, 10-key telephones:

\$6,520 approx prch

Model 616 • control unit, basic features, Message Center, SMDR, 13-key telephones:

8,460

Model 824 • control unit, basic features, Door Mate, 20-key telephones:

14,290

Model 1232 • control unit, basic features, Message Center, SMDR, 28-key telephones:

19,270

Model 1648 • control unit, basic features, Message Center, SMDR, 48-key telephones:

34,000

Model 2456 • control unit, basic features, Message Center, SMDR, 56-key telephones:

42,500

Model 32/128 • control unit, basic features, SMDR, traffic analysis, 128 (Model 2480) key telephones:

51,495

□ System Components

KSU Model 412 • power supply and circuitry:

\$4,350 approx prch

KSU Model 616 • power supply and circuitry:

5,480

KSU Model 824 • power supply and circuitry:

9,250

KSU Model 1232 • power supply and circuitry:

11,430

KSU Model 1648 • power supply and circuitry:

18,650

KSU Model 2456 • power supply and circuitry:

23,430

KSU Model 32/128 • power supply and circuitry:

30,275

Battery Back Up • in case of commercial power outage:

720

DISA • Direct Inward System Access:

NA

APPROX PRCH: purchase price; price ranges are approximate and include installation. NA: not available; price not disclosed by vendor. Prices current as of March 1985.

Inter-Tel Key Systems

Models Phoenix/Hitec 412, 616, 824, 1232, 1648; Hitec 2480; Phoenix 2456 & 32/128

Door Mate Option:	150
Music On Hold:	260
Paging:	150
PCB • Printed Circuit Boards:	700
<input type="checkbox"/> Station Equipment	
Basic Electronic Key Telephone:	\$250 approx prch
Basic Electronic Key Telephone • equipped with emergency transfer capability:	375
DSS/BLF Unit:	725
Handsfree Module:	350

Model 2480 Telephones • used in system 2456 and 32/128:
400

Single-Line Electronic Telephones:
195

Subsystems

SMDR • Station Message Detail Recording:
\$14,000 to \$16,000 approx prch

System Maintenance & Diagnostics

System Reliability • power transfer in Models 412 and 824, battery backup on all other models for database, system memory, and station speed dial numbers.

System Diagnostics • self-diagnostic operations • major and minor alarms • audit trail generated on system printer • remote diagnostics • on-site diagnostics.

System Maintenance • performed by Inter-Tel or authorized distributor • maintenance by replacement • inventory of spare parts maintained by distributor.

System Management • features programmable at station • system console used in some models • CRT or printer used.

• END

IPC Technologies, Ltd DPX III Series

Models 100 DPX III, 160 DPX III & 1000 DPX III

■ PROFILE

Function • stored program distributed processing exchange (DPX) for switching voice and data.

Applications Supported • banking • brokerage • healthcare • hotel/motel • insurance • retailers • service sector • travel.

System Parameters • switching technology: digital switching using time division multiplexing (TDM) with pulse width modulation (PWM) • architecture: distributed processing tied to high-speed bus; nonblocking configuration (optional package required for DPX 1000 to become nonblocking); voice—analogue; data—digital • common control: stored program • transmission: single highway—each shelf in system has 208 time-shared channels (200 available for use) in conjunction with NonBlocking Network feature; 200 channels in system without NBN • wiring plan: 2-pair wire standard phones; 3-pair wire 64 IKS (Integrated Key Set); loop or ground start; type 1 E&M signaling on 2- and 4-wire tie lines • data switching capabilities: asynchronous at 300 to 9600 baud.

Traffic Capacity • 36 CCS/line (DPX 1000 requires NonBlocking Network feature) • grade of service: P.01 • simultaneous conversations: 100 DPX III-100; 160 DPX III-152; 1000 DPX III-100 without NBN, 800 with nonblocking architecture: yes (DPX 1000 requires optional package for nonblocking capability) • speed dial capacity: up to 5,000 numbers.

Trunks/Stations/Consoles • 100 DPX III—maximum 88 ports in any arrangement (ports can be any combination of lines, data lines, or trunks), 2 consoles per system; 160 DPX III—maximum of 152 ports, 2 consoles per system; 1000 DPX III—1,016 ports maximum, 4 consoles per system • trunks supported: FX, DID, ground start, loop start, OCC, tie, 2-wire E&M, 4-wire E&M trunks, WATS • attended and unattended operation.

Voice Equipment • vendor supplied: IPC 64 IKS Programmable Telephones, IPC 64 IKS+ • nonvendor equipment supported: standard 500 and 2500 telephone sets, message waiting telephone sets • electronic feature telephones: 64 IKS and 64 IKS+ Programmable Telephones.

Data Equipment • vendor supplied: none • nonvendor equipment supported: equipment that can be interfaced with any ASCII asynchronous RS-232C or RS-422 terminal • data rates: 9600 baud • modems; all types; only to access public network • interfaces supported: ASCII, RS-232C, RS-422 • printers: service



printers • data terminals: ASCII, TTY • computers: personal computers.

Subsystem Support • call detail recording: remote or on-site, RS-232C compatible • message center systems: consoles serve as message center • centralized attendant service • hotel/motel management systems.

Communications/Networking • abbreviated dialing • off-network dialing • on-network dialing • dialed digit translation • route optimization • tandem switching • transmission rates: 200 time slots and a single highway are available to all shelves in the system without NonBlocking Network feature; 200 time slots and a single highway are allocated to each shelf in system with NonBlocking feature • asynchronous to 9600 baud • local area networks.

First Delivery • 1983.

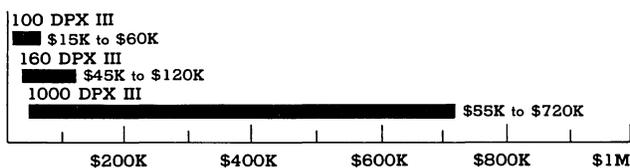
Systems Delivered • 500 (all types).

Installation Interval • 12 to 16 weeks ARO.

Comparable Systems • AT&T Dimension and System 75; Ericsson Prodigy and MD 110; Executone Eclipse; GTE Omni; Harris/Digital D1200; Hitachi DX; Mitel SX-100/-200; NEC NEAX 12A and 2400; Northern Telecom SL-1; Siemens Saturn II

PURCHASE PRICE RANGE

hardware & software



IPC TECHNOLOGIES DPX III PURCHASE PRICING bar graphs cover purchase price ranges between "small" and "large" configurations; installation and first year's maintenance included • 100 DPX III small configuration consists of 6 trunks/30 stations; 1 console; large configuration consists of 20 trunks/60 stations; 1 console • 160 DPX III small configuration consists of 18 trunks/70 stations; 1 console; large configuration consists of 25 trunks/130 stations; 1 console • 1000 DPX III small configuration consists of 20 trunks/80 stations; 1 console; large configuration consists of 90 trunks/750 stations; 3 consoles.

IPC Technologies, Ltd DPX III Series

Models 100 DPX III, 160 DPX III & 1000 DPX III

and III; Solid State Systems CEO and D-TEL; TIE/Communications Data Star.

Environmental Specifications • temperature: 32 degrees to 85 degrees Fahrenheit • humidity: 10% to 90% noncondensing • power: 120 VAC at 60 Hz, circuit should be separately fused and nonswitched • power drain: 100 DPX III—560 Watts; 160 DPX III—710 Watts; 1000 DPX III—2000 Watts • air conditioning: 100 DPX III—1900 BTU/Hour; 160 DPX III—(basic) 2400 BTU/Hour, with 64 IKS shelf—3900 BTU/Hour; 1000 DPX III—6830 BTU/Hour • dimensions: 100 DPX III—26x27x39 inches (DxWxH); 160 DPX III—26x27x71 inches (DxWxH); 1000 DPX III—26x27x83 inches (DxWxH) • weight: 100 DPX III—295 pounds; 160 DPX III—345 pounds; 1000 DPX III—420 pounds (fully loaded) • floor loading: 100 pounds per square foot • minimum equipment room dimensions: 100 and 160 DPX III—6x5x8 feet (DxWxH); 1000 DPX III with redundancy cabinet (5 cabinets)—6x12x8 feet (DxWxH).

Vendor • IPC Technologies, Ltd; 7336 Winthrop Road, Chester, CT 06412 • 203-526-9581.

Distribution • nationwide and worldwide through IPC and distributors.

Service/Support/Training • service, support, and training are provided nationwide and worldwide by IPC Technologies, Ltd • installation by IPC, distributors, or subcontractors • warranty 1-year parts and labor; minimum spare parts inventory required to troubleshoot a system • maintenance contracts available • local and remote maintenance.

■ ANALYSIS

The DPX III Series offers small to medium businesses a competitively priced, extremely reliable telephone system. IPC Technologies' dedication to providing a system whose components are designed for dependability as well as longevity ensures a DPX system that is worth the investment. System memory is capable of using a maximum of 512K with software package Version 5. Data handling capabilities allow digital transmission of information at speeds up to 9600 baud without the need for modems. A nonblocking network feature is available in all 3 DPX models—100, 160, and 1000. It provides a continuous path for voice and data communications throughout the system. Special cost-saving features, and the comprehensive service support program that backs all DPX models, rounds out the reasons why IPC's DPX III models are worth looking into when comparing telephone systems.

Mass volume commercial components with high-quality are selected for each system. The modular design, that makes extensive use of basic circuits and components, allows for ease of growth without the need for an overly complex system design. Printed circuit boards supply system memory, processing, and networking capabilities, as well as system and optional features. Diagnostic programs identify a problem down to the board level; malfunctions are corrected simply by replacing the defective board. This eliminates excessive downtime when a minor or major alarm occurs within the system. The top-end system, the 1000 DPX III, requires 512K bytes of memory to support Version 5, IPC's most current software package, while smaller models start at 32K bytes of RAM and increase this based on system requirements. The system has nonvolatile memory, implemented in EPROM and EAROM, which virtually eliminates reprogramming after a power failure.

IPC's DPX III with the Data Line Board option provides a cost-effective way for businesses to take advantage of the data switching capabilities within the system. Both RS-232C and RS-422 interfaces are acceptable to the system. Data can be transmitted at up to 9600-baud asynchronous over the nonblocking network. The system uses time-division multiplexing with pulse width modulation for switching voice and data. Modems are not necessary to transmit the digital signal through the switching network. A maximum of 4 data terminals can be interfaced per board. Terminals connect directly to Data Line Boards in the same manner as telephone stations connect to station circuit boards. Voice and data can travel simultaneously

over talk paths.

The 100 and 160 DPX have nonblocking capabilities incorporated in their design. The 1000 DPX requires the NonBlocking Network feature, which provides 200 time slots for each shelf as opposed to 200 per system in its normal configuration.

Special cost-saving features like Least Cost Routing and Call Detail Recording allow businesses to optimize their company's voice and data needs in relationship to the volume of traffic their system handles. It is capable of pinpointing areas of heavy usage to determine if additional support is needed.

The performance record of IPC systems is impressive. IPC states Mean Time To Repair (MTR) figures as follows: Minor System Failure (line or trunk)—15 minutes, Major System Failure (CPU replacement)—60 minutes. Users of the DPX III Series have repeatedly expressed how well IPC provides prompt, skilled service on all their models. The company encourages customer participation and supports the user continuously after installation of the system.

IPC (Interconnect Planning Corporation) was formed in 1973. IPC Technologies is a subsidiary of IPC Communications. The company established itself in the business community by providing Wall Street with its electronic key system, the EPBT (Electronic Push Button Turret System). The DPX product line was acquired from Chestel in 1980. The system was known at that time as the Citation CBX. It was subsequently changed to the DPX III Series, which today includes Models 100, 160, and 1000.

□ Strengths

The nonblocking network of the DPX III Series for both voice and data (1000 DPX needs an optional package installed to become nonblocking) is a significant enhancement when comparing telephone systems. The modular design allows for growth up to 1000 lines. System expansion occurs in 4-port increments. Ports can function as stations, data lines, or trunks, which eliminates the need to install specific equipment for these components. Ports can be assigned to a specific function. If changes are required, the equipment simply needs to be reprogrammed; nothing has to be replaced. This cuts down on equipment costs, while minimizing maintenance and programming requirements.

Integrated voice and data capabilities for the 1000 DPX are supported by IPC's IKS+ telephone, which connects data terminals directly into the system. Again, the simplicity of design enables the DPX to provide advanced operations without jeopardizing the system's reliability.

Service and support provided by IPC Technologies is highly praised by DPX III users. IPC provides dependable, prompt service as needed. The systems are competitively priced. Price per port is approximately \$650 to \$700, depending on the system's configuration and optional features.

□ Limitations

The DPX III Series offers users a basic telephone system with additional features like Least Cost Routing, Redundancy, Information Processing Center, Message Waiting, Speed Dialing, and data capabilities. The system design offers reliability but also limits it from features like Automatic Network Dialing, Satellite Operation, and Centralized Attendant Service.

The DPX Series does not offer true voice/data integration. The analog voice signal is not digitized within the system, as with most other "truly digital" switches.

Data communications support is limited to mostly low-speed devices. The maximum data speed supported is 9600 bps, which is far less than most of the competition. Although the company's IKS 64+ station sets have an RS-422/RS-232C interface built into the set, communications to the switch is both analog (voice) and digital (data), which requires 3-pair station wiring, rather than 2-pair as in newer digital telephones available. There is no interface to T1/D3 facilities, and no support for packet-switched X.25 networks such as GTE Telenet and Tymnet.

IPC Technologies, Ltd DPX III Series

Models 100 DPX III, 160 DPX III & 1000 DPX III

■ SOFTWARE

□ Terms & Support

Terms • generic program for DPX installed at manufacturing plant • cost of software included with basic system • optional features extra cost.

Support • DPX system software is supported by IPC Technologies Ltd • field-developed software is supported by individual dealer that authors the program.

□ Software Overview

DPX software is used to control operations, provide features, and conduct diagnostic tests. It controls the assignment of channels to ports on an as-needed basis. The software is stored in 3 different types of memory: Erasable Programmable Read Only Memory (EPROM), Electrically Alterable Read Only Memory (EAROM), and Random Access Memory (RAM).

The EPROM and EAROM are stored in nonvolatile chips. EPROM is installed at the time of system manufacture. EAROM supports on-site programming activities such as class of service. RAM components are programmed from the station and require reprogramming if there is a power failure. These 3 types of software storage are required for programming System Features, Attendant Features, and Station Features.

The internal diagnostic program provides online testing and monitoring of DPX performance. The use of LEDs (Light Emitting Diodes) provides accurate pinpointing of trouble within the system. Correction of a deficiency within the system is done on a board replacement basis.

□ Features Overview

All features are a function of various software releases. **Version 5** is the current implementation and supports all features in Versions 1 through 4 plus additional capabilities • DPX III Series generic software makes the following advanced features standard: automatic program load, data communication (1000 DPX only), DTMF/rotary conversion, message waiting, system forwarding, toll restriction • all versions will run partially or totally in all DPX III models • standard features are bundled into the system price.

□ DPX III Series System Features

General System Features

Standard Features • adjustable hold-recall enable (timed): calls on hold by attendant can be programmed to revert to attendant after 30 seconds • adjustable trunk parameter timing: the time allowed between dialing the access code and the first digit and each successive digit after • automatic emergency call: any station left off-hook for 40 seconds automatically rings operator • burst ringing: the ringing sequence begins immediately without waiting for next ring cycle • camp-on time adjustment: calls sent to station by console camp-on to a busy extension for an adjustable time period • console-less operation: station user can answer and process incoming calls • console: centralized attendant for incoming calls • dialing, rotary, or tone • distinct/discrete ringing: internal/external calls • DID intercepts: lines can be programmed to another station or console • direct-in-trunks: incoming line bypasses operator • direct inward dialing: incoming trunk call connects directly to station, bypassing attendant • direct inward system access: outside call can dial proper code to gain access to system facilities • executive override: permits the attendant or station to break in to an existing conversation-warning tone is signaled to parties before break-in occurs • extended ring before forward: predetermined number of rings before call will be forwarded • flexible numbering: allows first digit of a standard 3- or 4-digit numbering plan to be changed • hot lines: upon going off-hook, station will automatically ring any predetermined station • loop disconnect: interfaces with and provides a supervised loop circuit disconnect for up to 4 devices such as dictaphones, tandem OPX, etc • master number hunting: stations can be programmed in a master hunt group • message waiting: attendant can alert stations of a message • music on hold: interface to music source for calls

placed on hold • night answer, assigned/universal: predetermined station to answer calls after console has been turned off; any station can answer incoming calls • nonblocking • remote maintenance: a program for remote maintenance and diagnostics through an external customer-provided modem • simplified programming and maintenance package: keyboard data terminal with interface to enable programming in the field or remotely from system • variable parking orbit time adjustment: a call will remain in orbit 60 seconds, if not picked up reverts back to sending station.

NonBlocking Network Option • enables 1000 DPX III to become nonblocking, over 800 simultaneous conversations can be accommodated:

NA prch

Restriction Features

Standard Features • class of service: determines station accessibility to system features • incoming tie trunk restriction: prevents station users from accessing outbound tie trunk facilities • station restrictions: limited accessibility of system features by stations • toll restriction: 0/1 access code prohibited • trunk restrictions: prevents access to certain trunks by stations.

Controlled Outgoing Restriction Option • permits attendant control of outgoing calls by stations:

NA prch

3-Digit Toll Restriction Option • offers restrictions for up to 4 trunk groups:

NA

Call Accounting Features

Call Detail Recording Option • records and prints a copy of who made the call, what trunk was used, when call was made, how long it lasted, and where call was placed:

\$14,000 to \$16,000 prch

Information Processing Center Option • collects, analyzes, and organizes both voice and data call records into reports:

NA

Call Routing Features

Standard Features • attendant control of trunk group access: attendant controls access to trunks.

Least Cost Routing (LCR) Option • system automatically selects the least expensive route to place an outgoing call:

\$8,000 to \$12,500 prch

Data Features

Standard Features (Data Terminal) • break: "hook flash" displays menu to disconnect, transfer, or return • call back: used when a "busy" message is received • call extension: establishes data call to an extension • carriage return: the user enters "carriage return" twice to activate terminal; each data line board performs correct speed conversion for its own terminal • edit: changes the number of bits, parity, parity sign, and stop bits • help: lists and explains all user commands • list: will print baud rate, number of bits, parity, parity sign, and number of stop bits • transfer: sends calls to another extension.

Data Communications Option • provides interface support for asynchronous data terminals • capability available with Version 5 • modem pooling with public network • data speeds up to 9600-baud asynchronous • cost per line equipped:

\$650 to \$700 prch

Data Terminal Interface Option • connects data terminal to DPX station line • RS-232C and RS-422 interfaces:

500

PRCH: purchase price. NA: not available; price not disclosed by vendor. Prices effective as of December 1984.

IPC Technologies, Ltd DPX III Series

Models 100 DPX III, 160 DPX III & 1000 DPX III

Attendant Console Features

Standard Features • automatic camp-on (with recall): call sent to a busy station will camp-on to station; if not answered within predetermined amount of time, call returns to attendant • automatic hold: places call on hold when answering an incoming call or performing another operation • busy lamp: monitors station line status with a field display • cancellation of station call forward: attendant can cancel station call forward by dialing special code • destination release: attendant can cancel and redirect incoming call prior to the station answering • direct access: keys on console may be programmed directly to stations, parking orbits, zones, etc • page access key: direct access to paging circuit • parking orbit keys: up to 10 parking orbits can be accessed • pass back dial tone to restricted stations: enables restricted stations to dial outside the system through the attendant • selective hold retrieve: access to trunks or stations by using appropriate key • serial call: incoming caller wants to speak to more than 1 party; call can revert back to attendant upon completion of each call • speed dial: the console programs speed dial codes for system-wide use • split key: simultaneously places a call on hold and recalls previously held call • transfer to trunk: attendant can transfer an extension to a trunk • trunk control reserve: allows attendant to temporarily reserve a trunk for inbound calls only • intercept: all outbound calls can be directed by attendant to specific trunks • trunk disable: take a trunk out of system temporarily.

Station Features

Standard Features • call back: caller may dial special code to request busy station after it becomes free • call-back answer: if receiver hears the call-back signal while on the phone, the existing call can be placed on hold to answer the next call • call forward: station sends its calls to another location • call hold: station can place calls on hold • call pick-up: a station in a pick-up group can dial an access code to answer another call in the group • camp-on: a caller can camp-on a busy line • camp-on priority: automatically places call at the head of camp-on queue • conference: station can bridge other parties into a call • consultation hold: places 1 call on hold to consult with another call • dial access to any specific trunk: ability to directly access any trunk by dialing trunk code number • direct outward dial: access outside trunks without attending assistance • last number redial: system automatically redials last number dialed • message waiting: alerts station that attendant has message • page access: dial access to paging system • parking orbit: station can "park" a call; it can be retrieved from any phone in the system • speed dial: system disks frequently called numbers upon dialing special code • split: transferring between calls on the same line • station-to-station calling: stations can dial other stations • transfer: station can transfer incoming and outgoing calls to other stations • trunk access group: access to special service lines • trunk queue: station can dial designated code when trunk is busy; when trunk is available system rings that station • zone paging: 5 available zones for paging or ringing.

■ HARDWARE

□ Terms & Support

Terms • the DPX models are available for purchase or on a 1-, 2-, 3-, or 5-year lease • lease rates include maintenance • purchase prices include installation.

Support • equipment installed by IPC Technologies or authorized distributors • service and maintenance provided by IPC Technologies or authorized distributors • policies established by IPC.

□ Hardware Overview

All the DPX III models use distributed processing with digital time division multiplexing. Pulse width modulation is used for voice transmission. The systems are nonblocking with a single highway used to carry voice and data transmission. The initial cabinet within the DPX contains the CPU Shelf, the Basic Port Shelf, and 3 Auxiliary Shelves, IKS Shelves, or IKS/IKS Shelves in various combinations.

The CPU Shelf contains the System Processor that utilizes an 8080 microprocessor. It is equipped with a serial I/O port to interface any RS-232C terminal at 30 or 120 cps for administrative purposes (port diagnostics must be run at 300 baud). Auxiliary Memory is used in systems equipped with software Versions 3, 4, and 5 to store the generic program. RAM/PROM is required in all systems. All port-related memory is implemented in RAM/PROM. Each RAM/PROM board accommodates 8 port shelves (500 ports). A second board must be installed for additional ports. 32K RAM and 64K RAM are optional boards used when the Speed Dialing or Call Detail Recording features are activated. A battery backup is available, which retains information up to 6 hours in the event of a power outage. A Dual Console Interface is optional. It is required only on systems where a console is desired. The Master Clock is required and provides timing for all system audio paths. Quad Tone Decoder/Receiver is required for decoding tones or dial pulses. Each board contains 4 receivers and 4 DIP switches to identify each TD/R. A Quad DTMF generator is necessary whenever processor-controlled out dialing is required. It is also responsible for the Diagnostics program used in Versions 2, 3, 4, or 5. The Master Interface connects the CPU and the Group Interface boards. It converts the parallel command bus from the CPU into serial data and sends it out to all group interfaces.

The Basic Port Shelf supports stations, trunks, and consoles. Each Quad Line board accommodates 4 station circuits and interfaces with standard 500/2500 telephones. The Quad Trunk board provides ground start/loop start signaling. The Turnaround Repeater is used to regenerate and convert send timing to receive timing. This feature is not required with the NonBlocking Network feature. Quad 2-wire and 4-wire E&M tie trunk interfaces enable the DPX to connect to another DPX III or PBX. The RMOH board is equipped with the following circuits: page access, music on hold, 1 electronic ringer, and 2 90-volt ringers.

The IKS processor board communicates with the main processor, the group interface board, and the Quad IKS line boards. One IKS processor is used per IKS shelf (2 per IKS/IKS shelf when more than 8 IKS line boards are installed). It accommodates 4 station circuits; each circuit interfaces with one 64 IKS or 64 IKS+ phone. The NonBlocking Network board is optional.

□ Representative System Configurations

100 DPX III Configuration • single-cabinet system with 88 ports • 32 ports for IKS stations • 56 ports for analog stations and trunks • distributed processing • up to 2 consoles.

160 DPX III Configuration • single-cabinet system with 152 ports • 32 ports for IKS programmable telephones • 56 ports for analog stations and trunks • 64 additional ports that can have either 64 IKS or 2,500 telephone sets • distributed processing • up to 2 consoles.

1000 DPX III Configuration • multiple cabinet system with 1,016 ports maximum • 512K-byte memory maximum • up to 5 cabinets • redundancy • distributed processing • up to 4 consoles per system.

100 DPX III • 10 trunks/50 analog stations/10 IKS stations; single console: \$44,500 to \$50,200 approx prch

160 DPX III • 18 trunks/85 analog stations/25 IKS stations; single console: 87,600 to 98,700

1000 DPX III • 32 trunks/420 analog stations/60 IKS stations; 2 consoles: 331,500 to 373,200

□ Station Equipment—Voice/Data

Attendant Console • primary function to service incoming calls generated outside DPX III system • places outgoing calls • provides call status information: \$2,600 to \$2,900 approx prch

APPROX PRCH: purchase price; price ranges are approximate and include installation. Prices effective as of December 1984.

IPC Technologies, Ltd DPX III Series

Models 100 DPX III, 160 DPX III & 1000 DPX III

64 IKS • programmable electronic key set • 16 "soft" buttons for programming • microprocessor controlled • 4 special function buttons • display window:

_____ **350 to 400** _____

64 IKS+ • same as 64 IKS with interface RS-232C for data terminals:

_____ **450 to 500** _____

Data Communications Equipment

Simultaneous voice and data communication support at data speeds up to 9600-baud asynchronous between on-premise terminals or terminal and transmission facility • eliminates modem for internal communication • adds data without compromising voice communication • ASCII, RS-232C, RS-422 interfaces.

Data Line Board • any ASCII asynchronous RS-232C or RS-422 data terminal up to 9600 baud can connect either directly or through the IPC 64 IKS telephone:

_____ **\$250 to \$350 approx prch** _____

Peripherals

Service Teleprinter • instructs system computer when moves

and changes are performed • connected to equipment cabinet in local mode • can be used for remote DPX communications • lists traffic, extension, and trunk attributes:

_____ **\$1,150 to \$1,300 approx prch** _____

■ **SYSTEM MAINTENANCE & DIAGNOSTICS**

System Reliability • building block design techniques facilitate repetitive use of basic circuits in system • large scale integration reduces possibility of human error and improves Mean-Time-Between-Failure (MTBF) • printed circuit boards individually tested and burned in for 168 hours • minor failure MTTR is 15 minutes • major failure MTTR 60 minutes • redundant processing (1000 DPX III).

System Diagnostics • self-diagnostic program • system continuously monitors performance.

System Maintenance • provided by IPC Technologies Ltd or authorized distributor • inventory required for larger systems.

System Management • user and IPC manage and program systems • IPC Information Processing Center.

• **END**

ITT 3100 Series

Digital Hybrid Communications System Models 3100S, 3100M, 3100L & 3100D

■ PROFILE

Function • stored program computerized hybrid systems for switching voice and data.

Applications Supported • general business • health care • retailers • hotel/motel • banking • military • education • service sector.

System Parameters • switching technology: digital switching using TDM/PCM • architecture: distributed processing tied to high-speed bus; nonblocking configuration available • common control; stored program • transmission: 4-wire internal switching • wiring plan: stations—uniform 2-pair; attendant console—3 pair • data switching capability: 64K-bps full-duplex at station.

Traffic Capacity • 36 CCS per line (voice), 36 CCS per line (data) • grade of service: P.01 • simultaneous conversations: 96 maximum • nonblocking architecture: yes, up to 180 ports.

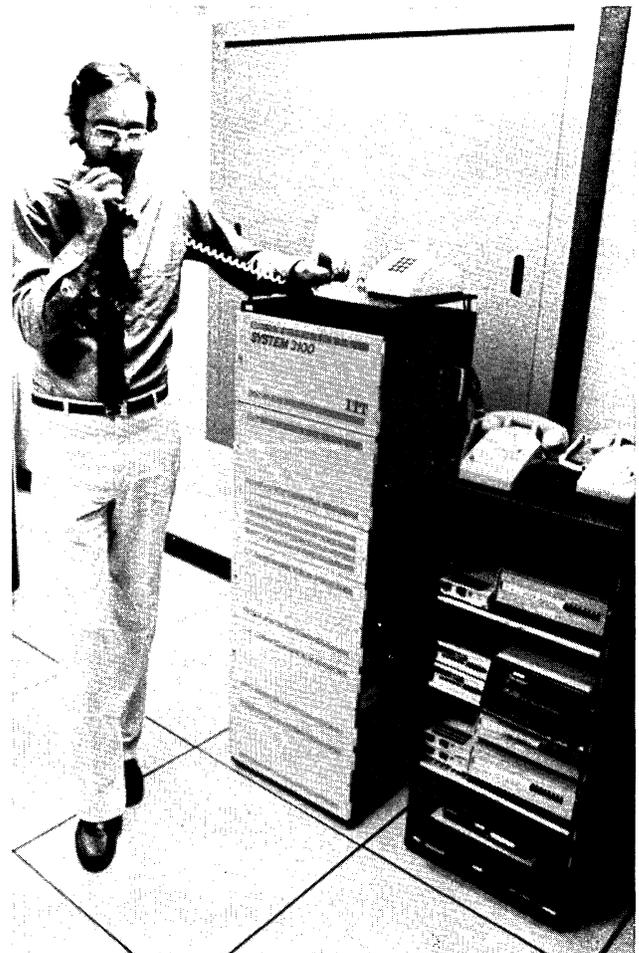
Trunks/Stations/Consoles • 3100S: up to 48 ports • 3100M: up to 144 ports • 3100L: up to 288 ports • 3100D: up to 288 ports • port configured as station, trunk, or console • up to 4 consoles • trunks supported: central office—1-way (in/out), 2-way; DID; FX; tie lines; OCC • attended and unattended operation.

Voice Equipment • vendor supplied: analog and digital telephones • nonvendor equipment supported: all rotary (500 type) and Touch-Tone (2500 type) telephones • electronic feature telephones: ITT 10- and 20-button electronic phones; 50-station DSS/BLF unit • digital telephones: none.

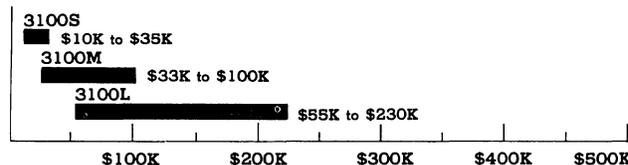
Data Equipment • vendor supplied: voice/data workstation; ITT Xtra Personal Computer; ITT Courier 9000 Series; ITT Qume terminals, printers • nonvendor equipment supported: terminals that support IBM 3270, BSC, ASCII • data rates: asynchronous 110 to 19.2K bps; full-duplex • modems: all types; modem pooling • multiplexers: all types • protocol converters: 3270, X.25 • data modules: data terminal interface (DTI) for standard phones • interfaces supported: RS-232C • printers: service printer; ITT Courier/Qume products • data storage: digital cassette unit, diskette subsystem, magnetic tape subsystem • data terminals: ASCII, TTY, 3270 • computers: minicomputers, personal computers.

Subsystem Support • call detail recording • hotel/motel management systems: interfaces to most management systems.

Communications/Networking • route optimization • tandem



PURCHASE PRICE RANGE hardware & software



ITT SYSTEM 3100 PURCHASE PRICING bar graph covers price ranges between "small" and "large" configurations; installation and first year's maintenance included • 3100S configurations range from 4 trunks/12 stations to 10 trunks/36 stations • 3100M configurations range from 8 trunks/40 stations to 20 trunks/120 stations; up to 4 consoles • 3100L configurations range from 14 trunks/60 stations to 40 trunks/240 stations; up to 4 consoles • configurations can vary due to port orientation of system • 3100D configurations range same as 3100L.

switching • satellite operation • protocols: X.25, BSC, ASCII • asynchronous to 19.2K bps • gateways: X.25.

First Delivery • 3100 (voice only): 1981; 3100D (voice and data): first quarter 1985.

Systems Delivered • over 2,000 systems, all models.

Installation Interval • 12 to 16 weeks ARO.

Comparable Systems • American Telecom Focus, AT&T Dimension 400 and System 75, Ericsson Prodigy, Executone Eclipse, GTE Omni SI, Harris/Digital D1200, Hitachi DX, IPC Technologies 160, DPX III, Mitel SX-200, NEC NEAX 2400, Northern Telecom SL-1S, Rolm VSCBX and CBXII, Siemens Saturn II, Solid State Systems D-TEL, TIE/Communications Data Star.

Environmental Specifications • temperature: 50 degrees to 80 degrees Fahrenheit (normal), 32 degrees to 122 degrees

ITT 3100 Series

Digital Hybrid Communications System Models 3100S, 3100M, 3100L & 3100D

Fahrenheit (maximum) • humidity: 30 to 60 percent (normal), 20 to 80 percent (maximum) • power: 117 VAX (+10% to 15%) at 60 Hz; 48 VDC (+17% to 8%); separately fused outlet 30-amp service per cabinet • air conditioning: not required • dimensions: each module—16.75x15x8.75 inches (WxDxH); up to 6 modules can be stacked per system • weight: 40 pounds each module; fully loaded system: 275 pounds • floor loading: 100 pounds per square foot • minimum equipment room dimensions: 8x10x8 (WxDxH) • FCC registration number: AS293P-69993-MF-E, ringer equivalence: 1.6A.

Vendor • ITT Business Communications Corporation; 300 East Park Drive, P.O. Box 4038; Harrisburg, PA 17111 • 717-564-4343.

Distribution • nationwide and worldwide through ITT direct sales offices and independent dealers and distributors • Canada through ITT Business Communications Division; 175 Dawson Road, Guelph, ON N1H 1A1 • 519-821-2000.

Service/Support/Training • service, support, and training by ITT or distributor • installation by ITT or distributor; subcontractors • warranty 1-year parts and labor; maintenance contracts available • local and remote maintenance.

■ ANALYSIS

The ITT System 3100 is a digital communications system that functions as both a PBX and a key system, hence its reference as a hybrid product. It uses distributed processing techniques with TDM/PCM switching to provide a system for voice and data applications in small to medium sized businesses.

Three versions of the 3100 are available: the 3100S, with 48 ports; the 3100M, with 144 ports; and the 3100L, with 288 ports. As with most port-oriented systems, a port can be configured as either a trunk or a station. A voice/data version, the 3100D, has been announced, and is expected to be ready for general delivery by the end of the first quarter 1985.

The 3100 supports all standard 500 and 2500 type telephones, plus a family of electronic telephones. Once the 3100D is available, terminal connections will be made through an Auxiliary Interface Device (AID) that can connect both a telephone and a terminal to a 3100 station line. The attendant console is similar in appearance to the AT&T-IS Dimension PBX console, and has an optional DSS/BLF unit for faster call completion.

The ITT telecommunications product line has undergone several significant changes over the past several years. In the late 1960s and early 1970s, ITT provided the crossbar TE-400 PBX product line, which achieved a high level of popularity among interconnect users. Moving into the electronic PBX area, ITT had 2 primary products, the TD Series and TCS-2. The TD Series included the TD-100, TD-200, TD-250, and TD-500, and supported lines sizes up to 512 stations. The TCS-2 filled the product gap up to about 6,000 stations. The TD Series was fairly successful; the TCS-2 had only a few takers. ITT's product line today includes the System 3100 for applications up to about 240 stations, and beyond that, there's no current medium- to large-scale product.

While the 3100 has been received more enthusiastically than any of the company's past offerings, it still is limited in its opportunities. Industry analysts are asking when ITT will unveil a large PBX product, as the competition in the medium- to large-scale market grows more intense. The company's approach is wait-and-see, specifically to see how events transpire over the next 12 months with other manufacturers like AT&T, Rolm, Northern Telecom, NEC, and others.

ITT touts the System 3100 as an integrated office switching hub, which implies a high degree of networking capabilities. The strategy is to attract smaller branch office locations to the 3100, get that office automated, then move to larger regional offices, and, ultimately, the headquarters location. The primary flaw in the strategy is the lack of a market for this particular kind of automated office. Usually, the headquarters location, or at the very least, a major regional office, will get upgraded first, and smaller locations simply don't have the need for sophisticated networking at this stage of the game. If smaller offices are indeed

upgraded for more sophisticated office applications, there should be a high level of compatibility among the various telecom systems. Most telecom professionals prefer to stick with a particular vendor for a multilocation network, simply because it's much easier to deal with a single point of contact, especially when frustration caused by the AT&T divestiture is at such a high level.

ITT says it is trying to get its act together at the low end first, before making a major commitment to the high end. The company has several choices in satisfying the need for a larger PBX: modify the powerful System 12 digital central office for end-user operations, develop and build an entirely new high-end system, or OEM, the PBX product of another company. The first is likely if suitable software can be developed in a reasonable time frame (12 to 18 months) and the price can be made competitive (\$800 to \$1,000 per line—fully equipped with digital station equipment). The second is unlikely, since ITT is too late into the large-scale digital PBX market, and development and testing lead times for a completely new system are typically 3 to 5 years. The third alternative is a good short term possibility, assuming the System 12 business version program materializes. ITT has been looking closely at the Rose digital system from CXC Corporation, but has not yet indicated its intentions. The Rose is a very sophisticated system, possibly too sophisticated for all but the most high-tech users, and could cause ITT's large-scale plans to fall through. Only a few Rose systems have been installed to date, and so far they have performed satisfactorily for voice applications. Naturally, to stay competitive with the rest of the marketplace, the system will have to be equally proficient with integrated voice and data applications. ITT needs to move faster than it says, because the competition will be busy selling and installing its larger systems, rapidly eroding ITT's potential marketplace.

Another possibility is the development of an expanded System 3100. The system is capable of expansion to at least 1,000 ports, owing in large part to its distributed architecture. This could be accomplished by speeding up the system's control processors, increasing the density of station/trunk circuit boards, and boosting the data speeds on the system's buses. Assuming that ITT is already developing this machine, it could be introduced as early as the third quarter of 1985, but certainly no later than the end of 1985, if ITT is to capture any additional market share.

The System 3100 is a good system for voice applications, and beta test sites of the 3100D have reported smooth operation so far. The next 6 to 12 months will be critical if ITT wants to remain a viable competitor in the entire range of PBX system sizes.

□ Strengths

The System 3100 is competitive in applications under 250 stations. Its modular design makes it easy to upgrade from the smallest to largest configurations with minimal downtime. The 3100 takes up very little floor space; additional modules are stacked vertically rather than horizontally. The system supports PCM switching, which means it will have no difficulty supporting high-speed T1 digital trunk facilities. It has a nonblocking architecture which is important particularly for data applications. Its cost is competitive with the rest of the industry for a fully digital system. Its ability to support key system functions makes it an effective competitor against products like the NEC Electra, Northern Telecom Vantage, and Iwatsu Omega, as well as the AT&T Horizon.

The 3100D data version appears to be working well so far; its data capabilities are operating as advertised. ITT's Courier and Qume product lines help round out the 3100's data support.

□ Limitations

Size is the primary limitation in the System 3100. Currently, ITT has no system available to satisfy applications over 250 stations, and this will hurt sales for the company. ITT is also in the throes of reorganizing its distribution for telecommunications products, and there is a great deal of uncertainty within the ranks as to job security. ITT has not been a major force in the PBX market for several years. They must take affirmative steps to correct this soon, or they might drop out of the end-user equipment marketplace altogether.

The System 3100 is fairly simple to configure, but this information

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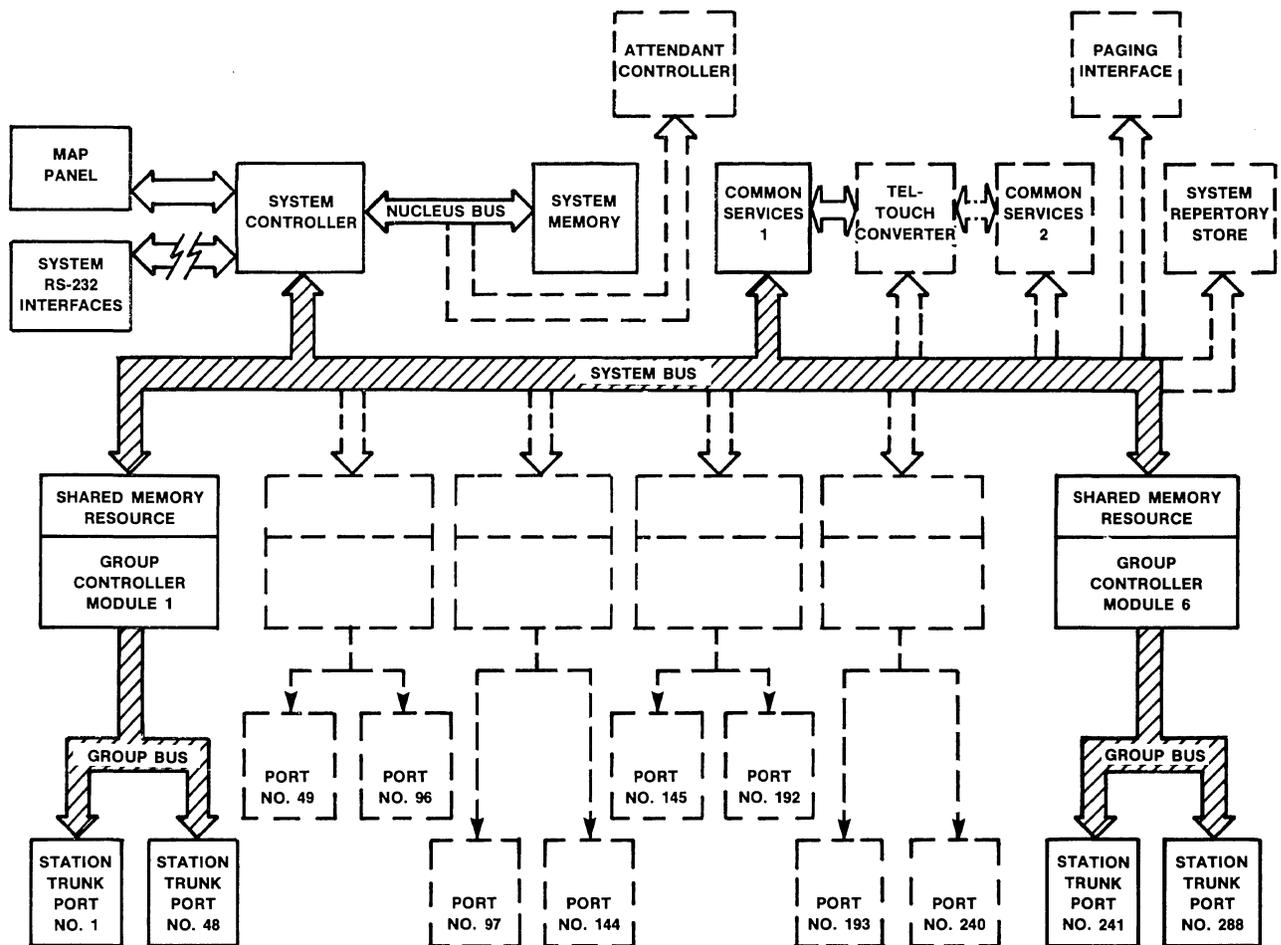


Figure 1 • System 3100L Functional Diagram.

is normally not within the end-user domain. The **no-standard syndrome** plagues the telephone industry, and ITT could improve its position among end users by making system configurators readily available, as well as accurate end-user pricing.

Interfacing data terminals to the 3100 is accomplished by a separate unit called the Auxiliary Interface Device (AID). This is the usual way of connecting terminals to digital PBX systems, and, as such, works fine. ITT currently does not have a digital telephone, i.e., one that digitizes voice at the set and sends a multiplexed signal carrying both voice and data information to the switch. The company has announced an integrated voice/data workstation, the Infostation, but the lack of a digital telephone is something the company should rectify this year, at the earliest.

■ SOFTWARE

□ Terms & Support

Terms • all software is bundled into the 3100 system price with the exception of optional features.

Support • ITT 3100 system software is supported by ITT and its associated dealers and distributors • field-developed software is supported by the individual dealer or distributor that authors the programs.

□ Software Overview

Software is used to control operations, conduct self-test functions,

and provide features. It should be noted that all features of the ITT 3100 family are software driven and targeted at 3 areas: (1) System Features; (2) Attendant's Features; and (3) Station Features. System software consists of the Operating System, Self-Test, and Configuration Tables.

The operating system defines major parameters and functions. The distribution of calls and methods of route selection and optimization is also controlled by the operating system.

The self-test provides online testing of system performance. Error table printouts are available upon request. System fault error codes are stored in memory and made available to local or remote access.

The configuration tables contain information unique to each 3100 installation. These tables may be changed or moved. The tables are used to define station characteristics and control assignments.

Diagnostic software is used to diagnose problems not found by the self-test programs. They are recorded serially on magnetic tape.

□ Features Overview

All features are a function of various software releases. Four releases are available: B.1.2, B.1.3, B.2.1, and B.2.2. Generic B.1.2 supports the 3100S and M; Generic B.1.3 adds remote programming/diagnostics, console, 10-digit toll restriction, least cost routing, and trunk queuing. Generic B.2.1 supports the 3100L, all features of B.1.3, plus SMDR for providing management reports. Generic B.2.2 adds DID, inward system

ITT 3100 Series

Digital Hybrid Communications System Models 3100S, 3100M, 3100L & 3100D

access, and off-network dialing. Integrated data support will be provided under Generic D.2.1, scheduled for release the first half of 1985. All releases will run partially or totally in all models. **All standard features are bundled into the system price.** Optional features are **extra-cost** items.

General System Features

Standard Features • attendant console: incoming calls all processed by attendant console • distinctive ringing: station ringing cycles signal type of call • flexible numbering of stations: stations can be numbered with either 3 or 4 digits • foreign exchange (FX) service: access to FX trunks • intercept treatment: calls to vacant or unassigned stations receive distinctive signal • line lockout with warning: stations left off-hook after predetermined length of time are first sent a howler tone, followed by release from the PBX • listed directory number (LDN) service: access to local C.O. trunks • multiple LDN: access to more than one local trunk group with indication at console • night service: after hours calls handled either by connecting trunks directly to stations or by dialing a special code to answer an incoming call • off-premises stations: connection for stations not located in same building as PBX • power failure transfer: prearranged stations are connected to trunks for service in a power outage • remote maintenance and testing service (RMATS): system provides real-time diagnostics for both user and system supplier • rotary dial calling: dial telephones supported • tie trunk service: access to tie trunks • touch-tone calling: tone dial telephones supported • touch-tone to dial pulse conversion: converts tone signals to rotary dial pulses for connection to rotary dial central offices • trunk answer from any station: night service feature, users answer incoming calls by dialing special code • WATS service: access to WATS trunks, both oncoming and outgoing.

Direct Inward Dialing Option • designated group of trunks that can complete incoming call directly to station without attendant assistance; 3100L only: _____ **NA prch**

Direct Inward System Access Option • provides direct access into CBX via trunk; user dials authorization code to access system features; 3100L only: _____ **NA**

Loudspeaker Paging Option • interface to customer-provided paging system: _____ **NC**

Music-On-Hold Access Option • interface to customer-provided music source: _____ **NC**

Recorded Telephone Dictation Access Option • interface to customer-provided telephone dictation system: _____ **NC**

Reserve Power Option • independent power source for temporary power during a short-term outage: _____ **NC**

Speed Calling Option • provides directory of frequently called numbers accessed by special dial code: _____ **NC**

Restriction Features

Standard Features • class of service: programmed codes that determine station access to specific features and facilities • fully restricted station: station permitted to make and receive calls from within 3100 only • inward restriction: DID calls blocked from completion to station; routed to alternate point • manual line service: attendant intervention required for all calls • toll restriction 0/1: outside calls requiring 0 or 1 prefix denied.

Area Code Restriction Option • permits or denies station user outside trunk based on 3-digit area code: _____ **NA prch**

Toll Restriction Option • permits or denies station user outside trunk access based on area code and local exchange (NXX) code: _____ **NA**

Call Routing Features

Standard Features • attendant control of trunk group access: controls station access to outside trunks.

Least Cost Routing (LCR) Option • provides automatic routing of outgoing calls over alternate customer facilities based on the Direct Distance Dialing (DDD) number; incorporates the functions of and replaces the code restriction and route advance features: _____ **NC prch**

Trunk Queuing (OTQ) Option • outgoing trunk calls to busy trunk group are placed in queue, then called back by system when trunk available: _____ **NC**

Call Accounting Features

Call Detail Recording Option • outputs the data on outside calls to printer, mag tape, diskette, or ITT 3100 application processor: _____ **\$14,000 prch**

Data Features (Planned for First Quarter 1985)

Data Communications Option • provides interface support for both asynchronous and synchronous data terminals • capability available with Generic D.2.1 software • data privacy: prevents other stations or attendant from interfering with data call in progress • modem pooling: provides for sharing of modems for both incoming and outgoing data calls • data speeds: up to 19.2K-bps asynchronous, 64K-bps synchronous; full-duplex • auto-call: 3100 automatically dials specific number when Request for Service activated: _____ **NA prch**

Network Features

Standard Feature • tie trunks: system supports dedicated lines connecting to other PBXs.

Attendant Console Features

Standard Features • alphanumeric display: allows attendant to process calls; identification of the source of an incoming or recalled call; calling extension class of service or trunk traffic group; called number or calling extension/trunk number • automatic recall: places call to busy extension after operator release • busy verification: check of off-hook condition on dialed line • camp-on busy: wait until off-hook condition ceases; place call when station idle • conference call: more than 2 parties speak together • digital clock • emergency trunk override: accesses busy trunk or station • hold: calling party or conference is placed in a position waiting for an internal party • intercept: automatically forwards call to attendant if the call station is vacant, down, or in use • paging access: attendant connected to paging system when PAGE button is depressed and lights • serial calls: initiates a series of calls for the same party • speed dialing: assigns abbreviated codes to selected stations • system alarm indication: indicates the existence of a system malfunction; steady for minor alarm, flashes for major alarm; audible alarm also sounds • tone silence: silence ringing at attendant's console due to arrival of incoming or recalled calls or system alarm • trunk connection: reinstate station user access to all trunk groups • 2-way splitting: alternates between calling and called party on a selected loop • universal cancellation of call forwarding and do-not-disturb; cancels call forwarding and/or do not disturb arrangements on a system-wide basis.

Direct Station Selection/Busy Lamp Field Option • permits direct pushbutton access to 100 stations: _____ **\$820 prch**

Message Waiting Service Option • remotely lights a lamp on a station to indicate message waiting: _____ **NA**

PRCH: purchase price. NA: not available; price not disclosed by vendor. NC: no charge. Prices effective as of January 1985.

ITT 3100 Series

Digital Hybrid Communications System Models 3100S, 3100M, 3100L & 3100D

Station Features

Standard Features • add-on conference: permits an internal extension to add one inside or outside call to an existing conversation • call hold: places call on hold • call park: places call on hold within CBX for retrieval at another station • call pick-up: stations can answer another phone either by dialing a code and the ringing extension, or by dialing the pick-up code and answering a ringing station in the same pick-up group • call transfer: station can transfer a call to another station • call waiting: station on a call can answer a second call after being alerted to the incoming call by a special tone • account coding: permits station to assign account code when placing call • direct outward dialing: permits station to originate outside call without operator • automatic camp-on: station user trying to reach busy extension dials code and stays on line until busy station frees up • camp-on callback: station user trying to reach busy extension dials code and hangs up; system calls back once busy extension frees up • do not disturb: prevents incoming calls to a station • executive override: designated stations can break into existing conversations or can override the do-not-disturb feature • forwarding: calls can be diverted to another extension • privacy: prevents calls from interruptions such as camp-on or barge-in tones • queuing: permits station to access busy trunk facility by dialing a code and either staying on the line (standby) or hanging up (callback) • station speed calling: users can program their extensions with up to 10 frequently dialed numbers • station hunting: calls to busy stations routed to alternate stations • station-to-station dialing: internal calls dialed without attendant assistance • system speed calling: users can access additional numbers stored in CBX memory • trunk select: stations can access specific trunk lines.

Application Software

ITT has installed the System 3100 in numerous environments. To date, ITT does not have specific software packages for applications such as hotel/motel, health care, or education. The system can function smoothly in most typical business and government environments.

HARDWARE

Terms & Support

Terms • System 3100 models are available for purchase or on a 1-, 2-, 3-, or 5-year lease • lease rates include maintenance • purchase prices include installation • system prices will vary among configurations, and are a function of the distributor overhead, markup, discounts, and costs for maintenance, training, and spare parts.

Support • equipment can be installed by ITT or its distributors • service and maintenance is based on the policies established by individual dealers and distributors.

Overview

The System 3100 includes 3 models, the 3100S, 3100M, and the 3100L. The system is port-oriented, which means a port can be assigned as either a trunk or a station. Specific ports can be assigned as 1 of up to 4 attendant consoles (the 3100S does not use a console). The 3100S provides 46 ports, the 3100M has 144 ports, and the 3100L supports up to 288 ports. The system uses distributed processing techniques, modular component design, and time division multiplexing with pulse code modulation (TDM/PCM) for the switching network. Up to 6 modules can be configured in the 3100, with each module stacked upon another.

The System 3100S is a 46-port model that uses 2 station/trunk modules to house the system circuit boards. System control is accomplished via a multiboard arrangement known as the Mini-Controller, which houses the CPU, memory, and operating features of the system. It can be easily field upgraded to the 3100M.

The 3100M is a 144-port system that contains a power supply, control module, and up to 6 station/trunk modules. Station and trunk circuits can be added in either 2- or 4-circuit increments. Attendant consoles can be provided with the 3100M. Upgrading to the 3100L is accomplished by replacing the system controller,

memory boards, and existing 2-circuit station/trunk boards with 4-circuit boards.

The System 3100L, with 288 ports, is the largest version of the product, and builds on a 3100M configuration.

A voice/data version of the 3100, the 3100D, has been announced, and is scheduled for general release during March 1985. Beta test systems are already working. Standard 3100 station cards are exchanged for voice/data cards that support data streams along with voice signals. Existing 3100s can be upgraded by replacing the circuit cards and updating the system software to Generic D.2.1.

System 3100 control functions are handled by the system controller and group controller. These functions each share a common memory resource and communication path via a high-speed parallel system bus. The system controller communicates, via a nucleus bus, with a dedicated system memory. The group controller communicates, via a group bus, with station/trunk circuits in each module. The system uses 2-level distributed processing. The system controller operates at the first level: the group controller operates at the second level. The system controller is a 16-bit microprocessor that supervises overall system operation through software program resident in system memory. It generates system timing and performs central processing functions. The group controller, also a 16-bit unit, performs all control functions associated with station/trunk circuits through software resident in the group controller's memory. All data required for station/trunk circuits is handled by the system controller through memory.

The System 3100 uses pulse code modulation (PCM) for internal transmission and switching. The analog voice signal on the station interface is encoded into an 8-bit PCM format. A codec (coder-decoder) converts the analog signals from the station/trunk interface to and from digital signals. The codec allows each station/trunk interface to function as an input/output port with analog information on the station or trunk side and digital information on the system side. In this way, digital information is processed the same, whether for station-to-station or for station-to-trunk calls. System advantages include nonvolatile stored program control to prevent program loss due to power failure; nonblocking traffic capability up to 288 ports; and dedicated pushbutton or dial code access. For internal transmission, 48 channels are multiplexed onto a 9-bit parallel, 192 time slot, time division bus. The group controller instructs the group controller modular time slot interchanger (MTSI) to output any 1 of the multiplexed channels during 1 of the 192 time slots. The MTSI is synchronized and controlled by the system controller.

System memory is implemented in EPROM (Erasable Programmable Read Only Memory) for program memory, RAM (Random Access Memory) for customer-entered system parameters, and EAROM (Electrically Alterable ROM) for database storage and system backup. The 3100S has a total of 48K bytes of memory, the 3100M uses 64K bytes, and the 3100L requires 128K.

Standard 500 and 2500 telephones are supported, as well as ITT proprietary 10- and 20-button feature telephones. The attendant console has an optional 50-station DSS/BLF unit for improved call processing.

Additional cabinetry is required for application processors, particularly for station message detail recording (SMDR).

Representative System Configurations

System 3100S Configuration • single-module system; nonredundant • 48K RAM memory • 6 trunks/22 stations; add-on DSS/BLF module • 16 single-line telephones; 6 10-button electronic telephones:

\$29,700 prch

PRCH: purchase price; price ranges include installation and first year's maintenance. APPROX PRCH: price ranges are approximate, and include installation and first year's maintenance. NA: not available; price not disclosed by vendor. Prices effective as of January 1985.

ITT 3100 Series

Digital Hybrid Communications System Models 3100S, 3100M, 3100L & 3100D

System 3100M Configuration • multiple-module system; nonredundant • 64K RAM memory • 12 trunks/86 stations; single console • 55 single-line telephones; 31 10-button electronic telephones:

63,560

System 3100L Configuration • multiple-module system; nonredundant • 128K RAM memory • 18 trunks/155 stations; single console with DSS/BLF • 130 single-line telephones; 22 10-button electronic telephones; 3 20-button electronic telephones; 4 handsfree units; ASR; SMDR:

112,250

System Controller Board • main CPU for system • 16-bit unit:

1,800

Group Controller Board • performs control functions for 48 ports per module:

1,650

Common Services Board • store/generate system supervisory and alerting tones, register and decode tone and pulse signals, set up conference calls, and distribute music sources to stations and paging equipment:

560

System Memory Boards • provide system operations, features, database storage, database backup:

1,800

Paging Interface Board • provides interface to customer providing paging source; up to 8 paging zones plus all-page:

600

System Repertory Store Board • provides up to 100 system speed dial numbers; up to 32 digits per number:

1,200

Tel-Touch Decoder Board • decodes DTMF signals from touch-tone telephones:

1,200

DC-to-DC Converter Board • provides DC voltage to circuit boards within a module:

650

Power Failure Transfer • automatically connects designated trunks and stations for emergency service during a power outage:

540

Power Supply • provides DC power for system • 1 unit required for 144 ports or less; over 144 ports requires 2 power supplies:

965

Station Circuit Board • provides analog station line; includes codec for conversion analog to digital; 4 circuits per board:

700

Digital Station Circuit Board • provides digital station line; supports up to 19.2K-bps asynchronous or synchronous speeds; 4 circuits per board:

1,675

Trunk Circuit Board • connects to standard C.O. trunk, WATS, OCC trunks; includes codec for analog to digital conversion; 4 circuits per board:

715

4-Wire E&M Tie Trunk Circuit Board • connects to 4-wire tie trunk; 2 circuits per board; supports E&M signaling:

1,350

DID/2-Wire E&M Tie Trunk Circuit Board • connects to DID trunk equipped with tip/ring reversal; also connects to 2-wire E&M trunk; 2 circuits per board; must be either DID or tie, no combination:

1,450

Attendant Controller Board • provides control signaling for up to 4 attendant consoles:

1,325

Station Equipment—Voice/Data

Attendant Console • primary function to service incoming calls, place outgoing calls • provides information on call status and types of calls handled • LED indicators for call status • clock, calendar display • desktop unit • optional DSS/BLF unit with 100 buttons for stations, 5 buttons for 100s groups of stations • message waiting capability available with DSS/BLF.

Console Only:

\$3,175 prch

DSS/BLF Unit:

820

Standard 2500-Type Telephones:

Single-Line:

85 to 170 approx prch

6-Button Set:

150 to 270

10-Button Set:

250 to 350

20-Button Set:

490 to 560

Single-Line Message Waiting:

130 to 195

Electronic Multibutton Telephones • single-button access for stations, features • touch-tone pad • call announcer for voice paging • optional speakerphone version for handsfree use • volume control • optional 50-station DSS/BLF module equipped with 10 programmable feature buttons.

10-Button Electronic Telephone:

365 prch

20-Button Electronic Telephone:

475

10-Button Handsfree Telephone:

580

20-Button Handsfree Telephone:

690

Add-On DSS/BLF Module:

495

Data Communications Equipment

Data Switching • supports data speeds up to 19.2K-bps asynchronous • implemented through software Generic D.2.1 and replacement of analog station cards with digital station cards • higher data speeds implemented in subsequent system upgrades: 64K-bps synchronous communications, gateways to X.25 and other protocols.

Auxiliary Interface Device (AID) • connects data terminals to 3100D • choice of connector: RS-232C or RS-422 • connects 10- or 20-button electronic telephone to terminals:

NA prch

Infostation • integrated voice/data workstation • feature telephone • programmable feature buttons • CRT display • detachable keyboard with programmable soft function keys • system software:

1,000

ITT Xtra Personal Computer • available either with monochrome or color display • 16-bit 8088 microprocessor • 128K bytes of RAM, 32K bytes of ROM, 360K bytes of diskette storage • expansion slots • 1 serial RS-232C and 1 parallel interface • ITT Courier DOS 2.11 operating system.

Xtra with Monochrome Display:

2,995

Xtra with Color Display:

3,425

ITT 3100 Series

Digital Hybrid Communications System Models 3100S, 3100M, 3100L & 3100D

10M-byte Winchester Disk:

2,390

128K RAM Upgrade:

NA

ITT Courier 9000 Series Display Terminals • complete family of IBM-compatible terminals • support IBM 3278/3279/3178/3179/3180 units • full range of features and options:

1,900 to 3,600 approx prch

Peripherals

ITT Courier Printers • the system 3100 can connect to a large family of ITT serial matrix printers, the 93XX Series • 132 columns; variable line spacing; variable character pitch • bidirectional printhead • 55 cps to 400 cps, depending on model:

\$725 to \$8,100 approx prch

Subsystems

Station Message Detail Recording (SMDR) • separate applications processor to accumulate SMDR data collected by 3100 for processing into reports • 15,000 call records supported on disk • adjunct printer • software:

\$14,000 prch

Maintenance and Administration Panel (MAP) • provides capability for programming system features; updating feature lists; running diagnostic routines; troubleshooting • 16-character LED display:

NA

System Maintenance & Diagnostics

System Reliability • main system functions stored on EPROM; restored upon power-up • diagnostic, error detection, and recovery routines stored in ROM • battery backup or uninterruptable power supplies available to keep system operational during power outage • power failure transfer connects designated trunks to stations automatically upon power outage.

System Diagnostics • Dimension continuously runs diagnostic routines on all system operations • alarm signal notifies attendant of minor or major outage in system • alarm lamps in equipment cabinets provide alert to major component malfunctions • system diagnostics can be queried remotely via Remote Maintenance and Testing Service (RMATS).

System Maintenance • normally performed by ITT or distributor personnel • Maintenance and Administration Panel (MAP) used for troubleshooting and querying system for internal performance; available for users, but normally used by ITT or distributor technicians • most repairs corrected in field by replacing circuit boards • system performance data collected by ITT or distributor for diagnosis prior to making field visit.

System Management • calling details available as raw data for further processing (SMDR) or detailed management reports for management analysis • feature changes made via MAP • moves and rearrangements made via MAP.

• END

Mitel PBX Family

Models Super 10, SX-10, SX-20, SX-100, SX-200 & SX-2000

■ PROFILE

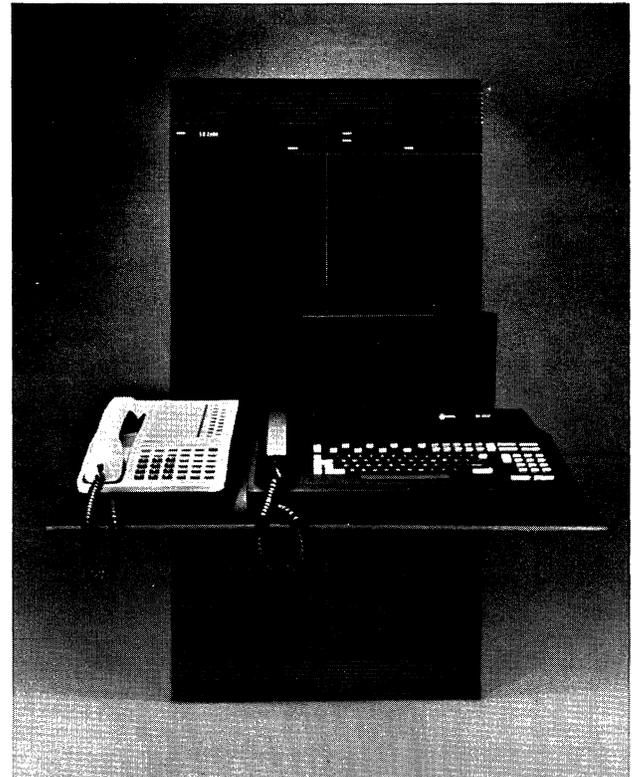
Function • stored program computerized private branch exchange (PBX) systems for switching voice and data.

Applications Supported • office automation; word processing; dictation; facsimile • health care • retailers • telephone operating companies • hotel/motel • private homes • service sector.

System Parameters • switching technology: analog switching technology using Space Division Switching on all models except SX-2000; digital switching technology using Space and Time Division/PCM for the SX-2000 only architecture; SX-10, Super 10, SX-20—centralized processor tied to PAM matrix; SX-100, SX-200—centralized processor tied to high-speed bus; SX-2000—distributed processing tied to high-speed bus; nonblocking configurations available • common control: stored program • transmission: SX-10, Super 10, SX-20—2-wire; SX-100, SX-200—2-wire; SX-2000—4-wire internally switched • wiring plan: stations—uniform 4-pair • data switching: SX-100/200—up to 9600-bps asynchronous/synchronous using modems; SX-2000—up to 64K-bps synchronous and 19.2K-bps asynchronous full-duplex.

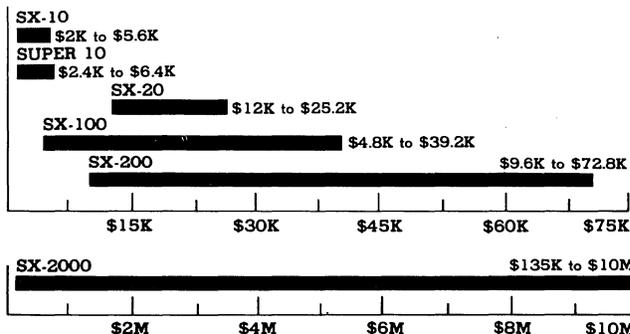
Traffic Capacity • SX-10 and Super 10—7 CCS per line (16 lines); SX-20—7.2 CCS per line (24 lines); SX-100/200—7.5 CCS per line (100 lines); SX-2000—12 CCS per line (voice), up to 36 CCS per line (data) • nonblocking configuration: available for data with SX-2000.

Trunks/Stations/Consoles • SX-5: 2 trunks; 6 lines • SX-10: 2 to 8 trunks; 8 to 16 lines • Super 10: 2 to 8 trunks; 8 to 16 lines; 1 attendant console • SX-20: 8 or 12 trunks; 48 or 72 lines • SX-100: up to 56 trunks; up to 112 lines; 1 attendant console • SX-200: up



PURCHASE PRICE RANGE

hardware ██████████



MITEL PBX FAMILY PURCHASE PRICING bar graphs cover price ranges between "small" and "large" configurations for hardware only; installation and maintenance are not included • pricing represents an approximation of distributor price ranges • SX-10 small configuration consists of 2 trunks and 8 stations; large configuration consists of 8 trunks and 16 stations • Super 10 small configuration consists of 2 trunks and 8 stations; large configuration consists of 8 trunks and 16 stations • SX-20 small configuration consists of 12 trunks and 48 stations; large configuration consists of 8 trunks and 72 stations • SX-100 small configuration consists of 4 trunks and 16 stations; large configuration consists of 28 trunks and 112 stations • SX-200 small configuration consists of 8 trunks and 32 stations; large configuration consists of 52 trunks and 208 stations • SX-2000 small configuration consists of 10 trunks and 150 stations; large configuration consists of 1500 trunks and 10,000 stations.

to 104 trunks; up to 208 lines; 1 attendant console • SX-200 with Generic 1000: up to 480 ports; maximum 144 data ports; maximum 12 attendant consoles • SX-2000: 50 to 2,500 trunks; 150 to 10,000 lines; unlimited consoles • trunks supported: central office—1-way (in/out), 2-way; DID; FX; tie lines; OCC; CCSA • attended and unattended operation (all models).

Voice Equipment • vendor supplied: analog and digital telephones • nonvendor equipment supported: all rotary (500-type) and touch-tone (2500-type) telephones • electronic feature telephones: Superset 3; Superset 4.

Data Equipment • vendor supplied: Superset 7 workstation/console for SX-2000; Dataset 1 module with RS-232C; Kontakt voice/data workstation • nonvendor equipment supported: terminals that support ASCII, TTY • data rates: up to 9600 bps with modems; 9600-bps synchronous and asynchronous (SX-200 with Generic 1000, SX-2000) • modems: all types; modem pooling (SX-2000, SX-200 with Generic 1000) • multiplexers: all types • protocol converters: X.25 • data modules: Dataset 1 • interfaces supported: RS-232C • printers: service printer • data storage: floppy diskette; hard disk, depending on application • data terminals: ASCII, TTY • computers: minicomputers, personal computers, word processors.

Subsystem Support • call detail recording: Dialed Activity Reporting Terminal (DART).

Mitel PBX Family

Models Super 10, SX-10, SX-20, SX-100, SX-200 & SX-2000

Communications/Networking • automatic route selection • tandem switching • main/satellite service • uniform call distribution • CCSA access • route advance.

First Delivery • SX-10: 1981 • Super 10: 1981 • SX-20: 1980 • SX-100: 1979 • SX-200: 1978 • SX-2000: 1983.

Systems Delivered • to date, Mitel has installed over 60,000 systems worldwide.

Installation Interval • SX-10/20: 2 to 4 weeks ARO • SX-100/200: 12 to 16 weeks ARO • SX-2000: 12 to 16 weeks ARO.

Comparable Systems • competition for the Mitel SX-10/20: AT&T Horizon; Rolm VSCBX; Tele/Resources TR-32; ITT 3100; GTE Omni SI; TIE CX128/1648; Iwatsu Omega III/IV; Toshiba Strata III; NEC Electra; Executone Gateway • competition for the SX-100/200: AT&T Dimension 400; American Telecom Focus; GTE Omni SI/II; ITT 3100; Siemens Saturn II/SD-192; Rolm VSCBX; TIE CX128; Northern Telecom SL-1 • competition for the SX-2000: AT&T System 75/85; Anderson Jacobson IOX; CXC Rose; Ditrax 580 DSS; Ericsson MD 110; Executone Summit; GTE Omni SIII; Harris D1200; InteCom IBX; NEC NEAX 2400; Northern Telecom SL-1; Siemens Saturn III; United Technologies/Lexar UTX; Ziel PNX.

Environmental Specifications • temperature: SX-10/20, Super 10—32 to 104 degrees Fahrenheit; SX-100/200—41 to 104 degrees Fahrenheit; SX-2000—32 to 122 degrees Fahrenheit • humidity: SX-10/20, Super 10—10 to 90 percent; SX-100/200—20 to 80 percent; SX-2000—5 to 95 percent (noncondensing) • power: SX-10/20, Super 10—100 to 130 VAC at 47 to 63 Hz; SX-100/200—115 VAC at 60 Hz; SX-2000—220 to 240 VAC at 50 to 60 Hz • air conditioning: SX-10/20, Super 10, SX-100/200—not required; SX-2000—required • dimensions: Super 10—22x11x5 inches (WxDxH); SX-10—14x7x22 inches (WxDxH); SX-20—16x8x22 inches (WxDxH); SX-100—25x19x17 inches (WxDxH); SX-200—24x28x38 inches (WxDxH); SX-2000—34x29x69 inches (WxDxH) • weight: Super 10—10 pounds; SX-10—60 pounds; SX-20—85 pounds; SX-100—100 pounds; SX-200—300 pounds; SX-2000—850 pounds • floor loading: Super 10, SX-10/20—wall mounted; SX-100—40 pounds per square foot; SX-200—75 pounds per square foot; SX-2000—100 pounds per square foot • minimum equipment room dimensions: SX-100/200—8x8x8 feet (WxDxH); SX-2000—8x10x8 feet (WxDxH).

Vendor • Mitel Corporation; P.O. Box 13089, 350 Legget Drive, Kanata, ON K2K 1X3 • 1-800-267-6200 • U.S.—Mitel, Inc; 5400 Broken Sound Boulevard, Boca Raton, FL 33431 • 1-800-327-2401.

Distribution • nationwide and worldwide through direct sales offices and distributors • United States through Mitel Inc Boca Raton, Florida; England through Mitel Telecom Ltd; France through Mitel France; Japan through Mitel Japan; Far East through Mitel Asia Ltd; Middle East through Mitel Africa Ltd.

Service/Support/Training • service, support, and training by authorized distributor or telephone company • installation by distributor, telco, or subcontractor • 1-year warranty on parts and labor; maintenance contracts available • local and remote maintenance.

■ ANALYSIS

Mitel's PBX family encompasses telephone switching systems for predominantly small applications to very large applications. Medium to very large applications will be satisfied by the SX-2000, with small to medium applications handled by the SX-100/200. The PBXs can support any AT&T proprietary telephone (either rotary or touch-tone) in addition to Mitel's own proprietary stations. The models consist of single-card systems to upgradable cabinet configurations packaged according to individual customer requirements. Station capacity ranges from 10 to over 10,000.

The firm has made a major impact on the U.S. telecommunications market since 1977. The delay of its SX-2000 product for the large PBX market and the subsequent loss of an IBM connection to rival Rolm Corporation hurt the Superswitch image somewhat, but Mitel appears to be in a comeback mode. The

recent announcement (October 4, 1984) of the upcoming Generic 1000 package for the SX-200 product line is one of the most innovative approaches to product line upgrading ever in the telecommunications market. Generic 1000 is intended to convert the existing base of SX-100/200s to digital PBXs and increase the line size potential to 480 stations from the present maximum of 208. The primary advantage in developing Generic 1000 is the 35,000 presently installed SX-100/200 systems. This vast installed base can now be upgraded to meet user requirements for voice/data switching and continue to grow to the 480-station size. Mitel hopes to capitalize on Generic 1000 and breath new life into its present base by expanding the capability of its present product line. The Generic 1000 is slated for July 1985 availability.

The long-awaited Mitel SX-2000 is now available and Mitel is entering the marketplace by signing distributors of the product. RCA Telephone Systems, a major Mitel distributor in the U.S., recently signed a \$200 million commitment with Mitel for distribution of the SX-2000 and SX-200 product lines. The SX-2000 is a potential market leader but its Release 1.0 version with up to 3,000 lines (SX-2000 SG) is limited when compared to other systems in that line size. The system is designed to provide cost-effective communications in the 250- to 3000-line range and offers office automation features in support of an integrated electronic office. Future releases of the SX-2000 will incorporate additional features as well as the SX-2000 MG (Multi-Group) for upper line ranges of 2500 to 10,000 stations.

The SX-2000 is designed to support office automation using Mitel Superset telephones, Kontakt workstations, and Dataset data interface modules. In addition to proprietary instruments, the SX-2000 interfaces with standard 500 and 2500 type telephones. The distributed architecture and modular design of the SX-2000 should make it a major force in the PBX marketplace if all the planned software/hardware enhancements bring it up to par with the competition.

The SX-2000 is a 1- to 8-cabinet, redundant system. System control consists of distributed 16-bit microprocessors with 64K-byte RAM chips for workspace and a bubble memory for the operating program and data storage. When the system is purchased with the redundancy option, the memory and processor numbers are doubled. The system can support from 150 to over 10,000 stations, and multiple attendant consoles supplied by Mitel. The SX-2000 is a dynamic system, and its operating system varies with each system configuration. Because the system uses the Motorola 68000 microprocessor, the memory can range into the millions of bytes. The system is targeted for medium to very large applications with medium to large growth patterns.

The Mitel SX-100/200 product line is Mitel's workhorse and boasts an installed base of over 35,000 systems in the U.S. The SX-100 is a single-cabinet, nonredundant system. System control consists of an 8-bit microprocessor with 176K bytes of memory (16K-byte RAM and 160K-byte PROM). The system can be expanded to 112 stations and 56 trunks without reconfiguration, and can accommodate an optional attendant console, which is supplied by Mitel. It is targeted for medium applications with medium growth patterns.

The SX-200, Mitel's original PBX product, is a 1- or 2-cabinet, nonredundant system. System control is identical to that of the SX-100. The system can be expanded to 208 stations and 104 trunks without reconfiguration, using up to Generic 217 software, and can accommodate an optional attendant console, which is supplied by Mitel. Generic 1000, the newest version, will support up to 480 stations, with 144 nonblocking voice/data terminations included, and up to 12 attendant consoles. The systems are targeted for medium applications with medium-to-large growth patterns.

Mitel also offers 3 small systems that can be configured as PBXs, key telephone systems, or a combination of both (hybrid). They are the Super 10, SX-10, and SX-20.

The Super 10 is a single-board system housed in an attendant console. It offers all the features of the SX-10. It also is not expandable, however, additional Super 10s can be used in a single installation. System control is identical to that of the SX-10. The system can be expanded from a minimum of 8 stations and 2

Mitel PBX Family

Models Super 10, SX-10, SX-20, SX-100, SX-200 & SX-2000

trunks to a maximum of 16 stations and 8 trunks without reconfiguration, and is targeted to very small business with small growth patterns.

The SX-10 is also a single-board system. It is not expandable, however, additional SX-10s can be used in a single installation. System control consists of an 8-bit microprocessor with 68K bytes of memory (4K-byte RAM and 64K-byte PROM). The system can be expanded from a minimum of 8 stations and 2 trunks to a maximum of 16 stations and 8 trunks without reconfiguration, and is targeted to very small business with small growth patterns and for home use.

The SX-20 is a single-cabinet, nonredundant system. The cabinet is small enough (weighs just 29 lbs) that it can hang from the wall. System control consists of an 8-bit microprocessor with 68K bytes of memory (4K-byte RAM and 64K-byte PROM). The system can be expanded from a minimum of 48 stations and 12 trunks to a maximum of 72 stations and 8 trunks without reconfiguration, and can accommodate an optional attendant console. The console is not supplied by Mitel, however, it may be compatible with any 6- or 10-button key set. A remote status display is also available to indicate the system status at a distance of up to 500 feet from the cabinet. It is targeted for small-to-medium applications with medium growth patterns.

Mitel also manufactured 2 smaller systems, the TalkTo (formerly the SX-2) and the SX-5. The SX-2 is now manufactured and marketed, along with several other low-end systems, by Trillium Telephone Systems, a spin-off of Mitel, which owns approximately 70 percent of the new firm. The SX-2 is now known as the TalkTo 109, and joins the larger TalkTo models, the 308 and 616. The SX-5 is a single-board system that supports up to 6 stations and 2 lines, and is also manufactured by Trillium.

Contact is Mitel's answer to the AT&T BCT 515, Rolm Cypress, and Northern Telecom Displayphone. It is an integrated, multifunctional workstation with the capability to support both voice and data. It requires only 2 wires (1 pair) for connection to the PBX; it can also be used in a standalone environment with its internal modems and IBM 3270 protocol emulation or Digital Equipment Corporation VT100 emulation. It contains a 12-inch (diagonal) CRT screen with an integrated diskette drive; an optional 500K-byte diskette can be added for additional storage. The system is targeted at 3 distinct environments: executive workstations, workstation for administrative assistants, and micro-networking. Currently available software for Contact is ExecuCalc for executive business planning; ExecuWrite for word processing facilities; and ExecuBasic for basic program generation.

Mitel is a Canadian-based company, which started operations in 1973 and now has offices located throughout the world. Mitel's primary product line is PBX equipment, and the company excels in manufacturing, engineering, and marketing these systems. Mitel has been listed on the New York Stock Exchange since 1981 and until 1983 showed large growth and profit (1981/210%; 1982/99%). The delay of the SX-2000 product and increased R&D cost associated with the system have resulted in losses and cutbacks for Mitel. This situation is expected to be temporary, however, and the company anticipates substantial forward movement as the SX-2000 gets into full production and Generic 1000 enters the marketplace. Mitel is estimated to have more EPABXs in service than any other manufacturer.

□ Strengths

Mitel's greatest strength is its excellent product line. Those who have installed Mitel PBX systems (and over 60,000 users can't be wrong) are very satisfied with their decisions. Mitel's development of Generic 1000 (at a cost of almost \$100 million) is perhaps the greatest stroke of genius seen in the PBX industry for some time. With over 35,000 SX-100/200 systems installed, Mitel has ensured the likelihood of these systems remaining in place, rather than switching over to another voice/data system.

The company's PBX systems have an extensive list of features, which will satisfy all but the most finicky user. Mitel also covers a broad size range, going from 8 stations to 10,000, with a rich feature mix throughout each system. It is just as easy to imagine a Mitel system in a private home as in a corporate headquarters

building. The systems are relatively easy to install and are priced very competitively. They are easy to maintain, and parts are readily available throughout the U.S.

Mitel is banking heavily on the acceptance of its SX-2000, and the early installations appear to be working well. After the system's delayed introduction, which some in the industry say cost Mitel a cozy relationship with IBM, it is living up to its promises, although the larger version, the SX-2000 MG (Multi-Group), is not yet available. Voice and data integration is running on several of the systems and performs very satisfactorily.

The company's workhorse, the SX-100/200, continues to satisfy users, and the new Generic 1000, scheduled for July 1985, will be well worth the investment. Current users planning on the Generic 1000 upgrade should be prepared to pay only about \$12,000 to \$15,000, a small sum compared to what the new package will accomplish.

The smaller systems, the Super 10, SX-10, and SX-20, continue to satisfy a wide range of requirements for users with less than 70 stations. Both business and hotel/motel configurations are available for the SX-20, which makes it a very attractive product.

Mitel's 3 areas of strength are marketing, engineering, and manufacturing. The company has managed to enter the lucrative U.S. market and setup a distribution, marketing, and support network that has resulted in one of the most successful companies in the PBX industry. The engineering efforts of Mitel have put out a quality design that is dependable and meets market requirements. With the exception of delays with the SX-2000, product development and marketing at Mitel have met or exceeded that of the competition since the company was founded.

□ Limitations

Mitel is limited at this time by its analog PBX product line and the late introduction of the SX-2000. Although well regarded for quality and variety of features, the current SX systems do not support simultaneous voice and data transmission. The SX-2000 will support data speeds up to 9600-bps synchronous and asynchronous, but this is far from what the competition is currently doing. Delays in the SX-2000 seem to have impacted other important R&D programs, particularly Generic 1000, which appears to be the salvation of the analog SX-100/200 product. The SX-2000 was originally scheduled for first quarter 1983 delivery, but its delay allowed the competition to gain a larger share of the integrated voice/data switching market. Mitel is also venturing into an arena it has little experience in. Under-200-line systems are a Mitel specialty, but the large-system marketplace is the real test.

Upgrading from one Mitel system to another is not easy. The smaller systems (Super 10, SX-10/20) require a cabinet replacement, although some circuit boards can be reused. Going from a smaller model to an SX-100/200 requires a complete replacement of systems. An SX-100 can be field upgraded to an SX-200, but neither can be upgraded to an SX-2000 without a complete system changeout.

Mitel, like the rest of the PBX industry, has fallen into the **no standard syndrome**. It is difficult to configure a system from an outsider or novice perspective. The user is totally dependent on the distributor for the product in the market area. The prices quoted and the support given to the customer are determined by the individual distributor. The markup passed on to the customer is also dependent on the overhead required by the distributor.

■ SOFTWARE

□ Terms & Support

Terms • with the exception of optional features, all software is bundled into the PBX system price • end-user prices will vary based on distributor markups, overhead, installation, maintenance, and training costs.

Support • PBX system software is supported under Mitel Corporation and its associated dealers and distributors • field-developed software is supported by the individual dealer that authors the programs.

Mitel PBX Family

Models Super 10, SX-10, SX-20, SX-100, SX-200 & SX-2000

□ Software Overview

PBX software is used to control operations, conduct self-test functions, and provide features. Features of the Mitel PBX family are software driven and targeted at 3 areas for the Super 10 and above: System Features, Attendant Features, and Station Features. System software consists of the Operating System, Self-Test, and Configuration Tables.

The operating system defines major parameters and capabilities. The distribution of calls and methods of route selection and optimization is also controlled by the operating system.

Self-test implements online testing of PBX system performance. Error table printouts are available upon request. System fault error codes are stored in the PBX memory and made available to local or remote access.

The configuration tables contain information that is unique to each Mitel installation. The tables define station characteristics and control assignments, and can be changed or moved as needed.

Diagnostic software diagnoses problems undetermined by the self-test programs. They are used by field service representatives to further aid them in the repair of the system.

□ Features Overview

Various software programs, called **generics**, provide the operating characteristics of Mitel PBXs. The Super 10 uses Generic 201; SX-10 uses Generic 103; Super 20 has a choice of Generics 400, 500, or 503; both the SX-100 and SX-200 can use Generics 215, 216, 217, and Generic 1000, which is scheduled for July 1985; and the SX-2000 uses Release 1.0.

□ SX-10 System

SX-10 General System Features

Standard Features • alarm indicators: self-diagnostic, which checks itself under operation and senses up to 8 malfunctions and displays it on an LED • block system programming: allows sequential station numbers, which contain the same number of digits • call block/controlled station-to-station restriction: allows a prime station to inhibit calling between extensions with this feature • call forwarding-busy: allows calls to a busy line to be forwarded to any other station within the SX-5 • call forwarding-follow me: allows calls to a busy line to be forwarded to one originating party that may call the forwarding station • class-of-service (COS): allows the system to define the features and services that may be accessed by a station assigned the COS • configuration switches: program senses these switches which are used to set the configuration of the system • flash disable: inhibits a station from flashing the switchhook to select a feature • lockout: activated if 1 of the 2 parties of a call goes on-hook • paging access: a code allows access to a customer-supplied speaker • prime extension: station connected to number 01: may be used as a normal station or for special functions • hold: allows an active call to be placed on hold and originate a new call • dictation trunk: allows centralized dictation equipment to be connected to a trunk to enable stations to utilize the equipment • trunk groups: up to 4 trunk groups: a station may access all trunk groups specified in its COS • trunk selection: ability to operate in either a key system mode or in PBX mode • voice synthesis: operates in key system mode: tells the user via voice synthesis the number of free trunks and the number of a trunk being placed on hold.

Automatic Callback Option • enables a caller encountering a busy signal to camp on the called party by means of a special code; caller can hang up and wait for call to be automatically placed when the called party hangs up: NA prch

Automatic Switching to TAFAS (Trunk Answer From Any Station) After Timeout Option • allows all calls normally directed to the prime extension to be routed to a common alerting device: NA

Background Music Option • allows a music source to be

connected to the PA system when the pager is not in use: NA

Console-less Operation Option • SX-10 operated without attendant console: NA

Direct Inward Dialing (DID) Option • allows designated trunks to be assigned specific stations: NA

Discriminating Ringing Option • allows a station user to distinguish between station calls and trunk calls by various associated type calls: NA

Distinctive Callback Ringing Option • allows a station user to identify a Callback call by its distinctive ringing pattern: NA

Flexible Night Service Option • allows incoming trunk calls to be routed to any selected station or night bells when the system is placed in night service by the prime extension: NA

Music On Hold Option • the calling party is connected to an audio signal when waiting for a busy station: NA

Rotary Dial Pulse to Digit Translation Option • allows the selection of 4 different translation plans to be used in any country's digit translation: NA

Station Transfer Security Option • prevents lost trunk calls due to incorrect station handling: NA

Trunk Answer From Any Station (TAFAS) Option • allows specific trunks to be routed to TAFAS when the system is in day answer mode and/or night answer mode: NA

SX-10 Restriction Features

Standard Features • restrictive station control: allows the prime station to temporarily restrict another station from making outgoing trunk calls • toll restriction: denies a station the ability to make specified toll calls.

SX-10 Call Accounting Features

Message Registration Option • allows the system to compute the number of local call units made from an extension: NA prch

SX-10 Data Features

Standard Features • data line security: prevents introduction of tones or signals on established data call.

SX-10 Attendant Console Features

Standard Features • prime extension user performs the special operations by dialing specific codes • night service: provides the system capability to use the ring bell relay and allow any station to answer incoming calls • music on hold: source music is connected to a calling party while on hold • call block: allows the inhibiting of calls between stations • trunk emergency release: releases occupied trunk circuits for emergency reasons.

SX-10 Station Features

Standard Features • automatic callback: provides the user to be rung after having camped on another extension when that party hangs up • call hold: allows a user to place the other party of a conversation in a Hold status by dialing an access code to hanging up the receiver • call forwarding: enables an extension

PRCH: purchase price. NA: not available; price not disclosed by vendor. Prices effective as of December 1984.

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Models Super 10, SX-10, SX-20, SX-100, SX-200 & SX-2000

user to divert all calls to another extension • direct outward dialing (DOD): stations may access trunks by dialing a trunk group access code • mixed station dialing: allows the simultaneous use of rotary and touch-tone telephones • speed dialing: allows numbers to be dialed with abbreviated codes from a system directory • through dialing: allows stations to gain trunk access via the prime station • station-to-station dialing: allows calling between stations by direct dialing • automatic station release: automatically releases and locks out a station if a digit is not dialed within a specified period of time • data security: a station with this feature cannot receive camp-on tones • dial call pick-up: allows any call to pick up any incoming call directed to a specified group of stations.

Executive Busy Override Option • allows a station that encounters a busy extension to enter the conversation:

NA prch

Station Camp-On Option • enables a caller encountering a busy signal to camp on the called party by means of a special code:

NA

Super 10 System

Features of the Super 10 are the same as the SX-10.

SX-20 System

SX-20 General System Features

Standard Features • the SX-20 contains all the standard features as its smaller family members (SX-10 and Super 10) • prime line: allows the use of a remote display with test line to act as a second attendant console; call status is indicated on the remote display.

SX-20 Restriction Features

Standard Features • all restriction features of the SX-10.

SX-20 Call Accounting Features

Standard Features • all call accounting features of the SX-10.

SX-20 Data Features

Standard Features • all data features of the SX-10.

SX-20 Attendant Console Features

Standard Features • contains the same standard features as the SX-10 • attendant access: automatically routes an extension dialing the attendant access code to the attendant console • attendant camp-on: attendant connects an incoming call to a busy station, the call is camped on the busy extension; the called party hears a tone to indicate a call is waiting • attendant overflow: when attendant is busy, a call will be answered by an extension with the appropriate COS • call hold: allows attendant to place a call in 1 of 3 locations: the call can be picked up by any station dialing the correct code • controlled station to station restriction: calls are rerouted to a reorder tone when call is placed • incoming call identification: allows attendant to answer incoming calls to the customer's listed directory number (LDN); when any of the calls come into 1 of the 3 lines, a light will indicate the presence of the calling party • paging: allows the attendant access to customer-provided paging equipment.

SX-20 Station Features

Standard Features • the SX-20 station features are the same as the SX-10 and Super 10.

SX-100/SX-200 Systems

SX-100 and SX-200 features are extracted from the on-board ROM of the PBX system. Features packages used in the SX-100 and SX-200 are contained in Generics 216, 217, and ACD Operating Systems. Generic 216 is the basic feature package for the SX-100 and SX-200, and contains all available standard features. Generic 217 contains all features available with Generic 216, and adds such new features as Superset 3 and 4, verifiable account codes, and enhanced automatic route selection. The ACD package provides all Generic 217 features as well as a sophisticated automatic call distribution system for small users.

Generic 1000, scheduled for July 1985, is a hardware/software combination that adds integrated voice/data capabilities to the SX-200 system. A new attendant console is provided, and system port capacity increases to 480 from 208.

SX-100/SX-200 General System Features

Standard Features • alarm indication: notifies system malfunction • automatic diagnostics: all occurring errors on the system are logged automatically and can be read or printed on demand • call re-routing table: allows customer to specify that all system, DID, CCSA, and dial-in tie trunk calls directed to a busy extension will be forwarded to a specific location • conflict dialing: system can differentiate between conflicting extension numbers such as "52345" and "5234" • console-less operation: system operated without the use of an attendant console • contact monitor: allows an extension line to be used for monitoring an alarm contact • customer programming and security: 5 levels of security; maintenance and programming capability of each level defined at installation • customer data entry: customer data entered from a terminal via RS-232 connector on maintenance panel or LCD Console • customer data entry backup and restore: allows customer data to be dumped to a second floppy disk and reloaded onto operating floppy disk if required • dictation trunks: interface to customer-provided dictation • direct inward dialing (DID): allows incoming trunk calls to reach extensions without attendant intervention or assistance • direct inward system access (DISA): allows external caller to access the system by selecting a special trunk and dialing a security code • discriminating ringing: provides 2 different ringing cadences to allow a user to distinguish between internal incoming calls and external incoming calls • extension transfer security: if trunk call is transferred to a ringing extension, and extension does not answer within time-out period, this feature will route call to attendant • fixed night service: allows calls normally directed to the attendant console to be routed to preselected extensions • flexible night service: allows attendant to change night service assignment of trunks associated with extensions or hunt groups • flexible numbering plan: numbering plan used within the system permits users to select any combination of numbers up to 5 digits • hunt groups: calls to busy station routed to alternate location • immediate ring: ringing applied to a called idle extension number after the last digit has been dialed • line lockout alarm: if extension is off-hook and is timed out (the user has not dialed within a certain time period), attendant will be alerted by a minor alarm • message waiting: allows attendant to inform a user that there is a message waiting • multitendant positions: system can handle multiple attendant console • multiple trunk groups: system permits up to 50 independent trunk groups to be defined • music on hold (MOH): music source can be connected to the system • paging access: paging equipment can be connected to the system • remote maintenance: allows remote access to the system from an ASCII terminal for maintenance and programming of the system • ringing timeout: extension can ring for 1 to 5 minutes before call is dropped (default ringing time is 5 minutes) • rotary to DTMF conversion: converts rotary digits to DTMF digits for outgoing trunks • speed call: allows extensions to use directory numbers in a system speed-call application • Superset 3 and Superset 4 equipment feature: Generic 217 and Generic 1000 support Superset 3 and 4 electronic telephones • tenanting: a feature of Generic 1000 which allows several customers, each with independent attendant consoles, to share same system • tone-to-pulse conversion: converts tones from DTMF equipment to rotary dial pulsing on outgoing rotary dial trunks • traffic measurement: traffic measurements can be accumulated, and results presented at an RS-232C port for subsequent printout on a suitable output device • trunk answer from any station (TAFAS) day and night: allows incoming trunk calls to ring common alerting device(s) when the system is in day or night service • vacant number intercept to attendant: all calls other than DID, CCSA, or dial-in tie trunk calls to vacant numbers or levels are routed to attendant for completion.

SX-100/SX-200 Restriction Features

Standard Features • account codes: special 1- to 12-digit code required for trunk calls; appears as an integral part of all SMDR records • class of service (COS): defines extension features available for that device; all devices with same COS have access

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to same features • toll control: denies an extension, dial-in tie trunk, or console the ability to make toll calls.

SX-100/SX-200 Call Accounting Features

Standard Features • station message detail recording (SMDR): allows data to be collected for each outgoing and, optionally, incoming trunk call • system identifier: allows a unique identifier to be assigned to system; identifies system when central polling equipment is used for traffic data collection.

SX-100/SX-200 Call Routing Features

Standard Features • automatic route selection (ARS): enables the system to automatically select the lowest cost trunk available as function of day and time.

SX-100/SX-200 Data Features

Standard Feature • data security: prevents insertion of tones or other signals into existing data connection.

Generic 1000 Data Features Option • supports data communications from up to 144 nonblocking ports in system:
NA prch

SX-100/SX-200 Network Features

Standard Features • tandem switching: system can switch tandem tie trunks • tie trunks: system can interface direct lines from other PBX systems.

SX-100/SX-200 Attendant Features

Standard Features • alarm readout: console can display alarm codes presently active in the system • busy override: allows attendant who encounters a busy connection to override the connection and enter the call • callback busy/no answer: attendant can set up an automatic callback if the called extension is busy or does not answer • call forward set up and cancel: allows attendant to set up, review and cancel call forwarding for any extension • call selection: LDN, recall and dial "O" keys: attendant console has up to 10 call selection positions; 1 is for recall, 1 for dial "O" calls, and the remaining keys are for Listed Directory Numbers (LDN) • called name, number, and class of service display: console will display dialed digits from the console as they are dialed; after the digits are dialed, the name (if Superset 4 telephone) and class of service associated with the dialed digits, will also appear on the console display • calling name, number, and class of service display: upon answering a call, console will display the name, extension number, and the class of service of the caller • call waiting display: number of calls waiting displayed on status line of the console display at all times • camp on: attendant connects call to a busy extension or trunk for automatic completion when the busy party becomes free • control of trunk group access: attendant can restrict a trunk group to attendant access only, or return it to dial access • direct trunk select: console or test line used to directly access a trunk for maintenance or operational procedures • DISA code set-up enable: attendant can change the direct inward system access (DISA) security code • display of Superset messages: attendant can read messages displayed on Superset LCD displays • do not disturb (DND) set up and cancel: attendant can set up or cancel do not disturb (DND) for an extension • flash over trunk: allows attendant to recall telephone company operator on an operator-assisted long-distance call • hold: attendant can place an extension or trunk on hold • individual directory number: each attendant console can have a unique directory number identifying the console • interposition calling and transfer: in multiconsole environment, an attendant can call or transfer a call to any other attendant using individual attendant directory number • last number redial: system can automatically redial last external number manually dialed from the attendant console • message waiting set up and cancel: allows attendant to inform a station that there is a message waiting • page access: connects attendant to customer-provided paging system • programmable LDN keys (Generic 1000): each attendant has programmable LDN positions; up to 9 LDN keys and labels can be programmed • serial call: incoming trunk call transferred by the attendant will return to attendant after the call is completed • station busy out: attendant to busy out any extension • time and date display: time

and date displayed on status line of console display • timed recall: automatically alerts attendant when a call extended through the console or a call held at the console has not been answered within preselected time • trunk busy out enable: attendant can busy out a trunk to prevent access to the trunk, and can remove busy condition as required • trunk-to-trunk connect: allows attendant to connect any 2 trunk calls, then release them from console • call forwarding—busy: calls forwarded on busy condition • call forwarding—busy/no answer: calls forwarded on busy or no answer • call forwarding—no answer: calls forwarded on a no-answer condition • call hold: allows extension user to place the call on hold • callback busy: allows user who has encountered a busy extension or trunk to set up a callback when the extension or trunk becomes idle • camp-on: station can camp-on to a busy extension • dial call pickup: extension assigned to a pickup group can answer any call for that group by dialing pickup access code • directed call pickup: allows extension user to answer any ringing telephone within the system • direct outward dialing: extension can access a trunk without attendant assistance • do not disturb: extension can be prevented from receiving incoming calls • external call forwarding: allows an extension user to set up call forwarding to a number external to the system • extension conference: allows an extension user to set up a conference with up to 17 conferees without assistance of the attendant • extension override security: an extension cannot be overridden by another extension using executive busy override • flash on incoming trunk: allows extension users to flash the switchhook while connected to an incoming trunk; enables trunk call to be transferred, held, or added to a conference • flash on outgoing trunk: allows extension users to flash the switchhook while connected to an outgoing trunk; enables trunk call to be transferred, held, or added to a conference • handsfree: conversation without lifting handset • hot line: extension programmed as a manual line can also be programmed to automatically dial a specific number upon going off-hook • hunting: calls to busy stations routed to next line in hunt group • manual line: extension with this feature is routed directly to attendant console upon going off-hook • paging access: extension can access the paging equipment by dialing required access code • transfer consultation hold/add-on: allows an extension user on an established call to hold the call, add a third party to the call, or transfer the original call to a third party.

SX-2000 System Features

SX-2000 features are extracted from the on-board Dynamic ROM and bubble memory of the system. The feature package used in the SX-2000 is contained in the Release 1.0 operating system. The functions contained in this operating system are identical to the smaller systems, however, they are not compatible. The features are also geared to the new complement of stations and terminals that were developed specifically for the SX-2000.

SX-2000 General System Features

Standard Features • contains all the features of the SX-200 (including Generic 1000) and smaller systems • digital support; ability to transmit and receive digital data along with voice.

SX-2000 Attendant Console Features

Standard Features • contains all the features of the SX-200 (including Generic 1000) and smaller systems • database restriction; ability of attendant to make minor system changes that affect the station calling protocol.

SX-2000 Station Features

Standard Features • contains all the features of the SX-200 (including Generic 1000) and smaller systems • Superset 4; supports all equivalent features for this proprietary station • Superset 7; supports all equivalent features for this proprietary station.

Application Software

Mitel has installed its systems in numerous application environments; to date Mitel has applications for the following industries: health care; retailers; office automation; telephone operating companies; lodging; service sector; and private homes.

Mitel PBX Family

Models Super 10, SX-10, SX-20, SX-100, SX-200 & SX-2000

■ HARDWARE

□ Terms & Support

Terms • PBX models are available for purchase or lease on a single or 2-, 3-, or 5-year lease • lease rates include maintenance • purchase prices include installation and first year's maintenance • end-user prices will vary based on distributor markups, overhead, installation, maintenance, and training costs.

Support • equipment can be installed by Mitel authorized distributors • service and maintenance is based on policies established by individual dealers or distributors.

□ Overview

Smaller systems, such as the Super 10, SX-10, and SX-20, are single-cabinet models that can be mounted on a wall or set upon a floor. The Super 10 has all its components in the attendant console; the SX-10 and SX-20 use small modular housings. Circuits are densely packed on plug-in boards, with as many as 24 stations on a board. Power supplies are provided with each model. Additional equipment, such as the DART (Dialed Activity Reporting Terminal), can be attached to these systems with the appropriate interface.

The SX-100 is a single-cabinet PBX which can be either wall or floor mounted. Circuit boards support 8 stations, 4 CO trunks, 2 tie trunks, or 2 DID trunks per board.

The SX-200 is a 1- or 2-cabinet system, depending on station requirements and the level of software desired. It uses the same circuit boards as the SX-100. When upgrading to Generic 1000, the digital switching version, a special package is available from Mitel with all the required conversion boards, software, etc. Mitel will have an exchange policy for users to obtain credit for components on their existing systems that are replaced by Generic 1000.

The SX-2000, in its current Release 1.0 form, is a 2-cabinet system capable of expansion up to 3,000 ports. Stations are configured 16 to a board; trunks are 8 to a board. Redundancy of all major components is available. System design is hierarchical, with distributed control of several levels of hardware. The Control Processor supervises activities of subsystem processors. SX-2000 subsystems include the main control complex, message switch subsystem, circuit switch subsystem, and peripheral switch subsystem. Message packets are sent among subsystems to transmit among other things, control requests and event reports. Processor software is also hierarchical; each controller can have from 2 to 6 levels of programming.

□ Representative System Configurations

Super 10 Configuration • single-board system:

Small System • 2 trunks; 8 stations:
\$2,400 to \$3,200 approx prch

Large System • 8 trunks; 16 stations:
4,800 to 6,400

SX-10 Configuration • single-board system:

Small System • 2 trunks; 8 stations:
2,000 to 2,800

Large System • 8 trunks; 16 stations:
4,000 to 5,600

SX-20 Configuration • 3-board system:

Small System • 12 trunks; 48 stations:
12,000 to 16,800

Large System • 8 trunks; 72 stations:
18,000 to 25,200

SX-100 Configuration • multiboard system; single cabinet:

Small System • 4 trunks; 16 stations:
4,800 to 6,400

Large System • 28 trunks; 112 stations:
28,000 to 39,200

SX-200 Configuration • multiboard system; or 2 cabinets:

Small System • 8 trunks; 32 stations:
9,600 to 12,800

Large System • 52 trunks; 208 stations:
52,000 to 72,800

SX-2000 Configuration • 1 or 2 cabinets • redundant • distributed architecture • 10 percent data switching:

Small System • 20 trunks; 250 stations:
90,000 to 125,000

Large System • 100 trunks; 1500 stations:
550,000 to 650,000

□ Station Equipment—Voice/Data

Superset Telephones • DTMF telephones used with all models.

Superset 3 (SX-10 through SX-2000):
\$150 prch

Superset 4 (SX-10 through SX-2000):
295

Superset 7 • CRT-based workstation for SX-2000; serves as an attendant console, maintenance console, secretarial workstation; detachable keyboard; 16-bit microprocessor-controlled device:
3,000 to 4,000 approx prch

Attendant Console • primary function to service incoming, off-premises calls, and connect them to the appropriate internal stations; place outgoing calls; provide information concerning status and types of calls being handled; desktop unit:

Super 10:
1,000 to 1,200

SX-10/SX-20:
1,500 to 1,600

SX-100/SX-200:
2,600 to 2,700

SX-200 with Generic 1000:
2,500 to 2,600

SX-2000 (Superset 7):
3,000 to 4,000

Remote Call Status Display • provides user with remote status display with all required call processing information; shows active state of each active station and trunk; can be located up to 500 feet from equipment cabinet:
300 prch

Kontakt • executive workstation; administrative workstations; micronetwork • supports ExecuCalc; ExecuWrite; ExecuBasic • 12-inch (diagonal) CRT with diskette and up to 256K bytes of memory • IBM 3270 and DEC VT-100 emulation • 2-wire local connection to PBX:
2,995 to 4,995 approx prch

□ Data Communication Equipment

Dataset 1 • for SX-2000 only • transmission unit (modem) connects to an EIA RS-232C interface connector; interfaces with Superset 4 or standard telephones; transmits data asynchronously at rates up to 19.2K bps; full-duplex transmission:
\$250 prch

Dataset 2 • for SX-2000 only • transmission unit (modem) connects to an EIA RS-232C interface connector; interfaces with Superset 4, Superset 7, or standard telephone; transmits data

APPROX PRCH: approximate purchase price. PRCH: purchase price range; all prices do not include maintenance or installation; pricing established by individual distributors and dealers. NA: not available. Prices effective as of December 1984.

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asynchronously at rates up to 9.6K bps or synchronously at rates of up to 19.2K bps; full- or half-duplex transmission:

650

Peripherals

System Printer • for SX-2000 only • connected to system cabinet for local operation; used for remote PBX communication; lists self tests, audit tables, and traffic reports:

NA approx prch

Subsystems

DART (Dialed Activity Reporting Terminal) • for systems SX-10 through SX-2000 or other vendor PBXs; 20 to 400 station capacity; summarizes uses and activity for all stations connected; price includes modem, does not include printer or first-year subscription:

\$2,400 approx prch

■ SYSTEM MAINTENANCE & DIAGNOSTICS

System Reliability • redundant CPUs • error-correcting memory • redundant critical electronics • reserve memory power • backup battery • automatic program load.

System Diagnostics • system continuously diagnoses operation • major/minor alarm indications at attendant console • audit trail generated on system service teleprinter • remote diagnostics by Mitel service centers.

System Maintenance • normally performed by Mitel authorized distributor • larger systems typically include inventory of line cards, trunk cards, phones, cable, test equipment, etc for customer or vendor maintenance.

System Management • users can change such functions as pick-up groups and call routing, perform station relocations • system CRT or teleprinter used.

• END

NEC Electra Family

Models 616 & 16/48 Electronic Key Systems

■ PROFILE

Function • the NEC Electra 16/48 and 616 are electronic key systems designed for voice switching.

Applications Supported • the Electra series is targeted at small- to medium-sized business users (under 45 stations).

System Parameters • Electra 16/48 and Electra 616 use analog speech transmission with a solid state switching matrix • systems utilize centralized stored program control of all system functions.

Traffic Capacity • the Electra 16/48 system can accommodate up to 21 unblocked connections and the Electra 616 can handle up to 8 unblocked connections.

Trunks/Stations/Consoles • Electra 16/48—16 trunks/48 stations • Electra 616—6 trunks/16 stations.

Voice Equipment • vendor supplied: Electra 16/48: ET-8-1 35-button electronic telephone, ET-16-1 43-button electronic telephone, and DSS/BLF; Electra 616: 35-button electronic telephone, door phone, BLF • nonvendor supplied: both the 16/48 and the 616 systems use industry standard 500 and 2500 type telephones.

Data Equipment • none.

First Delivery • July 1979.

Systems Delivered • over 7,500.

Installation Interval • 2 to 4 weeks ARO.

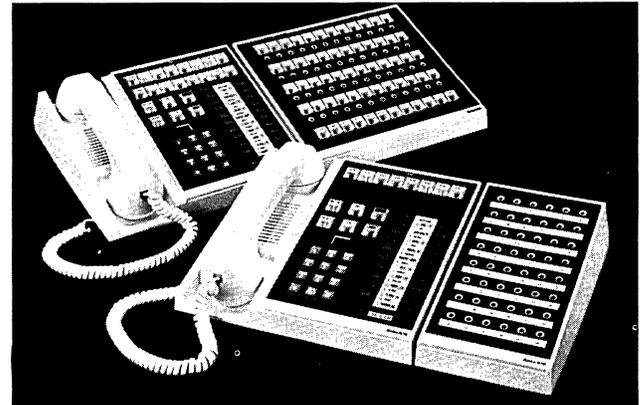
Comparable Systems • AT&T Information Systems Com Key, Merlin; Comdial Maxkey; Executone Equity II, Encore, Command 8/16 and 20/56; Inter-Tel Phoenix/Hitec; ITT EKS-701 and EKS-801; Iwatsu Omega III/IV; Northern Telecom Vantage 12 and 48; TIE Businesscom and Ultracom; Toshiba Strata.

Environmental Specifications • temperature: 32 to 104 degrees fahrenheit • humidity: 60 to 85 percent • power: air conditioning: not required • equipment dimensions: 16/48—19x11.8x15.7 (WxDxH) inches; 616—19.2x8x16.5 (WxDxH) inches • weight: 16/48—61 pounds; 616—40 pounds • floor loading: 40 pounds per square foot; if wall mounted, wall should be strong enough to hold twice the listed cabinet weight • minimum equipment room dimensions: 8x8x8 (WxDxH) inches; separate room not normally required.

Vendor • NEC Corporation—NEC Telephones, Inc; 8 Old Sod Farm Road, Melville, NY 11747 • 516-753-7000.

Canadian Headquarters • contact U.S. headquarters.

Distribution • nationwide through various supply houses.



operating telephone companies, and interconnect telephone companies.

Service/Support/Training • service, support, and training are provided by NEC and its authorized distributors • NEC distributors handle all system installations and are supported by NEC's engineering staff • maintenance contracts are available from the installing companies and various third-party installation and maintenance companies.

GSA Schedule • listed.

■ ANALYSIS

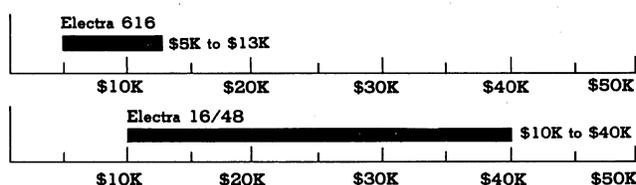
The NEC Electra Series is a family of stored program controlled key systems using electronic switch matrices for analog speech transmission. The Electra 16/48 is a 16-line, 48-station system that can use either electronic telephones or industry standard telephones. The Electra 616 has a capacity of 6 lines and 16 stations plus all the characteristics of the larger 16/48 model. The 616's size lends it to very small applications. For example, the system can be equipped with a door phone unit to provide 2-way hands-free communications for home or small business applications.

The Electra Series is in one of the most highly competitive markets in the telecommunications industry and has been successful from the start. Competition in the electronic key system market is increasing and bringing more products into the market daily. The NEC Electra Series has been known for dependable economical communications since its introduction, and has built a loyal following. The systems are easy to install and maintain. They provide customers with all of the desired features in the small- to medium-sized business phone system market. While there are newer, more sophisticated electronic key systems on the market, the Electra Series offers the user proven service and a flexible feature package that covers most applications. The Electra Series does not talk to a user, but it has very seldom failed to let a user talk to someone else.

□ Strengths

The major strength of the Electra Series is its proven quality of communication. Along with its long and successful track record, the Electra has a solid feature package and excellent support from installation and maintenance companies as well as the manufacturer. Although the system doesn't offer a few features

PURCHASE PRICE RANGE hardware & software



NEC ELECTRA PURCHASE PRICING bar graphs cover price ranges between "small" and "large" configurations; installation and first year's maintenance included • Electra 616 configurations range from 2 trunks/6 stations up to 6 trunks/14 stations • Electra 16/48 configurations range from 6 trunks/14 stations to 14 trunks/40 stations.

NEC Electra Family Models 616 & 16/48 Electronic Key Systems

found on the latest electronic key systems, it nonetheless offers the user ease of operation and economical pricing.

□ Limitations

There are no major limitations in the Electra Series. The system is designed as a small- to medium-size electronic key system. If the user anticipates growth past the 48-station capacity or a need for advanced data features, the Electra is not recommended. The Electra models are not hybrid systems and may soon find the market for expandable systems with more PBX features hard to compete in.

■ SOFTWARE

□ Terms & Support

Terms • software is bundled in with the system price; lease terms are arranged through the distributor network and range from 1 to 6 years normally.

Support • software is fully supported by NEC and its authorized distributors.

□ Software Overview

Software controls all Electra system operations, provides features, and handles system diagnostics. Features are either built into the system or are user programmable. Operating features are implemented in ROM while user features are implemented in RAM.

□ Features Overview

The Electra 16/48 and 616 have standard feature packages and are restricted only by the type of telephone used. Some of the features are intended for use with electronic telephones and would not be supported on industry standard telephones. The major difference in the 2 software packages is the set of attendant features associated with the main system on the 16/48. For detailed descriptions of features, refer to the Glossary in Section 1100 of this volume.

■ GENERAL SYSTEM FEATURES

System Features • automatic callback; automatic hold release; automatic timeout on intercom calls; battery backup; busy lamp field (BLF); data access; distinctive ringing; direct station selection/busy lamp field (DSS/BLF); DTMF/dial pulse signaling; exclusive hold; external tone signals; flexible ringing; handsfree answerback on intercom; handsfree dialing and monitoring; hold; intercom tone/voice signaling; message waiting; multiline access; music on hold; night transfer; paging access; outgoing call restriction—0/1; outgoing call restriction—toll; privacy; power failure transfer; privacy with release; recall/flash button for feature access; single-line telephone access; system speed dialing; station-message detail recording; trunk queuing; zone paging; diagnostic routines; DSS/chain calling.

Station Features • add-on conference; call forwarding—all calls; call forwarding—busy; call pickup; call transfer; call waiting; do not disturb; I-Hold indication; key set display; last number redial; nonlocking buttons; handsfree operation; multiline conference; prime line selection—originating, receiving; programming features from key set; pushbutton dialing; speed dialing—station; volume control; handsfree answerback on intercom; door phone (616 only) • 616—door phone.

Attendant Features • attendant automatic answer; attendant recall with station identification on display; busy lamp field/direct station selection unit; programming from attendant position; attendant camp-on; attendant off-hook ringing.

■ HARDWARE

□ Terms & Support

Terms • Electra systems are available from authorized distributors in various lease plans • lease rates normally include maintenance • installation rates are normally not included in the lease price but may be from some distributors • end-user pricing will vary based on costs such as distributor markups, discounts, and overhead;

installation, maintenance, and training costs will also impact the price.

Support • the Electra Series is supported by NEC's authorized distributors with engineering assistance provided by NEC on an as-needed basis. Distributor Personnel are trained by NEC and maintenance repairs are done by replacement.

□ Overview

The Electra 16/48 and the Electra 616 are electronic key systems utilizing microprocessor (8085) control with a solid state crosspoint switching matrix for analog transmission. The system configurations are shown in the following table:

	Lines	Stations	Intercoms	DSS/BLF
Electra 1648	16	48	5	4
Electra 616	6	16	2	2

The 1648 is expandable in increments of 16 stations in each of 3 cabinets while the 616 is expandable by adding additional station boards (8 stations to a board) to a single wall-mounted cabinet.

The Electra 16/48 may be equipped with an ET-8-1 or ET-16-1 electronic telephone. The ET-8-1 has 35 buttons. Eight of the buttons are used for CO lines, 20 are for DSS and speed dial access. The remaining 7 buttons are function buttons that appear on both electronic telephones. The ET-16-1 electronic telephone has 43 buttons: 16 for CO access, 20 for DSS or speed call access, and the remaining 7 buttons are function buttons. The function buttons are: Hands-Free Dialing, Do-Not-Disturb.

The 16/48 may also be equipped with a DSS/BLF or a standalone BLF. The DSS/BLF is a 60-button unit (12 functions, 48 station selection). The BLF is a 48-station indicator field.

The Electra 616 uses 3 types of station equipment, electronic phones, door phones, and BLFs. The electronic phone used on the 616 is similar to the phone used on the 16/48, the major difference is the 616 phone has a speed call button instead of a recall button; all other features are the same. The door phone provides 2-way hands-free communication. The 616 BLF provides a lamp field; provides 16 status indicators for stations.

□ Representative System Configurations

Electra 16/48 • 1 to 3 cabinets; nonredundant; up to 16 trunks, 48 stations, 2 DSS/BLF units, 4 BLF units.

8 Trunks/16 Stations:

\$ 14,500 prch

16 Trunks/40 Stations:

36,500

Electra 616 • single-cabinet system; nonredundant; 6 trunks, 16 stations, 2 BLF units; 2 door units.

2 Trunks/6 Stations:

6,500

4 Trunks/12 Stations:

10,500

□ System Components—Electra 16/48

Basic Key Service Unit (KSU) • provides for 8 trunks, 16 stations, 2 DSS/BLFs, 1 BLF, central processor, ringing generator, memory, switching matrix, tone generator, DTMF/rotary converters, power failure transfer, and power supply:

\$5,500 to \$6,500 approx prch

Expansion Key Service Unit • provides for 4 trunks, 16 stations, 2 DSS/BLF, 4 BLF; expands system capacity to 12 trunks, 32 stations:

1,800 to 2,000

PRCH: purchase price. APPROX PRCH: price ranges are approximate and include installation and first year's maintenance. Prices effective as of February 1985.

NEC Electra Family Models 616 & 16/48 Electronic Key Systems

Second Expansion Key Service Unit • provides for 4 trunks, 16 stations; expands system capacity to 16 trunks, 48 stations:
1,600 to 1,800

Key Telephone Circuit Board • connects up to 4 electronic key telephones:
220 prch

Single-Line Telephone Circuit Board • connects up to 4 single-line 500/2500 telephones:
190

Central Office Trunk Circuit Board • connects up to 4 circuits:
250

Power Failure Transfer Circuit Board • connects up to 8 CO trunks to designated 500/2500 telephones:
300

Paging Equipment Circuit Board • provides interface to customer-provided paging system:
200

Station Message Detail Service (SMDS) Circuit Board • provides detailed call information for incoming, outgoing, and transferred CO/PBX calls; RS-232C output; must be output to separate printer:
850

Power Supply • provides DC current for system operation:
350

System Components—Electra 616

Basic Key Service Unit • provides for 6 trunks, 16 stations, 2 intercom circuits, 2 BLFs, 2 door phones, switching matrix, DTMF/rotary converters, central processor, memory, and power supply:
\$4,500 to \$5,500 approx prch

Key Telephone Circuit Boards • connects up to 8 key telephones:
350 prch

Trunk Circuit Board • connects up to 3 CO/PBX trunks:
200

Paging/BLF/Security Circuit Board • connects to customer-

provided paging system; connects up to 2 BLFs, provides circuitry for 2 security alarms:
400

Door Phone Circuit Board • connects up to 2 door phone units:
250

Station Equipment

Model ET-8-1 Electronic Key Telephone (16/48):
\$225 prch

Model ET-16-1 Electronic Key Telephone (16/48):
300

DSS/BLF for 16/48:
440

BLF for 16/48:
250

Model ET-6-1 Electronic Key Telephone (616):
225

Door Phone Unit for 616:
100

BLF for 616:
250

SYSTEM MAINTENANCE & DIAGNOSTICS

System Reliability • reserve battery for system memory • automatic program load after system restart.

System Diagnostics • major/minor alarm indications • on-site diagnostics.

System Maintenance • performed by NEC's authorized distributors • maintenance by replacement of defective or faulty parts • inventory of spare parts normally maintained by the distributor.

System Management • users have the capability to change some system features and class of service from the prime station.

• END

NEC NEAX Family

NEAX 12A & NEAX 2400 IMS

■ PROFILE

Function • stored program computerized branch exchange (PBX) systems for switching voice (NEAX 12A) and voice/data (NEAX 2400).

Applications Supported • office automation: word processing, dictation, facsimile, message center, voice messaging • healthcare • retailers • hotel/motel • banking • military • government • education • service sector • general business.

System Parameters • switching technology: NEAX 12A—analogue space division using PAM; NEAX 2400—digital using TDM/PCM • architecture: NEAX 12A—centralized processor using solid-state crosspoint matrix; NEAX 2400—distributed processing tied to high-speed time-division switch network • common control: stored program; redundant common control available for NEAX 2400 • transmission: NEAX 12A—2-wire internal switching at 9600 bps; NEAX 2400—4-wire internal switching at 2M bps • wiring plan: uniform 2-pair for stations; 2-pair for NEAX 2400 attendant console; 12-pair for NEAX 12A console • data switching: NEAX 12A—9600 bps full-duplex at station; NEAX 2400—19.2K bps asynchronous, 56K bps synchronous, full-duplex at station.

Traffic Capacity • NEAX 12A—1974 CCS (system); NEAX 2400—36 CCS/port for 736 ports (Port Interface Module); larger configurations average 30 CCS per port; 36 CCS per port (data) • grade of service: P.01 • simultaneous conversations: NEAX 12A—20; NEAX 2400—768 per PIM • nonblocking architecture: NEAX 12A—no; NEAX 2400—“virtually” nonblocking; 1 out of 10M blocked (theoretical limit).

Trunks/Stations/Consoles • NEAX 12A: 4 to 48 trunks; 4 to 360 stations; 1 to 4 attendant consoles • NEAX 2400: 100 to approximately 23,000 users, any combination; up to 63 attendant consoles • trunks supported: central office—one-way (in/out), 2-way; DID; FX; WATS; OCC; tie lines—2-/4-wire E & M; T-1; Autovon; CCSA.

Voice Equipment • vendor supplied: analog and digital telephones; attendant consoles; hotel/motel console (NEAX 12A) • nonvendor equipment supported: all rotary (500 type) and touch-tone (2500 type) telephones • electronic feature telephones: NEAX 12A—ElectraPhone; NEAX 2400—Dterm • digital telephones: NEAX 2400—Dterm.



Data Equipment • vendor supplied: NEC Astra minicomputer; system administration terminal • nonvendor equipment supported: ASCII, TTY, 3270 (SNA/SDLC) terminals • data rates: NEAX 12A—9600 bps; NEAX 2400—19.2K bps async, 56K bps sync; full-duplex • modems: all types; modem pooling in NEAX 2400 • multiplexers: all types • protocol converters: 3270, X.25, X.75 • data modules: NEAX 2400—data interface with Dterm telephone • interfaces supported: RS-232C, RS-449 • printers: service printer • data storage: not required in system; available on floppy disk with NEAX 2400 system administration terminal if enhanced security is required.

Subsystem Support • automatic call distribution: NEAX 12A—uniform call distribution • call detail recording: Station Message Detail System (SMDS); NEC Astra-Phacs, Mini-Phacs voice message systems: Voice Mail Module • message center systems: Text Mail Module • centralized attendant service • hotel/motel management systems: Hotel/Motel System Package (NEAX 12A) • facsimile systems: Facsimile Mail Module.

Communications/Networking • abbreviated dialing: NEAX 2400 • off-network dialing: NEAX 2400 • on-network dialing: NEAX 2400 • dialed digit translation • route advance • tandem tie trunk switching • satellite operation • transmission rates: NEAX 12A—9600 bps; NEAX 2400—56K bps up to 1.544M bps (T-1) protocols: NEAX 2400—X.25, X.75, SNA/SDLC, ASCII • T-1 interface: NEAX 2400 • gateways: NEAX 2400—X.25, X.75, SNA/SDLC • local area networks: NEAX 2400.

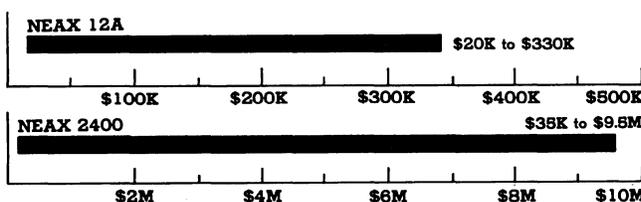
First Delivery • NEAX 12A: 1979; NEAX 2400: 1984 (U.S.).

System Delivered • NEAX 12A: over 1,200; NEAX 2400: approximately 50 (U.S.).

Installation Interval • NEAX 12A: 8 to 12 weeks ARO; NEAX 2400: 12 to 24 months ARO (based on size).

Comparable Systems • NEAX 12A: American Telecom Focus, AT&T Dimension 400 and System 75, Ericsson Prodigy, Executone Eclipse, GTE Omni SI, Harris/Digital D1200, Hitachi DX, IPC Technologies 160 DPX III, ITT 3100, Mitel SX-200,

PURCHASE PRICE RANGE hardware & software



NEC NEAX 12A & NEAX 2400 PURCHASE PRICING bar graphs cover price ranges between “small” and “large” configurations; installation and first year maintenance costs included • NEAX 12A small configuration consists of 8 trunks, 50 stations, and 1 console; large consists of 36 trunks, 325 stations, and 2 consoles; this is as large a configuration as should be developed with the 12A—larger systems will require the NEAX 2400 • NEAX 2400 small configuration consists of 8 trunks, 50 stations, and 1 console; large consists of 1,200 trunks, 9,300 stations, and 6 consoles; 25% data/voice sets; these are realistic design limits for likely configurations—the NEAX 2400 design limit is over 23,000 ports, however, systems of this size are relatively few in number.

NEC NEAX Family

NEAX 12A & NEAX 2400 IMS

Northern Telecom SL-1S, Siemens Saturn II, Solid State Systems CEO, TIE/Communications Data Star • NEAX 2400: American Telecom Focus, Anderson Jacobson IOX, AT&T Systems 75 and 85, CXC Rose, Ditrans 580 DSS, Ericsson MD110 Executone Summit, GTE Omni SIII, Harris/Digital D1200 InteCom IBX, Mitel SX-2000, Northern Telecom SL-1/SL-100, Siemens Saturn III, TIE/Communications Mercury, United Technologies/Lexar UTX, Zitel PBX.

Environmental Specifications • temperature: NEAX 12A—32 degrees to 104 degrees Fahrenheit; NEAX 2400—41 degrees to 86 degrees Fahrenheit (normal), 32 degrees to 104 degrees Fahrenheit (maximum) • humidity: 15 to 90 percent (maximum) • power: NEAX 12A—117 VAC (plus/minus 10%) at 60 Hz, -48 VDC (plus/minus 5%); NEAX 2400— -48 VDC (plus/minus 5%); separately fused outlet 30-amp service per cabinet • thermal output: NEAX 2400—2,500 to 5,000 BTU per hour (single module), 7,500 to 37,000 BTU per hour (multiple modules) • dimensions: NEAX 12A—26" W x 21" D x 69" H; NEAX 2400—29" W x 22" D x 13" H (Port Interface Module/Control Processor Module/Miscellaneous Module), 29" W x 22" D x 75" H (Interface Module Group—includes 5 module blocks) • weight: NEAX 12A—441 pounds; NEAX 2400—101 pounds (Port Interface Module), 617 pounds (Interface Module Group) • floor loading: NEAX 12A—97 pounds per square foot; NEAX 2400—25 pounds per square foot (PIM), 160 pounds per square foot (IMG) • minimum equipment room dimensions: NEAX 12A—8' W x 10' D x 8' H • FCC registration number: NEAX 12A—AY589N-62547-PF-E, ringer equivalence 3.4B; NEAX 2400—AY589N-11793-PF-E, ringer equivalence 2.1B.

Vendor • NEC Telephones, Inc; 532 Broad Hollow Road, Melville, NY 11747 • 516-752-9700.

Distribution • nationwide and worldwide through over 2000 offices, distributors, and selected dealers: Southern Region—5780 Peachtree, Dunwoody Road, NE, Suite 100, Atlanta, GA 30342; 404-252-9952 • Midwest Region—1875-B Hicks Road, Rolling Meadows, IL 60008; 312-991-5550 • Southwestern Region—1525 Walnut Hill Lane, Irving, TX 75062; 214-257-9100; Western Region—3100 Central Expressway, Santa Clara, CA 95051; 408-727-9110.

Service/Support/Training • service, support, and training by dealers/distributors • installation by dealers/distributors warranty 1 year parts and labor; maintenance contracts available • local and remote maintenance.

■ ANALYSIS

The NEC family of PBX systems has had good success in the U.S. since its first appearance back in the 1970s. The company has kept pace with the industry's major trends in switching technology, and today NEC has perhaps one of the most comprehensive product lines in communications available.

The NEAX product line was first introduced in 1978, with the large-scale digital NEAX 22, which was designed to compete with the likes of the AT&T Dimension, Rolm CBX, and Northern Telecom SL-1. Although a powerful system, the NEAX 22 didn't sell as well as predicted, and has been effectively replaced by the newer NEAX 2400. To provide a cost-effective system for smaller businesses, NEC brought out the NEAX 12 and 12A in 1979. An analog system, the NEAX 12A has achieved greater success than the NEAX 22, although its technology is viewed as "ancient."

With the telecommunications industry moving towards an integrated voice/data/text messaging environment, the pressure was on the major manufacturers to develop and introduce more sophisticated PBX systems. NEC's latest product, the NEAX 2400 Integrated Management System, fulfills those requirements in an efficient, modular, and cost-effective manner. Based on distributed microprocessor technology, the NEAX 2400 is one of only a few systems that can grow from its minimum configuration to its maximum size, **without changing out any major components of the system.** It is a truly modular system, and its cost is very competitive with the best in the industry.

Architecturally, the NEAX 12A and 2400 are as different as they could be. The 12A uses a single central processor to handle all system operations, while the 2400 uses one or more CPUs (16-bit

8086-based units manufactured by NEC) with routine system operations distributed to 8-bit microprocessors (again manufactured by NEC) that are built into the primary system circuit boards. With the 2400, any outage that occurs at the board level brings down **only that activity**; the rest of the system will function as usual, with identification of the faulty part handled by the 2400.

An increasingly important issue for communications professionals planning on integrating voice and data communications is the system's throughput capability, also known as its traffic capacity. Most digital PBXs that switch data should be **nonblocking**, particularly for data traffic. The NEAX 12A can be configured in a nonblocking mode, but only when the number of stations and trunks is 40 or less (total). Otherwise, it is possible for calls of any type (voice or data) to be blocked. The NEAX 12A is not touted as a data switching system, although with modems it will support data speeds up to 9600 bps. The NEAX 2400, on the other hand, is **designed** for data switching, and as such will provide nonblocking service. Up to 736 ports (the capacity served by an Interface Module Group), fully nonblocking service is provided. Above that capacity, what NEC refers to as "virtually" nonblocking service is provided. This means the probability of a call being blocked is about 1 in 10,000,000, which should be excellent for most data applications.

NEC targets the NEAX 12A at small to medium businesses with moderate growth patterns. However, since the NEAX 2400 overlays the NEAX 12A, and is competitive with it in price, the NEAX 12A should be selected only for those applications where price is the primary concern. Hotel/motel installations are primary examples of a good fit for the NEAX 12A. Both NEAX systems can be used in a wide variety of business situations, but since the future of the industry is integrated voice/data communications, the NEAX 2400 is the better choice.

Station users have a wide array of features to use in both NEAX systems. Standard 2500-type telephones can be installed or electronic feature sets can be used. The NEAX 12A can use the ElectraPhone, which has several buttons designed for ease of feature activation. A visual display can be ordered, which indicates the calling station's extension number. Most integrated voice/data PBXs today have proprietary telephone that can connect data terminals for simultaneous voice and switching. The NEAX 2400 uses the Dterm phone, which has an RS-232C port in the back of the set. Voice is digitized at the set, and is multiplexed to the PBX, along with the data terminal signals, over a single pair of wires. Dterm phones are available in 4- and 16-line versions, with programmable feature access buttons.

Both NEAX systems have communications management features that provide efficient call handling and management information. Station Message Detail Recording (SMDR) is standard in both systems, and raw data provided by the switches can be processed by NEC's Astra line of minicomputers. These systems are called either Astra-Phacs or Mini-Phacs, depending on the number of call records required to be processed. Call routing features like Least-Cost Routing and Route Advance assure that the most cost-effective trunk facilities will be used. Both systems can reside within large multinode tandem-switched networks, such as CCSA. System administration is easily handled on both systems though either the attendant console or a system management terminal. This makes it easy for users to change station feature assignments, move stations, and inquire about system performance.

The NEAX 12A is built around 1 to 3 cabinets, with 120 to 360 stations available. Up to 4 attendant consoles can be provided. This methodology is fairly typical of the way PBXs have been configured for the past 20 years or so. The NEAX 2400 looks at things from a completely different perspective. Starting off with a single Port Interface Module (PIM), and a Miscellaneous Module (MISC) for control and alarm functions, a user can have up to 184 station/trunk ports. All in the space of about 2 large suitcases. Adding 3 more PIMs increases the configuration to 736 ports. Each additional PIM is stacked upon the other. This is called an Interface Module Group (IMG). Expanding beyond a single IMG requires an Expansion Module Group (EMG) plus additional IMGs. This type of configuration is called a Multiple Module Group (MMG). Redundant CPUs and other critical electronics are

NEC NEAX Family

NEAX 12A & NEAX 2400 IMS

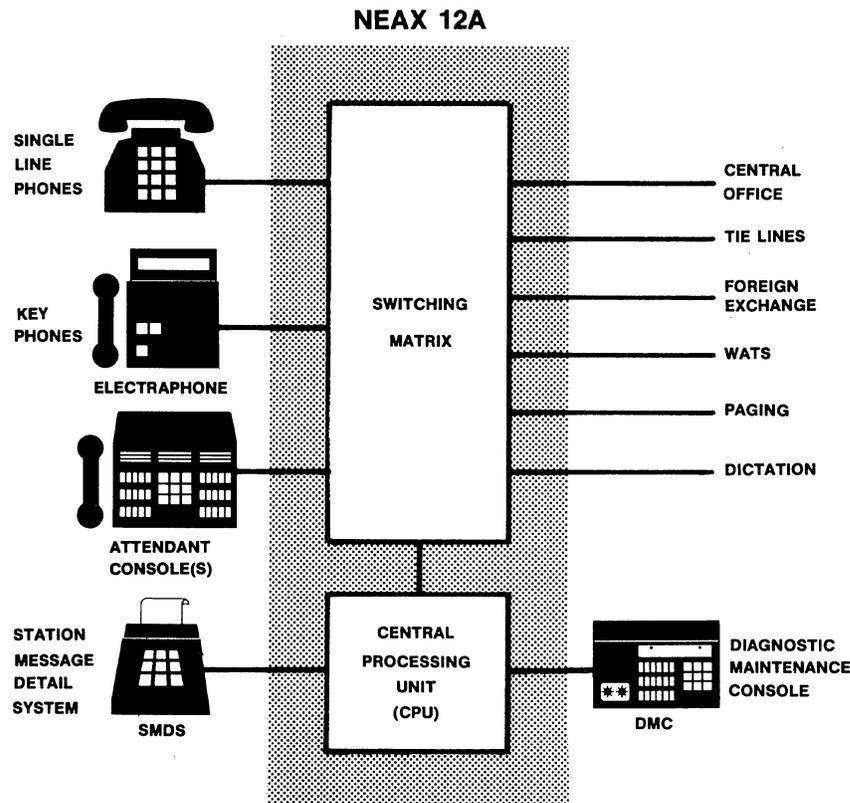


Figure 1 • NEAX 12A block diagram.

provided with MMGs. The important point to make is that this expansion is possible without changing out any existing equipment. Very few other systems on the marketplace have this capability.

Within the industry, the NEAX 2400 has already received a lot of attention since its introduction in September of 1983. It is being distributed by the leading interconnect companies, as well as many of the divested AT&T regional holding companies. Its data communications support is comparable to the best in the industry, and its capabilities in the areas of voice mail, text mail, teleconferencing, and local area networking make it a superior product. Its price is very competitive with other voice/data systems. NEC intends to position itself as one of the premier vendors of telecommunications equipment in the world, and the NEAX 2400 is indeed a world-class product.

□ Strengths

NEC Telephones, Inc is in the enviable position of having a parent company that is one of the largest in the industry. With its considerable experience in telecommunications, semiconductors, computers, facsimile, and video products, NEC is now beginning to enter the world of integrated data and voice communications. The ability for NEC Telephones to use its sister companies to reinforce its current product line is a strong advantage.

The NEAX 12A is marketed for hotel/motel, retail, and business applications. These are very large markets, and NEC has positioned this product to be very competitive. The small to medium PBX system arena is ideal for the 12A. The key to selling this product is acknowledging that it is a voice-only system. To make the system attractive to prospective customers, NEC prices the 12A substantially less than newer systems that have

integrated voice and data capabilities. A point to remember: if the system was designed to support both data and voice, the customer will ultimately pay for the equipment's development. The NEAX 12A, conversely, is a mature product; it is sold worldwide, and NEC will continue selling it in its targeted marketplace.

NEC realized the potential in the U.S. market for integrated voice and data systems. To successfully address this opportunity, NEC phased out its older NEAX 22 product line and introduced the NEAX 2400 Integrated Management System (IMS). This powerful system totally integrates voice and data communications using sophisticated distributed processing technologies. Its communications support permits the 2400 to become an integral part of a local area network. It also supports voice mail, text mail, and teleconferencing, all of which are leading-edge capabilities.

Unlike other competitors, the 2400 was already installed prior to its announcement in the U.S. The system was first installed in Japan in mid-1983, which gave NEC an excellent opportunity to field test the system under actual operating conditions. NEC pulled off a significant marketing coup when the 2400 was introduced in the U.S. The system's announcement coincided with its first installation in the U.S. In the telecommunications industry, it can typically be months or years between the introduction of a new PBX and its first customer installation. NEC sent a strong message to its competition: the NEAX 2400 is both here and **ready for installation immediately.**

Another NEC strength is its 2000-plus nationwide dealer network. NEC's strategy is to be a total supplier of sophisticated communications systems. This is extremely significant in light of the recently proposed acquisition of Rolm Corporation by IBM. The computer giant also has a leg up on semiconductor manufacturing through its 30-percent stake in Intel

NEC NEAX Family

NEAX 12A & NEAX 2400 IMS

Corporation—an interesting challenge to the rest of the industry, but not necessarily to NEC. Although many companies in the industry envision a world dominated by AT&T and IBM, it may well develop into a 3-way race, with NEC carving out a large market share for itself, too.

The NEAX 2400 is a major contender in the large-scale PBX marketplace with its 23,000-plus port capacity. This puts it in a league with only a few rivals, such as the AT&T System 85, Ericsson MD 110, GTE Omni SV, and Northern Telecom SL-100. With respect to the other major voice/data systems in the industry, the key players are the InteCom IBX, Rolm CBX II, CXC Rose, and the Zitel PNX. The NEAX 2400 has a strong position in this exclusive group, particularly because **NEC can deliver the product right now, the price is right, and the system delivers on its promises.**

□ Limitations

A major problem for end users is the "no standard" syndrome. Users are totally dependent on distributors for developing the overall system configuration and subsequent pricing. The growth of pricing wars in the PBX industry has made it even more difficult to develop any industry-wide price structuring formulas. NEC and its distributors are unfortunately part of this situation. A system as elegantly simple in design as the NEAX 2400 lends itself naturally to an itemized pricing format. How about it, NEC?

The NEAX 12A is billed as a nonblocking switch, but in reality it is not. Unless the system designed is a very small system, with under 40 stations/trunks total, the system will introduce blockage. For most users with strictly voice-only requirements, this poses little or no major problem. The 12A is not designed for voice/data switching; for those low-end users who have this requirement, the NEAX 2400 is the better choice.

The NEAX 12A also takes up more floor space than the 2400, on a per line basis, and if this is a consideration, the 2400 again is the better buy. When the NEAX 22 was actively marketed, users with a NEAX 12A had an upward migration path. Circuit boards could be interchanged between the 2 products, but an upgrade from a 12A to a 22 still meant replacing the main cabinets and common equipment. Upgrading from a 12A to a NEAX 2400 means an entire swap-out of machines, as there are no common components. However, once a user has a NEAX 2400, the system can be increased easily from a basic system to the largest configuration, with no components replaced.

The NEAX 2400 is a definite plus to the NEC product line. However, with all the numerous products in the NEC arsenal, there is a limited array of station equipment for the NEAX 2400. The system can certainly support standard station equipment, but the lack of a family of powerful system terminals and computer interfaces should be addressed by NEC if the NEAX 2400 is to achieve its potential.

Other major PBX manufacturers have announced agreements to exchange technologies with computer manufacturers in an effort to promote greater compatibility among products. NEC has not moved rapidly enough in this increasingly important area, and could lose a foothold in the market. Of particular importance is support for one or both of the computer/PBX interface specifications being touted: CPI (computer-to-PBX interface developed by Northern Telecom) and DMI (digital multiplexed interface developed by AT&T). Currently, most manufacturers support CPI, with only AT&T supporting DMI. NEC is certainly in a position, particularly with its parent company, to go any way it chooses, but the U.S. marketplace is fickle, and likes to embrace standards.

■ SOFTWARE

□ Terms & Support

Terms • with the exception of optional features, all standard software is bundled into the PBX system price.

Support • PBX system software is supported under NEC Telephone and its associated dealers and distributors • field developed software is supported by the individual dealer that authors the programs.

□ Software Overview

PBX software controls operations, conducts self-test functions, and implements features. It should be noted that features of the NEC NEAX PBX family are software driven and targeted at 3 areas: System Features; Attendant Features; and Station Features. System software consists of the Operating System, Self-Test, and Configuration Tables.

The operating system defines major parameters and capabilities. The distribution of calls and methods of route selection and optimization is also controlled by the operating system.

The self-test provides online testing of the PBX system performance. Error table printouts are available upon request. System fault error codes are stored in the PBX memory and made available to local or remote access.

The configuration tables contain information that is unique to each NEAX system installation. These tables may be changed or moved. The tables are used to define station characteristics and control assignments.

Diagnostic software diagnoses problems not found by the self-test programs. They are used by the field service representatives to further aid them in the repair of the system.

□ Features Overview

NEAX 12A features are extracted from the on-board ROM (Read-Only Memory) of the system. There are 3 primary application areas that have been targeted for the 12A. They are the Hotel/Motel Package, Retail Package, and Business III Package. The NEAX 12A operating system will support all 3 target applications. NEAX 2400 features are also extracted from on-board ROM. They are intended for operation with all sizes of the NEAX 2400. All standard features are bundled into the system price. Optional features are **extra-cost** items.

□ NEAX 12A System Features

General System Features

Standard Features • access to paging: provides switching and trunk circuitry to interface to loudspeaker or radio-paging equipment • access to recorded telephone dictation: access to and control of customer-provided dictation equipment • automatic set relocation: allows the reassigning of a station via a code from the console • auxiliary signaling: lights, bells, buzzers, etc, can be connected to the system for special requirements • CCSA access: interface to common control switching arrangement networks (on Business III, N/A on Hotel/Motel) • class of service: defines the features and services that can be accessed by a station • code calling access: attendant and station access code to interface a customer-provided tone signaling system • direct inward dialing (DID): allows designated trunks to be assigned to specific stations • flexible station numbering: stations can be numbered with 2, 3, or 4 digits • foreign exchange (FX) co-access: provides access to distant central offices via foreign exchange trunks • hold and conference release on abandon: release of line when an outside party hangs up on a line on hold • immediate ringing: called party receives ringing within 1 second of dialing completion • intercept treatment with reorder tone: dialing of unassigned number will return a reorder tone • manual line service: station access to a called party via attendant • night service: permits incoming calls normally directed to the attendant console to be routed to preselected station when the console is unattended • off-premise extension: allows a station to be located remote from the central control location • recall dial tone: provides indication to station user that the switchhook has been successfully used to generate a signal to request a service feature during an established call • ring validation: allows the ring time duration to be specified on CO trunk group • rotary dial calling: permits station users to originate calls over rotary or pushbutton lines using rotary dial telephones • special dial tone: distinctive dial tone that recognizes call transfer, conference, or ring again • tie trunk: connects other PBX systems to NEAX 12A • touch-tone calling: signals used for dialing internal or external calls • uninterruptible power source: provides up to 8 hours of power using separate batteries during power failure • WATS access: provides access to incoming or outgoing WATS trunks •

NEC NEAX Family

NEAX 12A & NEAX 2400 IMS

wide frequency tolerant power plant; permits use of variable AC sources for power consumption.

Attendant Administration Option • allows limited service change activity such as charges to rotary and touch-tone assignments from the attendant console:

NA prch

Automatic Wake-Up Service Option • enables calls to be made to specified rooms automatically at specified times, attempted calls are placed on system printer:

NA

Centralized Attendant Service (CAS) Option • designed for facilities located in same geographic area; each location has separate telephone system and centralized attendant, attendants are grouped together at 1 central location:

NA

Music Package Option • allows attendant and station access to music on hold:

NA

Power Failure Transfer Option • during AC power failure, specified trunks are automatically connected to predesignated stations:

NA

Recorded Announcement (RAN) Option • provides a means of responding automatically to incoming calls by prerecorded announcements:

NA

Remote Access to PBX Option • allows user outside the PBX access to the PBX via an exchange network connection without attendant or station assistance:

NA

Reserve Power Option • allows an additional power source to be accessed when the primary power supply fails:

NA

Room Status Option • provides "Room Vacant," "Room Occupied," "Room Reserved" status indication on Hotel/Motel Attendant Console:

NA

Uniform Call Distribution (UCD) Option • used for large number of incoming calls; means of receiving, concentrating, queuing, and uniformly distributing a high volume of incoming calls to answering stations; can be ordered with PBX system or a standalone unit:

NA

Restriction Features

Standard Features • access restrictions: controls station access to designated trunks and call groups • code restrictions: specifies area and exchange codes which are to be restricted from use by stations • outward restriction: call attempts routed to intercept tone; stations not permitted access to CO, FX, CCSA trunks, etc • toll restrictions: denies station user dial access to the toll network or toll operator • trunk group access restriction (TGAR): code assigned to each station which defines the trunk or trunk groups the station may access.

Call Accounting Features

Standard Features • remote administration: allows off-premise control of specified operations • traffic measurement: storage of traffic data on a system or customer basis.

Call Detail Recording (CDR) Option • outputs data on external calls to a printer and/or magnetic tape:

NA prch

History File Option • allows users to allocate an area of data storage for use as a history file where system messages can be stored until a printout is requested:

NA

Call Routing Features

Standard Features • least-cost routing: outgoing calls completed over least-cost trunk facility • route advance: system automatically selects alternate outgoing trunk facility if all desired trunks are busy.

Data Features

Standard Features • data line security: protects data circuits using PBX extensions from interruptions such as camp-on tones, busy verification.

Network Features

Standard Features • CCSA access: supports connections required for access to CCSA network • tandem tie trunk switching: PBX can switch incoming tie line calls to outgoing tie lines.

Attendant Console Features

Standard Features • alarm lamps: indicators that allow the attendant to see if a major or minor alarm has occurred • alphanumeric display for attendant position: allows attendant to process call; identifies source of an incoming or recalled call, calling extension, class of service, or trunk number • attendant control of trunk group access: attendant restricts station dial access to outgoing trunk groups by dialing an activation code and the access code of the trunk group to be restricted • attendant direct station selection (DSS) with busy lamp field: calls from console placed to station by depressing a key associated with the desired station line; lamp shows status of each station • attendant lockout: attendant denied the ability to reenter an established connection held on an attendant position, unless recalled by a station user • attendant interposition transfer: allows calls to be transferred from one attendant to another attendant in the same customer group • automatic timed reminders: automatically alerts the attendant when a call extended through the console has not been answered within a preselected time • automatic release: automatically releases incoming calls when transferred from one station to another • barge-in: allows the attendant to establish a talking connection with any apparently busy trunk or special service • busy verification: allows the attendant to establish a talking connection with any busy directory number to verify that the directory number is actually busy and in working order • call selection: allows attendant to answer incoming calls either in the order in which they are received or by selecting a call type from the Incoming Call Identification (ICI) lamps • call transfer: attendant can transfer a call to another extension • calling number display to attendant: provides the attendant with digit display of the station number of any station seeking attendant assistance • cancel: terminates a start call and automatically reconnects the answering position to the original calling facility • camp-on: allows the attendant to complete an incoming call to a busy directory number, a special tone is sent to busy station alerting of camp-on • conference call: up to 6 stations can establish a communications link, assisted by attendant • incoming call identification (ICI): console indicators which show the status of incoming calls • manual release: releases the answering position from any active call • night service control: permits incoming calls normally directed to the attendant to be routed to a preselected station when the console is unattended • nonlocking keys: keys which cannot be locked, standard on console • position busy: enables the attendant to render the console busy and prevent the assignment of incoming calls to the position • pushbutton dialing: ability to use pushbuttons to dial numbers in lieu of rotary dialing • return coverage on busy: allows camped-on party to be returned to the attendant after a period of time • return coverage on don't answer: returns party to attendant if station is left unanswered • secrecy: automatically splits the source and destination when a call is established through an attendant loop • serial calls: allows an attendant to complete an incoming call to 2 or more stations in succession without requiring the called station users to recall the attendant • splitting:

PRCH: purchase price. NA: not available. Prices effective as of November 1984.

NEC NEAX Family NEAX 12A & NEAX 2400 IMS

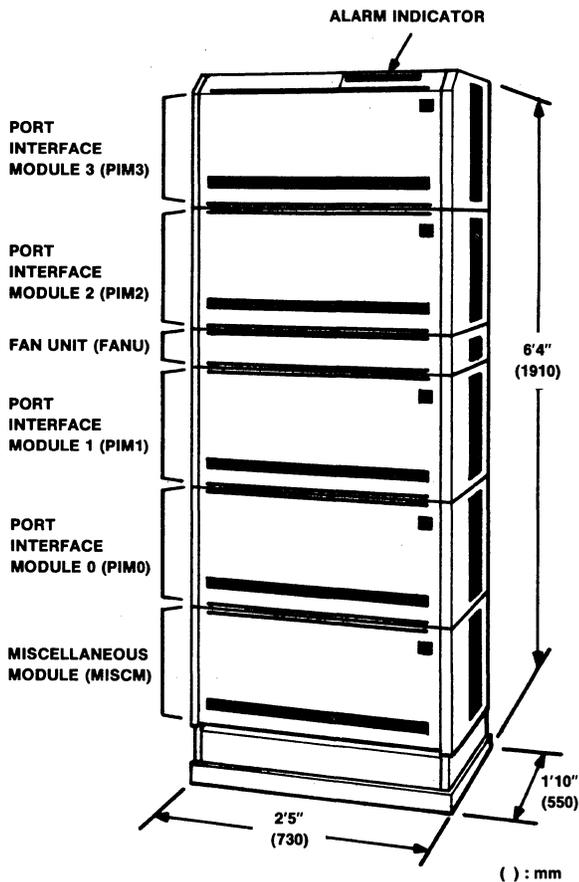


Figure 2 • NEAX 2400 interface module group (IMG).

allows the attendant to select and talk privately to either party of a call completed through the console, or the recall of a completed call that is held on a console loop • straightforward outward completion: attendant can place outgoing call for user without the user hanging up • switched loop operation: each call requiring attendant assistance is automatically switched to an idle loop available on an attendant position • through dialing: allows station users to complete outgoing calls on trunks by dialing the desired number after the attendant has selected the trunk facility.

Attendant Overflow Option • allows specified calls to be automatically rerouted to a customer-specified Directory Number (DN) when the attendant is busy: NA prch

Automatic Dialing Option • allows an attendant to dial a directory number of up to 16 digits by pressing a single key: NA

Speed Call Option • allows an attendant to place a call to directory numbers by dialing a 1- or 2-digit code: NA

Do-Not-Disturb Option • attendant can put any directory number in this position which allows the station to make calls, but appears to be busy to all incoming calls: NA

Display/Change Date Option • allows the attendant to change the master date for traffic and diagnostic purposes: NA

Display/Change Time Option • allows the attendant to change the master time clock for traffic and diagnostic purposes: NA

NEAX 12A Station Features

Standard Features • attendant recall: allows a station user to recall the attendant by pressing a key or flashing the switchhook • call pickup: allows a station user to answer calls directed to other stations in a call pickup group • call status indicators: displays the status of a call associated with a specific key • call transfer: allows a station user on any 2-party call to transfer the existing call to a third party • call waiting: informs a station user, when on an established call, that another call is waiting to be connected • conference: allows a station, while on any established call, to bridge the existing call into another party or parties • dial access to attendant: allows station users to reach attendant by dialing 0 • direct outward dialing (DOD): stations can access trunks by dialing a trunk access code • distinctive alert: allows station users to distinguish between outside calls and inside calls • hold: station user can, without assistance from the attendant, hold an established call • hunting: routes a call to a busy station to the next idle station in a group • loudspeaker paging access: interface to customer-provided to system loudspeaker/amplifier system • manual signaling: station is denied dial tone; station may receive calls but all call originations must be made via the attendant • privacy: a station user goes off-hook, this feature prevents another station user from entering the connection • privacy release: allows a third party to enter an established call of a private connection • release: allows the station user to release an active call without going on-hook • station-to-station calling: direct dial to other stations without attendant assistance • tone buzzing: enables the station user, when off-hook, to be alerted by a buzzing tone through the loud speaker of the station • tone ringing: adjustable ringing tone is used to alert an idle station user of an incoming call • trunk access from any station (TAFAS): allows incoming calls to be directed to designated stations when attendant is absent.

Speed Call Option • allows a station user to place calls to directory numbers by dialing a 1- or 2-digit code: NA prch

NEAX 2400 System Features

General System Features

Standard Features • all features of the NEAX 12A plus the following • nonvolatile generic program: backup memory support for system control program not required • online maintenance: real-time diagnostics of system by user • peg counts: system records number of times specific traffic activities occur • all options for NEAX 12A are options for NEAX 2400.

Direct T-1 Interface Option • connection to T-1 facility: NA prch

Restriction Features

Standard Features • same as for NEAX 12A • options same as for NEAX 12A.

Call Accounting Features

Standard Features • same as for NEAX 12A • options same as for NEAX 12A.

Call Routing Features

Standard Features • same as for NEAX 12A • options same as for NEAX 12A.

Data Features

Standard Features • same as for NEAX 12A plus the following • asynchronous data switching: system supports async data • data interface auto-answer: automatic answer of incoming data calls (Dterm set) • data terminal traffic measurement: statistical analysis performed by system to optimize use of data facilities • data transparency: data transmission paths are transparent to data equipment • half-/full-duplex switchover: data sets can operate

NEC NEAX Family

NEAX 12A & NEAX 2400 IMS

either in half- or full-duplex modes (Dterm set) • modem pooling: system supports multiple modems for efficient data calling • simultaneous voice and data: transmission circuit can support both voice and data signals simultaneously (Dterm set) • synchronous data switching: system supports sync data.

Network Features

Standard Features • same as for NEAX 12A • options same as for NEAX 12A.

Attendant Console Features

Standard Features • same as for NEAX 12A • options same as for NEAX 12A.

Station Features

Standard Features • same as for NEAX 12A • options same as for NEAX 12A.

Dterm Electronic Telephone Option • digital feature phone that supports simultaneous voice and data transmission • automatic recall • calling station status display • call forwarding • call hold • call pickup • call transfer • call waiting • do not disturb • elapsed time display • exclusive hold • executive right-of-way • hands-free dialing/answering • last number redial • line preselection • message reminder on display • time reminder • speed calling • plus all standard NEAX 12A station features:

NA prch

Application Software

NEC has installed its systems in numerous application environments. To date, NEC provides system software for general business and hotel/motel applications.

■ HARDWARE

□ Terms & Support

Terms • the PBX models are available for purchase or lease on a 1-, 2-, 3-, or 5-year lease • lease rates do not include maintenance.

Support • equipment can be installed by NEC Telephone authorized distributors • service and maintenance is based on the policies established by individual dealers or distributors.

□ Overview

The models of the NEC NEAX PBX family are computer-based systems designed for stored program activities using space division/analog (12A) and TDM/PCM digital (2400) switching for voice and voice/data. Stations supported varies from 360 (12A) to over 23,000 (2400). As user requirements change, additional systems with the appropriate configuration can be installed. Existing operation will not be altered unless requested by the customer.

Only the NEAX 2400 PBX family member supports simultaneous integrated voice and data switching, but both PBXs can connect to tandem switching networks.

NEC Telephones also supplies its users with selected peripherals and electronic telephones, as specified by the user.

The major components that make up the NEC NEAX PBX family include system modules, attendant consoles, station devices, equipment cabinets, and peripheral equipment.

□ Representative System Configurations

NEAX 12A Configuration • 1, 2, or 3 cabinets • nonredundant • single cabinet system maximum 24 trunks/120 stations • 2-cabinet system maximum 46 trunks/240 stations • 3-cabinet system maximum 46 trunks/360 stations • up to 4 attendant consoles • field upgrade from single-cabinet to 3-cabinet system.

Small System • 15 trunks/110 stations • 1 console:
\$32,000 to \$58,000 approx prch

Medium System • 28 trunks/235 stations • 1 console:
72,000 to 84,000

Large System • 35 trunks/305 stations • 2 consoles:
108,000 to 126,000

4-Circuit Station Line Circuit Board • 4 stations per circuit pack:
2,000

2-Circuit Trunk Line Circuit Board • 2 trunks per board • local CO, FX, WATS, etc:
1,600

Line Trunk Unit • circuit board rack for lines and/or trunk circuit boards • holds up to 6 line circuit boards and 4 trunk circuit boards:
3,500

NEAX 2400 Configuration • Port Interface Module (PIM): cabinet that provides access to 184 station/trunk ports • Miscellaneous Module (MISC M): cabinet that houses alarm, maintenance, and other system controllers • Control Processor Module (CPM): required for configurations over 736 ports; houses distributed multiprocessor control circuitry • basic system includes PIM and MISC M for 184 ports maximum • Interface Module Group (IMG): includes 1 MISC M and up to 4 PIMs for maximum 736 ports • up to 63 attendant consoles • redundancy provided with multiple module group systems • field upgrade from smallest to largest system with no units replaced or modified.

Small System • 10 trunks/50 stations • 1 console • nonredundant • 50% digital Dterm phones:
37,000 to 49,000

Medium System • 100 trunks/500 stations • 2 consoles • nonredundant • 50% digital Dterm phones:
450,000 to 565,000

Medium System/Multiple Module Groups • 475 trunks/1,185 stations • 50% digital Dterm phones • DID • 3 consoles • redundant processors:
1,080,000 to 1,320,000

Large System/Multiple Module Groups • 1,250 trunks/9,155 stations • 50% digital Dterm phones • DID • 4 consoles • redundant processors:
7,880,000 to 9,875,000

16-Circuit 2500 Set Line Circuit Board • 16 stations per circuit pack:
2,300 to 2,600

4-Circuit Digital Telephone Circuit Board • 4 digital Dterm telephones supported per circuit pack:
1,000 to 1,200

4-Circuit CO Line Circuit Board • 4 central office trunk lines per board • WATS, OCC, FX, local CO supported:
2,000 to 2,300

4-Circuit DID Line Circuit Board • 4 DID trunks per circuit pack:
1,200 to 1,400

Redundant CPU • includes PIM:
11,000 to 13,000

Port Interface Module (PIM) • supports up to 184 ports:
4,500 to 6,000

Miscellaneous Module (MISC M) • supports various system control functions:
3,500 to 5,000

Control Processor Module (CPM) • supports control functions required for multiple IMG configurations:
4,500 to 6,000

PRCH: purchase price; includes installation cost and first year maintenance. NA: not available. Prices effective as of November 1984.

NEC NEAX Family NEAX 12A & NEAX 2400 IMS

Backup Battery Supply • minimum 4 hours provided:
2,500 to 3,000

Station Equipment—Voice/Data

Attendant Console • primary function to service incoming calls
 • connects outgoing calls • provides information concerning
 status of calls being handled.

NEAX 12A: \$2,800 to \$3,000 approx prch

NEAX 2400: 2,700 to 2,900

Hotel/Motel Console • special desktop attendant console unit
 located on the front desk of the lodging facility:
NA

ElectraPhone • electronic key telephone system providing the
 user with 17 buttons and an optional data screen; up to 64
 Electraphones can be equipped in the NEAX 12A:
100 to 130

Dterm Telephones • used with NEAX 2400 IMS,
 microprocessor-based digital telephones with 4 or 16 keys, which
 can be independently programmed, and a 16-character LCD
 display.

4-Line Dterm Phone: 270 to 300

16-Line Dterm Phone: 360 to 390

Data Communication Equipment

Modem Pooling • eliminates the need for dedicated modems •
 consists of originate-only modems, terminate-only modems, or
 dual mode as well as dual speed modems:
\$1,000 to \$1,200 approx prch

NEC 2400 Packet Switching • allows local network or Ethernet
 communication network access:
NA

NEC 2400 Protocol Converter • allows ASCII terminals to
 access asynchronous, bisynchronous, and SNA/SDLC host
 databases:
NA

NEC 2400 Voice Mail Module (VMM) • stores digitized voice
 information on disk for retrieval by directed users; field installable;
 provides vehicle for exchange of information in a voice format:
NA

NEC 2400 Text Mail Module (TMM) • storage and retrieval
 system for text information—telex, teletext, other hard copy output
 equipment—on premise or at distant locations; data is input by
 user along with instructions for retrieval or dissemination:
NA

NEC 2400 Facsimile Module (FMM) • used for storage,
 retrieval, maintenance, and retransmission; operates on
 preprogrammed instructions for unattended operation:
NA

Asynchronous Data Adapter • interface for asynchronous data
 terminals:
260 to 275

Synchronous Data Adapter • interface for synchronous data
 terminals:
260 to 275

Peripherals

Service Teleprinter • used for system diagnostic reporting • list
 moves and changes within the system • can be used with remote
 PBX:
\$1,400 to \$1,700 approx prch

Maintenance & Administration Terminal • access to system
 diagnostic routines and database software • maintenance
 personnel can interrogate system using MAT either on-site or at a
 remote location:
1,600 to 1,950

Subsystems

Station Message Detail Recording System • accumulates
 outgoing call details for subsequent processing by separate
 system into management reports:
NA approx prch

NEC Astra-Phacs SMDR Reporting System • based on NEC
 Astra minicomputer • handles from 25,000 to 100,000 call
 records • includes operator CRT, printer, and software:
16,500 to 32,700

SYSTEM MAINTENANCE & DIAGNOSTICS

System Reliability • redundant CPUs in NEAX 2400 •
 error-correcting memory • redundant critical electronics in
 NEAX 2400 • distributed processing in NEAX 2400 • backup
 battery supply.

System Diagnostics • systems continuously diagnose operations
 • major/minor alarm indications at attendant console • audit train
 of system activities generated on system teleprinter • remote
 diagnostics by distributor service centers.

System Maintenance • normally performed by authorized NEC
 distributor • factory support available from NEC if required • local
 maintenance can be performed by user if desired; parts inventory
 can be maintained on-site.

System Management • users can change such functions as
 pickup groups and call routing, perform station relocations •
 system management terminal or attendant console used.

• END

Northern Telecom Meridian DV-1

Integrated Data/Voice Information System

■ PROFILE

Function • stored program computerized information controller for switching voice and data • can be standalone system or function as part of PBX or Centrex system.

Applications Supported • office automation: word processing, presentation graphics, spreadsheets, electronic mail, file transfer, database management; general business.

System Parameters • switching technology (voice): digital using TDM/PCM • architecture: dual high-speed buses; 20M-bps packet-switched bus for data transport, 20M-bps circuit-switched bus for voice communications; operating functions distributed throughout system via Shared Resource Units • common control: distributed through 32-bit Motorola 68010 and Intel 80286 microprocessors; 1M to 4M bytes of memory per processor; system administrative functions under control of XMS operating system residing in primary processor • transmission: 4-wire at speeds up to 20M bps per bus • wiring plan: 2-pair twisted pair per station; used with standard 2500 telephones, Meridian 4000 Series voice/data terminals, IBM Personal Computers, or other ASCII terminals • data switching capability: 2.56M bps per station, asynchronous or synchronous communications supported.

Traffic Capacity • 36 CCS per port, voice or data • grade of service: P.01 • simultaneous conversations: up to 100 voice connections and 35 data connections • nonblocking architecture for both voice and data.

Trunks/Stations/Consoles • 100 voice ports maximum; configurable as 500-/2500-type telephones or standard 2-/4-wire trunks • 35 data ports available for Meridian 4000 terminals, IBM PCs, or other ASCII terminals.

Voice Equipment • vendor supplied: 500-/2500-type telephones, single-line only; proprietary Northern Telecom feature telephones (planned) • nonvendor equipment supported: standard 500/2500 telephones and auxiliary devices.

Data Equipment • vendor supplied: Meridian 4010/4020 voice/data terminals; Displayphone/Displayphone Plus voice/data terminals; LanLink Interface Unit (LIU); Northern Telecom Omnitask 435/445/565/585 systems • nonvendor equipment supported: IBM Personal Computer; personal computers emulating Digital Equipment VT-100; ASCII terminals requiring RS-232C or Centronics parallel interface • data rates: up to 2.56M bps per station, asynchronous or synchronous • modems: any type compatible with RS-232C or Centronics parallel interfaces • multiplexers: most types supported • protocol converters: system emulates IBM 3270 SNA/SDLC; future support includes IBM 2780/3780, X.25, and IBM Document Interchange Architecture (DIA), Document Content Architecture



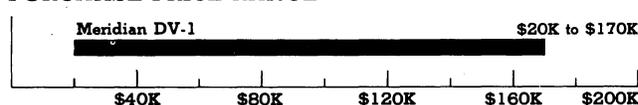
Northern Telecom's Meridian DV-1 Cabinets showing a Removable SRU.

(DCA), and X.400 protocols • data modules: personal computers connect directly to Lanlink; Meridian 4000 Series connects directly to LanLink; ASCII terminals connect to LanLink Interface Unit, which connects to LanLink • interfaces supported: RS-232C; Centronics parallel interface • printers: units that can connect via RS-232C or parallel interface • data storage: 40M-byte or 80M-byte hard disk drives; 200M-byte drive to be available later in 1985; 48M-byte streaming cartridge tape drive for backup • data terminals: Meridian 4000 Series; Displayphone and Displayphone Plus; ASCII terminals; VT-100 terminals; IBM Personal Computer.

Subsystem Support • applications processors: based on either Motorola 68010 or Intel 80286; 1M to 4M bytes of memory; connected to both high-speed buses • applications supported: electronic mail, form generation, calendar, calculator, word processing, presentation graphics, spreadsheet, relational database management, file management, Share (integrates voice communications with information transfer capabilities).

Communications/Networking • voice communications: support for most standard 2-wire and 4-wire facilities provided by AT&T, BOCs, and specialized common carriers • direct inward dialing supported • automatic route selection (ARS) not supported • system can utilize networking capabilities of associated PBX or Centrex data communications: 3270 SNA/SDLC and BSC support; 3274-1C and 3274-51C control units emulated; future

PURCHASE PRICE RANGE



NORTHERN TELECOM MERIDIAN DV-1 PURCHASE PRICING bar graphs cover price ranges between "small" and "large" configurations; installation and first year's maintenance included • ranges based on configurations supplied by Northern Telecom; individual hardware and software component prices not yet released • small configuration includes 1 Primary Processor, 1 Application Processor, 5 Meridian 4020 terminals, and ten 2500-type telephones • large configuration consists of 1 Primary Processor, 3 Application Processors, 25 Meridian 4020 terminals, and 65 2500-type telephones.

Northern Telecom Meridian DV-1 Integrated Data/Voice Information System

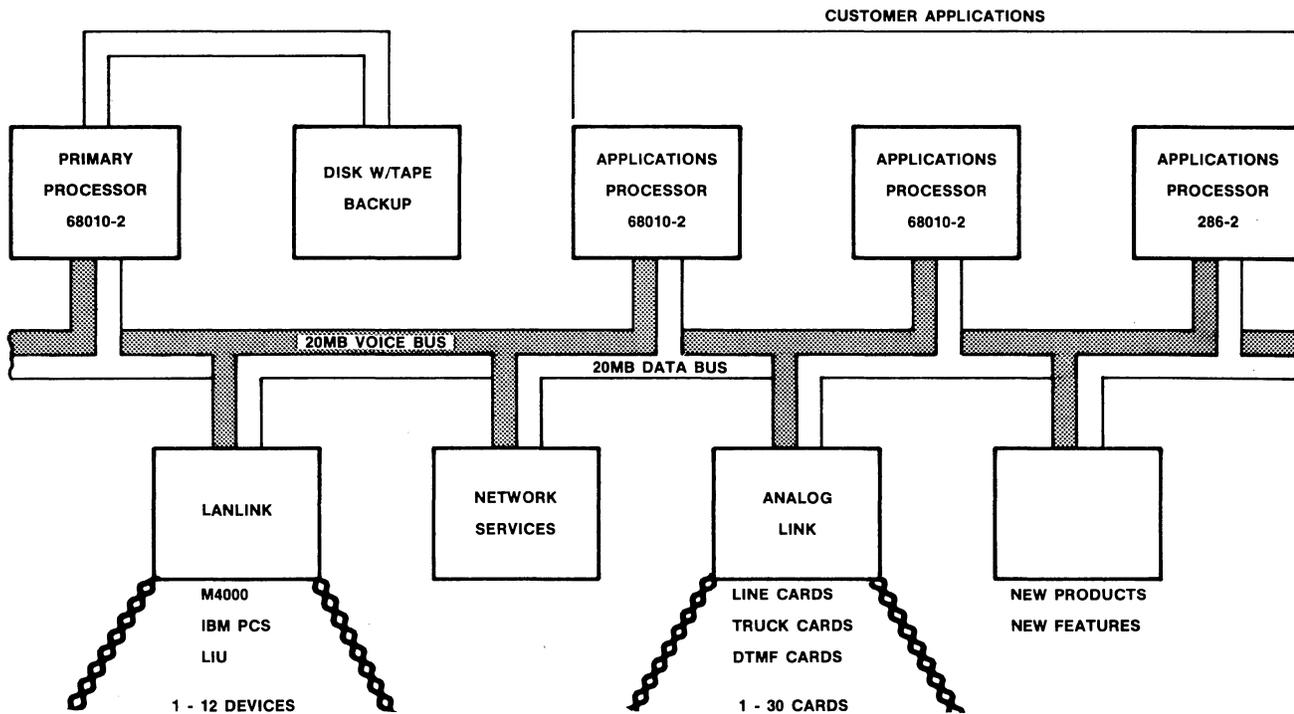


Figure 1 • Meridian DV-1 architecture.

support for IBM 2780/3780, DIA, DCA, and X.400, CCITT X.25; asynchronous communications using VT-100 or terminals supporting RS-232C or Centronics parallel interfaces • transmission rates: 2.56M-bps direct connection to DV-1; 19.2K-bps asynchronous connection to LanLink Interface Unit • T-1 interface: none • gateways: X.25 planned • local area networks: proprietary 20M-bps packet-switched facility; LanLink network for networking IBM PCs, Meridian 4000 terminals, or LanLink Interface Units.

First Delivery • planned for mid-1985.

Systems Delivered • approximately 20 beta sites; no production models delivered.

Installation Interval • 12 to 16 weeks ARO.

Comparable Systems • AT&T System 75; CXC Rose; David Systems Information Manager; Rolm CBX II; Telenova Inc Telenova I; Zitel PNx; various data-only systems.

Environmental Specifications • temperature: 50 to 80 degrees Fahrenheit • humidity: 30 to 60 percent • power: 110 VAC at 60 Hz; separate outlets • air conditioning: not required • cabinet dimensions: 10.5x19x36.5 inches (WxDxH) • weight: 120 to 150 pounds • minimum floor space required: 6x8 feet • floor loading: 50 pounds per square foot • FCC Registration: not yet registered.

Vendor • Northern Telecom, Inc; P.O. Box 1222, Minneapolis, MN 55440 • 612-932-8000.

Canadian Distribution • Northern Telecom Limited; 33 City Centre Drive, Mississauga, ON L5B 3A2 • 416-275-0960.

Distribution • nationwide through direct sales offices to large corporate accounts; value-added resellers to small- and medium-sized businesses.

Service/Support/Training • service, support, and training provided by Northern Telecom, telcos, or value-added resellers • initial vendor training provided by Northern Telecom • on-site and remote maintenance capabilities • 1-year warranty parts and labor • maintenance contracts available from NTI, telcos, and

VARs.

GSA Schedule • unlisted.

■ ANALYSIS

Northern Telecom announced its newest entry in the office automation marketplace, the Meridian DV-1 Data Voice System, on February 14, 1985. The Valentine's Day announcement was well planned, as the new product is considered a "sweetheart" by many analysts in the industry. The DV-1 was on display at the International Communications Association (ICA) Conference in Dallas during the first week in May, and attracted a lot of attention during the show. Those who saw the DV-1 go through its paces were impressed with its performance, flexibility, and compact size.

The DV-1 appears to have effectively bridged the gap in the integration of voice and data communication with its compact, modular design, using multiple 32-bit microprocessors operating over dual high-speed communication buses. It can support from 5 to 35 concurrent data users and up to 100 voice users. Other highlights of the announcement were a family of integrated voice/data terminals, the Meridian 4000 Series; terminal communications over 2 twisted-pair wire at 2.56M bps; a new proprietary operating system, XMS; use of UNIX V and Concurrent DOS operating systems in the same environment; an enhanced version of the SL product lines, the Meridian SL; and support for several IBM products, including the Personal Computer and 3270 communications, with future support of IBM's proposed Document Interchange Architecture and Document Content Architecture, and 2780/3780 communications.

The new system is targeted at branch office and departmental organizations, and integrates functions and applications of a computer with a telephone system. It allows a professional worker to create and distribute all types of information, whether voice, data, text, or graphic. A professional can create a spreadsheet, integrate it in a memo, and discuss the whole matter verbally with

Northern Telecom Meridian DV-1 Integrated Data/Voice Information System

1 or more associates, all within the same system. The DV-1 uses multiple windows to support these functions. As a computer system, it provides traditional data functions such as word processing, electronic mail, database management, and program development. As a telecommunications system, the DV-1 provides telephone features comparable to those found in PBXs and key systems. The DV-1 can operate either as a standalone system or part of an associated PBX or Centrex system, with access to all features available with those systems.

The DV-1 is based on 4 specific hardware elements: Meridian 4000 Series terminals, 2.56M-bps distribution to the desktop, Shared Resource Units, and dual 20M-bps buses.

Each system is built around a series of Shared Resource Units (SRU), which handle specific system operations. Seven different SRUs are available, and connect to the dual bus network. The Primary Processor uses a Motorola 68010 microprocessor, and Applications Processors use either the 68010 or the Intel 80286.

Another SRU handles terminal connections for the new Meridian 4000 Series terminals, IBM PCs, or LanLink Interface Units, which connect asynchronous devices. All voice communications are handled by another SRU within the DV-1. Other SRUs handle disk storage, network communication for voice services, and power. Each SRU is physically, electronically, and logically independent while acting as a separate self-contained node on the buses. If an SRU fails, it is automatically taken out of service and the system administrator is notified.

The DV-1 uses multiple operating systems that run concurrently. Numerous applications are available that will run on the DV-1. Northern Telecom's new XMS operating system controls all system operations, and provides voice and data communication features. It provides an environment for UNIX V and Concurrent DOS, which supports MS-DOS and CP/M-86 applications. Northern Telecom also announced several office automation packages it will offer with the DV-1, providing electronic mail, presentation graphics, spreadsheets, and forms generation. Programming languages available include COBOL, BASIC, Pascal, and C. Program development tools were also announced.

Cabling to terminals requires standard twisted-pair wires, rather than coaxial or fiber optic cables. This keeps costs under control, and provides greater flexibility. Only 2 pairs are required to connect a new Meridian 4000 terminal or IBM PC to the DV-1. Standard 500/2500 telephones also use 2-pair wiring.

The Meridian 4000 Series provides data-only (Model 4010) and voice/data (Model 4020) terminals with numerous voice and data communications features. The data-only 4010 can be upgraded to the 4020. Up to 9 windows are supported on the 4000 Series. IBM Personal Computers are also supported, and connect to the LanLink SRU via a plug-in board in the back of the PC. Various asynchronous terminals can run in the DV-1, particularly those supporting Digital Equipment VT-100. Numerous other terminals can operate in the DV-1, and are connected either with an RS-232C or parallel interface. Voice communications are handled via standard single-line 500/2500 telephones.

Northern Telecom has pushed the integration of voice and data closer to reality for many users with the DV-1. Most major data/voice PBX manufacturers, Northern Telecom included, have concentrated on larger installations as the key to integrating voice and data. But in the DV-1, Northern Telecom has pointed out that opportunities for data/voice integration are indeed at the lower end, too. This development has spurred rumors that AT&T Information Systems and Rolm Corporation are working feverishly to bring out low-end versions of their System 75 and CBX II, respectively. Both manufacturers are weak in their data/voice products under 100 lines, particularly in the integration of voice and data. Other manufacturers of LAN-based systems, CXC Corporation and Ztel, Inc, are having problems bringing their systems to market, and making them work properly. Their cost is high, too. Major computer system manufacturers have products that handle multiple applications, but no voice communications. Assuming the DV-1 works, and all indications are that it does, Northern Telecom has scored a major coup in voice/data integration. Its price is very favorable, both for voice and data applications. The DV-1 also enhances the useful life of the company's existing base of SL-1 PBX systems, providing

an effective bridge into the automated office.

When the first production systems are delivered this May, they will not have all the functionality as advertised in press releases. Not yet. Northern Telecom is planning to release more features and support during the balance of 1985 and into 1986. The system is well thought out, the price seems right, and the company's commitment to it is significant.

The DV-1 will be distributed by Northern Telecom data sales force, rather than the telecom sales force, which handles the SL product line. It will also be handled by authorized value-added remarketers. Although it might appear a conflict is possible with 2 different sales forces selling, in many cases, to the same individual, Northern Telecom claims it has worked out this potential problem, and anticipates no difficulties.

Strengths

Although the Meridian DV-1 has only a few installations so far, including the original beta sites, it was on display at the International Communications Association (ICA) Conference in Dallas the first week in May. Based on the demonstrations in place at the time, the system will do everything claimed in its press announcements. The Meridian 4020 voice/data terminals were also in use at the show, and do indeed handle simultaneous voice and data. Opening the DV-1's cabinets, the arrangement and configuration of Shared Resource Units (SRUs) is very logical and easy to understand. The units are simple to remove and replace, and the entire 3-cabinet display unit took up only 6 square feet of floor space. The Motorola 68010 primary and applications processors were installed; there were no Intel 80286s in the display model.

The price per voice terminal is estimated between \$275 and \$450, a very competitive figure. Data communications terminals range between \$4,000 and \$5,000 per user, including application software. Also very competitive. The use of 2-pair cabling to terminals will save money for users, since most telephone wires in a building are of that type already, thus precluding an additional investment. Data Communications support is extensive, even this early in the product's life. IBM 3270 support is available, and the Personal Computer can easily coexist with the Meridian 4000 Series terminal in a DV-1. The new Meridian 4000 is a powerful big brother to the company's popular Displayphone. The system's ability to function in either a standalone or PBX/Centrex environment increases the product's attractiveness to end users with a diverse system mix. In short, Northern Telecom has done a fine job of appealing to the greatest number of people with the highest degree of flexibility and cost-effectiveness.

Limitations

Currently, the only station equipment supported in the DV-1 are 500/2500 telephones and the Meridian 4000 Series. Multibutton key telephones are not supported. Other Northern Telecom feature phones, like the SL-1 telephone and the new Meridian 2000 and 3000 Series of digital telephones, are not supported. The system is advertised as having a capacity of 35 data and 100 voice connections. Actual configuration limits are higher, but the company is stressing the product's viability in the under-100-line marketplace, and claims its system is fully nonblocking for voice and data within the above limits. There is no interface to specialized circuits such as tie lines, T-1 lines, and any other local area networks. Support for X.25 is planned, however. Northern Telecom states it plans to continually evaluate these and other capabilities for future product enhancements, and claims the DV-1 architecture will be able to support them when needed.

■ SOFTWARE

Terms & Support

Terms • basic operating system (XMS) included in basic system price; other operating systems, utilities, applications, and applications development programs are priced separately.

Support • DV-1 system software is supported by Northern Telecom and licensed distributors • applications software is supported by Northern Telecom, licensed distributors, and

Northern Telecom Meridian DV-1 Integrated Data/Voice Information System

software product developers.

□ Software Overview

DV-1 software consists of the XMS operating system, which runs on the Motorola 68010 processor; additional operating systems include versions of UNIX V and Concurrent DOS, which run on the Intel 80286 processor and support MS-DOS and CP/M applications.

XMS provides overall system control and administration, as well as voice and data communication features. It provides an environment suitable for multiple applications, and supports multiple windows on a terminal screen.

Specialized application packages are available from Northern Telecom for graphics, electronic mail, word processing, and database management. Several programming languages are available, including COBOL, FORTRAN, BASIC, Pascal, and C. Program development tools include a COBOL source code generator, a COBOL source code debugger, a COBOL screen generator, and a screen-based text editor. Other industry standard applications that run under the above operating systems will also be supported.

Operating Systems

XMS (Northern Telecom) • handles overall system operations and provides environment under which other operating systems can function; supports all voice and data communications functions:

	\$500 prch	\$15 maint
Unix V (AT&T Bell Labs):	NA	NA
Concurrent DOS (Digital Research, Inc):	NA	NA
CP/M-86 (Digital Research, Inc):	NA	NA
MS-DOS (Microsoft Corp):	NA	NA

Programming Languages

	\$1,250 prch	\$16 maint
RM/COBOL (Ryan-McFarland Corp):	125	NA
RM/COBOL Update:	1,250	16
RM/FORTRAN (Ryan-McFarland Corp):	125	NA
RM/FORTRAN Update:	NA	NA
Level II COBOL XA (MicroFocus Ltd):	NA	NA
Pascal-2 (Oregon Software, Inc):	NA	NA
Personal BASIC (Digital Research, Inc):	NA	NA

Development Tools

ANIMATOR (MicroFocus, Ltd) • Level II COBOL interactive source code debugger:	NA prch	NA maint
COGEN (Bytel Corp) • COBOL source code generator:	NA	NA
EMACS (UniPress Software, Inc) • screen-based text editor:	NA	NA
Forms-2 (MicroFocus, Ltd) • COBOL screen generator:	NA	NA

Data Communications

3274 Comm-8 Users • supports connection of 3270 terminals operating in SNA/SDLC environment:

	\$8,890 prch	\$13 maint
3274 Comm-8 Users Update:	225	NA
Timesharing Communications:	700	9
Timesharing Communications Update:	225	NA
VT-100 Communications (Digital Research, Inc):	NA	NA

□ Features Overview

Voice communication features are provided as part of the XMS operating system. Features are supported on both 500/2500 telephones and Meridian 4020 voice/data terminals. Northern Telecom Displayphone and Displayphone Plus are also supported by the DV-1.

System Features

Standard Features • key system configuration: supports multiline access, intercom, and paging • direct inward dialing (DID): incoming calls completed directly to station, bypassing attendant • basic trunk terminations: standard trunk types supported • system timeouts: programmed delays for use of specific system functions • help function: provides assistance to users, particularly those using Meridian 4020 terminals • hunting: calls to busy terminals route to alternate terminals • automatic pause for dialed digits: programmable delay inserted into dialing sequence required by specialized carriers • call timer: system provides elapsed timer for calls • paging access: interface to customer-provided paging system • message waiting: notification to terminal user of a message.

Restriction Features

Standard Features • class of service: provides various levels of access to outside facilities • authorization codes: requires dialing of special code before system processes call.

Call Accounting Features

Standard Features • call detail recording: system collects specific data on all outgoing calls for subsequent processing • account codes: special code used for identification of calls associated with specific client or project.

Data Features

Standard Features • data/voice communications: supports simultaneous voice and data • data privacy: blocks insertion of specialized tones and signals into data connection • modem pooling: supports multiple modem groups for outgoing data calls • IBM SNA/SDLC emulation: supports 3274-1C and 3274-51C control unit • asynchronous communications: supports terminals using Digital Equipment VT-100, RS-232C, or Centronics parallel interfaces • Share: permits Meridian 4020 users to transfer files between terminals, while coordinating activities by voice • automatic call setup: simplifies data call establishment by dialing predefined codes • LanLink: high-speed (2.56M bps) connection to Meridian 4000 Series, IBM Personal Computer, or other PC using 2-pair twisted-wire facilities.

Network Features

Standard Features • tie trunks: supports 2-wire and 4-wire circuits • interface to SL-1/-100 PBX systems: connects to larger switches as part of larger network, supports all network features of SL systems.

PRCH: purchase price for software license. MAINT: monthly maintenance cost. NA: not available; price not disclosed by vendor. Prices effective as of May 1985.

Northern Telecom Meridian DV-1 Integrated Data/Voice Information System

Attendant Console Features

Standard Features • DV-1 does not have dedicated console such as SL family of PBXs • Meridian 4020 terminal can function as attendant position • incoming call identification: all incoming calls are identified • call status display: pertinent information about each call processed at attendant position displayed on terminal screen • call connect: incoming calls connected to desired stations.

Station Features

Standard Features (500/2500 Telephones) • call hold: calls can be placed on hold • call forwarding: calls routed to alternate terminal • call transfer: calls can be transferred to another terminal • call waiting: caller alerted to another call waiting to be answered • conference calling: users can establish multiple calls on single connection • automatic line selection: on multiline arrangements, users can determine which line is selected first, which line rings at their location • barge-in: with proper class of service, user can interrupt established call • held line reminder: call on hold beyond specific period of time triggers alert to users • privacy with release: users cannot enter into an established call, but can selectively release privacy feature • host CO/PBX recall: on systems where DV-1 is behind a PBX or Centrex, user can generate signal to associated switching system to access that system's features • ring again: system will redial last number dialed at a terminal • handsfree operation: users can make or receive calls • handsfree call pickup: calls to a terminal can be answered by another terminal • call park: calls can be placed on a system hold for retrieval at another terminal • do not disturb: blocks ringing at a terminal for privacy.

Standard Features (Meridian 4020) • access to all 500/2500 features • screen-based operation: access to telephony features using programmable soft keys and screen information • dialing by name: user dials name of desired party and system automatically makes call • directory: user has access to personal, internal, or corporate information directories • 3 last-numbers redial: system can redial last 3 numbers attempted • auto-line selection: system automatically dials calls for data connection.

☐ Applications Software

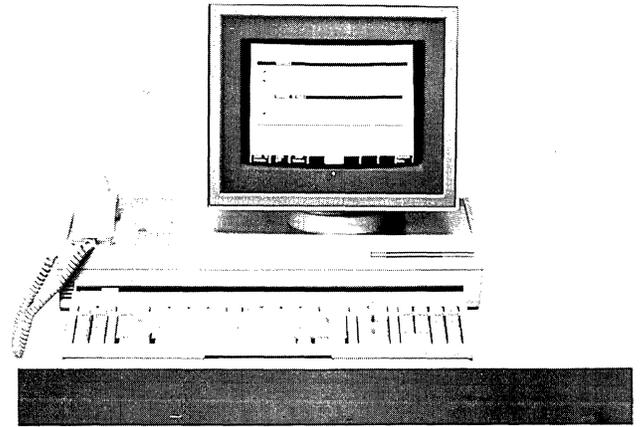
Northern Telecom has announced several applications for the DV-1, with the likelihood of additional products in the future. The company says its support of UNIX and Concurrent DOS will provide users with a wide variety of application choices.

Q-Office (Quadratron Systems) • office automation package supporting the following functions: menu, note collection and retrieval, electronic mail, forms generation, calendar, and calculator:

\$1,150 prch \$15 maint

Q-Office Update:	125	NA
Q-One (Quadratron Systems) • word processing:	595	8
Q-One Update:	150	NA
Q-Graph (Quadratron Systems) • presentation graphics:	NA	NA
Q-Plan (Quadratron Systems) • electronic spreadsheet:	495	7
Q-Plan Update:	125	NA
Q-Office Plus (Quadratron Systems) • integrates all the above packages:	1,745	22
Q-Office Plus Update:	225	NA

Telephone Services • provides all voice telecom features in



Northern Telecom's Meridian DV-1 M4020 Terminal.

system:	750	20
Telephone Services Update:	225	NA
Informix (Relational Database Systems) • relational database management system:	1,600	20
Informix Update:	150	NA
File-It! (Relational Database Systems) • file management system; compatible with Informix:	495	7
File-It! Update:	125	NA

■ HARDWARE

☐ Terms & Support

Terms • systems can be purchased or leased for 1, 2, 3, or 5 years • end-user prices can vary based on numerous factors like overhead, discounts, and costs related to installation, maintenance, and training.

Support • systems are supported by Northern Telecom and accredited distributors.

☐ Overview

The Northern Telecom DV-1 is a modular system, with major system components implemented in Shared Resource Units (SRU). Each plug-in unit operates independently from another. For example, if an SRU goes offline, it will not adversely affect operation of other SRUs. Functions provided by that particular SRU will not be available.

Each DV-1 is built around 1 to as many as 8 cabinets, each of which has 2 shelves for SRUs. There are 7 different SRUs available: 1) Primary Processor—controls all system operations; 2) Applications Processor—provides specific system functions such as electronic mail and messaging; uses either Motorola 68010 or Intel 80286 microprocessors and 1M to 4M bytes of memory; 3) Disk Storage—provides hard disk support up to 40M bytes or 80M bytes with 48M-byte cartridge streaming tape drive for backup 4) LanLink—proprietary local area network that connects Meridian 4000 terminals, IBM Personal Computers, or LanLink Interface Units; uses 2-pair twisted-pair wires with 2.56M-bps

Northern Telecom Meridian DV-1 Integrated Data/Voice Information System

speeds to terminals; 5) Analog Link—provides voice communication support for telephones or loop/ground start trunk lines; 6) Network Services—provides telephony service functions such as tones, ringing, and 3-party conferencing; 7) Power Supply—converts standard 110VAC to DC current required in each SRU.

Data and voice communications are carried separately over 2 high-speed buses. Data is carried over a 20M-bps packetized asynchronous local area network bus. Voice is transmitted over another 20M-bps circuit-switched bus. Connections to the system buses are available using a variety of techniques, particularly 2-pair station cable. Data communications from a terminal to the associated SRU are made at speeds up to 2.56M bps.

Station equipment for the DV-1 includes the new Meridian 4000 Series of terminals. The 4010 is a data-only device, and the 4020 incorporates voice features with the data terminal. The 4010 is upgradeable to the 4020. Standard single-line 500/2500 telephones can also be used with the DV-1, as can standard asynchronous terminals with voice features, like the Northern Telecom Displayphone and Displayphone Plus. Existing Northern Telecom feature phones, such as the SL-1 electronic telephone, are not currently supported. The Meridian 4020 can be programmed to function as an operator position, if required.

The system has several design criteria. Although configurations larger than 35 data terminals and 100 voice terminals are possible, Northern Telecom says it has identified these as practical limits for configuration purposes. Users can expect nonblocking communications if these limits are not exceeded.

□ Representative System Configurations

Small System • supports 8 data users and 18 voice users • 1 Primary Processor with 2M-byte memory • 1 Application Processor (68010) with 1M-byte memory • LanLink Interface Unit • 1 LanLink SRU • 40M-byte disk SRU • 1 Analog Link SRU with 5 station cards, 10 trunk cards • Network Service SRU • 8 Meridian 4020 terminals • 1 cross-connect panel for connecting telephones/terminals to SRU • 2 cabinets and associated power supplies • eighteen 2500 telephones not included • XMS and UNIX operating systems • Q-Office Plus application • 3270 communication package:

\$47,100 prch NA maint

Medium System • supports 20 data users and 40 voice users • 1 Primary Processor with 2M-byte memory • 2 Application Processors with 2M bytes each • LanLink Interface Unit • 2 LanLink SRUs • 80M-byte disk SRU • 2 Analog Line SRUs with 10 station cards and 20 trunk cards • Network Service SRU • 20 Meridian 4020 terminals • 40 2500 telephones not included • 1 cross-connect panel • 3 cabinets and associated power supplies • XMS and UNIX operating systems • Q-Office Plus application • 3270 communication package:

93,165 NA

□ System Components

Northern Telecom has stated it will not disclose individual system components at this time; it has, however, produced some representative configurations instead.

Primary Processor • controls all system operations; uses Motorola 68010; available with 2M or 4M bytes of memory.

Processor with 2M Bytes:

\$6,600 prch \$27 maint

Processor with 4M Bytes:

14,740 37

Applications Processor • provides support for specific applications; available as either Motorola 68010 or Intel 80286; available with 1M or 2M bytes of memory.

68010 with 1M Bytes:

6,600 40

68010 with 2M Bytes:

10,670 45

Intel 80286:

NA NA

LanLink SRU • supports up to 12 Meridian 4000 Series terminals, IBM Personal Computers, or LanLink Interface Units:

4,290 20

Disk Storage SRU • available in either 40M-byte or 80M-byte versions, each with 48M-byte streaming tape backup.

40M-Byte Version:

7,670 55

80M-Byte Version:

10,670 85

Analog Line SRU • supports 30 card slots for various station/trunk configurations • supports short/long loop station cards and loop/ground start trunk cards:

2,100 30

Short Loop Station Card • supports 2 stations; distances up to 4,000 feet from DV-1:

125 NC

Long Loop Station Card • supports 1 station; distances up to 15,000 Feet:

135 NC

Loop/Ground Start Trunk Card • supports 1 circuit; either loop or ground start:

145 NC

Dual Tone Multifrequency (DTMF) Card • provides tone detection and signaling for system:

250 NC

48-Volt Converter • converts DC current provided by power supply SRU to 48-volt DC for telephone equipment:

135 NC

Network Services SRU • provides specific telephone-related features, including signaling and 3-way conferencing; 1 per system:

1,600 38

Power Supply SRU • converts standard 110V AC current to DC used by system; 1 per cabinet:

440 8

Cabinet:

550 15

Input Jumper • unit that connects to cabinet with plug to standard 110V outlet:

330 NC

Horizontal Jumper • unit that connects cabinets together:

330 NC

Vertical Jumper • end unit that connects lower rack of circuit boards with upper rack; attaches to standard system cabinet:

330 NC

Cross-Connect Panel • connects various lines in system at central point:

250 NC

□ Station Equipment—Voice/Data

Meridian 4000 Series Voice/Data Terminals • includes 68010 processor • up to 1.1M-byte memory • 128K memory for screen management • 12-inch monochrome display, bit-mapped, screen resolution 351x720 pixels • 132-column display • up to 9 windows supported • multiple character fonts, 8 levels of gray scale • handsfree operation • detachable, hideaway keyboard

PRCH: purchase price; prices include installation and first year's maintenance. MAINT: monthly maintenance charge after first year. NA: not available/applicable. NC: no charge. Prices effective as of May 1985.

Northern Telecom Meridian DV-1 Integrated Data/Voice Information System

with 109 keys • modular telephone component • Model 4010 data-only version; Model 4020 voice/data version.

Model 4010:	\$1,195	NA
Model 4020:	1,395	NA

Meridian 4000 Series Components

M4020 Integrated Voice/Data Controller:	\$879	\$11
M4010 Data-Only Controller:	779	9
M4010 to M4020 Controller Upgrade Kit:	279	2
Display Monitor:	399	5
Keyboard:	119	2
I/O Option Board:	100	NC
Memory Module • increases memory to 1.1M bytes:	175	NC
Headset:	150	NC
Terminal Printer • 150-cps bidirectional ink jet unit:	495	11
Printer Cable:	35	NA
LanLink Interface Unit (LIU) • provides support for 1 RS-232C interface and 2 Centronics parallel interfaces; connects to LanLink SRU:	950	12

Data Communications Equipment

Simultaneous voice and data communication support using Meridian 4020 terminals or other Northern Telecom approved devices • standard ASCII terminals, VT-100 terminals, and IBM Personal Computers supported • most standard peripherals supported • support for X.25, IBM DCA/DIA/X.400/2780/3780 planned • T-1 interface being evaluated as future offering.

Modems

201C:	\$850	\$10
208A/B:	1,995	10
212A:	675	10

212A/D:	800	10
V.29 Unit:	2,995	10

Peripherals

DV-1 supports standard 327X, VT-100, and ASCII terminals; peripherals that utilize RS-232C or parallel interface.

Printers

Band Printer, 300 LPM, Serial Interface, Pedestal Mounting:	\$8,310	\$98
Band Printer, 300 LPM, Parallel Interface, Pedestal Mounting:	7,480	98
Band Printer, 300 LPM, Serial Interface, Cabinet Unit:	9,745	98
Band Printer, 300 LPM, Parallel Interface, Cabinet Unit:	8,980	98
Band Printer, 600 LPM, Serial Interface:	13,785	138
Band Printer, 600 LPM, Parallel Interface:	12,900	138
Letter-Quality Printer • 40-cps dot-matrix unit:	2,700	48

Subsystems

The DV-1 supports multiple applications processors, which affords great flexibility in configuring a system. Currently, there are no specific subsystems such as automatic call distribution, voice mail, or SMDR records processing. Northern Telecom plans to evaluate user comments and suggestions when planning future system enhancements.

SYSTEM MAINTENANCE & DIAGNOSTICS

System Reliability • multiple microprocessors in distributed environment • each SRU functions independently of another • error detection and correction • power supplies for each cabinet.

System Diagnostics • system continuously runs diagnostics routines • malfunctions reported on Meridian 4000 terminal • remote system diagnostics.

System Maintenance • performed either by Northern Telecom or authorized distributor • defective SRUs replaced in field with minimal degradation of service.

System Management • system programming changes made via Meridian 4000 terminal • voice communication and data communication parameters changed easily.

• **END**

Northern Telecom Meridian SL PBX Family

Models Meridian SL-1S, SL-1MS, SL-1N, SL-1XN & SL-100

PROFILE

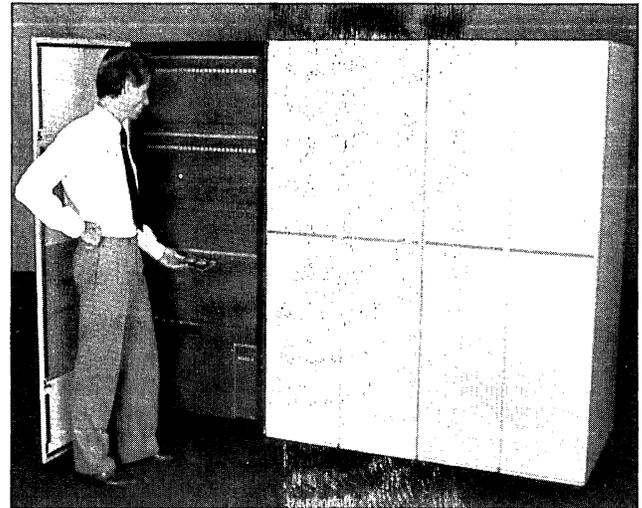
Function • stored program computerized branch exchange (PBX) systems for switching voice and data • digital switching technology • TDM/PCM • 2-pair wiring connects standard keysets • up to 3,000 nonblocked connections • redundancy on all models except SL-1S and SL-1MS.

Communications/Networks • route optimization; Foreign Exchange (FX); WATS access; DDD; transmission rates to 56K bps; AUTOVON; satellite communication; voice-band data transmission; centralized attendant service; automatic call distribution; 2-/4-wire transmission; X.25; T1; tandem network; Electronic Switched Network (ESN); 1-/2-pair station wiring; 56K-bps internal synchronous speed; 19.2K-bps internal asynchronous speed; Integrated Services Network; LANSTAR local area networks.

Trunks/Stations/Consoles • Meridian SL-1S: up to 20 trunks; up to 144 lines; 1 console • Meridian SL-1MS: up to 80 trunks; up to 400 lines; up to 15 attendant consoles • Meridian SL-1N: up to 360 trunks; up to 1,500 lines; up to 15 attendant consoles • Meridian SL-1XN: up to 1,500 trunks; up to 5,000 lines; up to 15 attendant consoles • Meridian SL-100: up to 3,000 trunks; up to 30,000 lines; up to 255 attendant consoles.

Traffic Capacity • SL-1S: 1800 CCS per system; 8 to 16 CCS per line equipped at P.01 grade of service • SL-1MS: 7200 CCS per system; 10 to 20 CCS per line at P.01 • SL-1N: 15,480 CCS per system (standard configuration), 25,920 CCS (nonblocking configuration); 10 to 36 CCS per line at P.01 • SL-1XN: 79,200 CCS per system (standard configuration), 129,600 CCS (nonblocking configuration); 10 to 36 CCS per line at P.01 • SL-100: 8 to 36 CCS per line at P.01 • nonblocking configuration: available with SL-1N and XN models only.

Voice Equipment • vendor supplied; SL-1 electronic telephone; LOGIC 1 handsfree telephone; LOGIC 25 single-line telephone; SL-1 Displayphone; Meridian 2018 digital telephone; Meridian



MERIDIAN SL-1.

2112 digital telephone; Meridian 3000 Touchphone; ACD agent position set; ACD supervisor position; 500 rotary telephone; 2,500 Digitone telephone; SL-1 attendant console; SL-100 electronic telephones; SL-100 attendant console • equipment supported: all 500-type rotary dialed telephones; all 2500-type Touch-Tone telephones.

Data Equipment • vendor supplied; SL-10 Packet Data Switching System; Add-on Data Module (ADM); Asynchronous Interface Module (AIM); Multi-Channel Data System (MCDS); 3270 Protocol Converter; Personal Computer Interface Card; Data Modem Pool; Integrated Messaging System (IMS); Integrated Voice Messaging System (IVMS); Digital Trunk Interface (DTI); Computer to PBX Interface (CPI); 4-port Data Line Card (DLC); Asynchronous Interface Line Card (AIRC); Asynchronous Synchronous Interface Module (ASIM); System/36 Gateway; X.25 Gateway; LANSTAR • equipment supported: teleprinter terminals; CRT terminals; microcomputers; minicomputers; line printers; magnetic tape; disks.

Applications Supported • office automation; word processing; dictation; facsimile • hotel/motel • health care • retail • general business • banking • service sector • government • military.

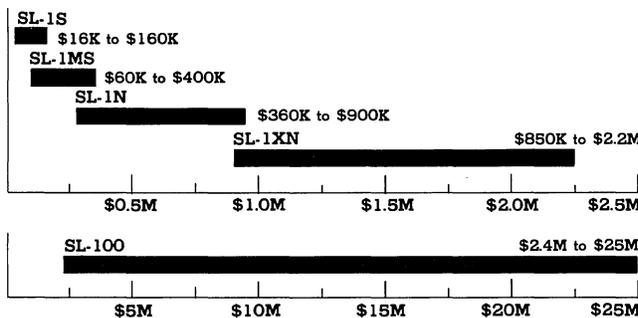
First Delivery • Meridian SL-1S; Meridian SL-1N; Meridian SL-1MS; Meridian SL-1XN: 3rd quarter 1985 • SL-1 first delivered 1975.

Systems Delivered • to date Northern Telecom has installed over 10,000 systems worldwide.

Comparable Systems • competition for the Meridian SL-1S and Meridian SL-1MS • AT&T-IS Dimension 400, 600, and System 85; Mitel SX-100 and SX-200; ROLM CBX-II; ITT TD-500; Anaconda-Ericsson Prodigy • competition for the Meridian SL-1N • AT&T-IS Dimension 600 and System 85; Mitel SX-2000; ROLM CBX-II; Intecom IBX S/40; Siemens Saturn; Ericsson MD 110; NEC NEAX-22 • competition for the Meridian SL-1XN; AT&T-IS System 85; Mitel SX-2000; ROLM CBX-II; Intecom IBX S/80;

PURCHASE PRICE RANGE

hardware & software



NORTHERN TELECOM MERIDIAN SL PBX FAMILY PURCHASE PRICING bar graphs cover price ranges between "small" and "large" configurations for hardware and software; installation and maintenance not included • SL-1S ranges from 10 trunks, 30 stations to 40 trunks, 140 stations • SL-1MS ranges from 20 trunks, 80 stations to 45 trunks, 360 stations • SL-1N ranges from 35 trunks, 180 stations to 120 trunks, 1,100 stations • SL-1XN ranges from 100 trunks, 950 stations to 300 trunks, 4,800 stations • SL-100 ranges from 500 trunks, 3,000 stations to 3,000 trunks, 25,000 stations.

Northern Telecom Meridian SL PBX Family

Models Meridian SL-1S, SL-1MS, SL-1N, SL-1XN & SL-100

Siemens Saturn; NEC NEAX-22; Ericsson MD 110 • competition for the Meridian SL-100; AT&T-IS System 85; Ericsson MD-110; NEC NEAX 2400; GTE Omni V; ROLM CBX-II.

Environmental Specifications • temperature: 59 to 86 degrees Fahrenheit (normal), 40 to 100 degrees Fahrenheit (maximum) • humidity: 20 to 50 percent, noncondensing • power: 115/230v AC at 50/60 Hz; AC converted to 48v DC at switch • air conditioning: SL-1S—not required; other systems—optional • dimensions: SL-1S—32x16x56 inches (WxDxH); all other models—52x20x71 inches (WxDxH) • weight: SL-1S—500 pounds; other models—850 to 1,500 pounds, depending on configuration • floorloading: 100 pounds per square foot (all models) • minimum equipment room dimensions: SL-1S—8x8 feet (WxD); SL-1MS—8x10 feet (WxD); SL-1N and SL-1XN—12x18 feet (WxD); SL-100—18x24 feet (WxD).

Vendor • Northern Telecom International Ltd; 33 City Center Drive, Mississauga, ON L5A 3A2; 613-962-4511 • Northern Telecom Inc; 2100 Lakeside Boulevard, Richardson, TX 75081-1599; 214-437-8000.

Distribution • nationwide and worldwide through direct sales offices and distributors • United States through Northern Telecom Inc, Richardson, TX; West Germany through Northern Telecom AG; England through Northern Telecom (UK) Ltd; Singapore through Northern Telecom (Asia) Ltd; France through Northern Telecom (France) SA; Dublin through Northern Telecom (Dublin) Ltd.

■ ANALYSIS

Northern Telecom sent shock waves throughout the PBX market when it announced the Meridian family of digital communication systems on February 14, 1985. Included in the announcements were the following:

- A major architectural extension to the company's existing SL-1 and SL-100 digital PBX systems, significantly increasing their capabilities, and providing an expanded cadre of information services and features.
- A new office information system for smaller organizations or individual departments in larger organizations, the Meridian DV-1, that integrates voice, data, text communications for up to 100 stations.
- New digital telephones and integrated voice/data workstations.
- A high-speed local area network (LAN), called LANSTAR, that provides communications to a wide variety of data terminals and systems.
- Increased connectivity with industry-standard data communications protocols and standards.

The Meridian SL family of PBX systems incorporates 3 major architectural extensions over the company's venerable SL-1 digital PBX. First, there is LANSTAR, a 40M-bps parallel transport system composed of dynamically allocated circuit and packet-switched bandwidth; next, there is a new multiprocessing architecture associated with LANSTAR to maximize its performance capabilities; and finally, the company introduced a new 2.56M-bps twisted-pair distribution system that connects the switch with specific terminals. All of these capabilities are assembled into a generic offering—and the cornerstone of the Meridian SL line—called **Integrated Services Network**, or ISN.

Several new information services are provided as part of ISN, which is implemented in separate equipment cabinetry from the basic SL-1/SL-100 products. **Messaging** provides voice and text information exchange within the system, and conforms to the CCITT X.400 standard for electronic document transfer. **Forms** permits the easy creation and storage of forms for rapid online access. **Access** automatically handles basic speed, code, and protocol conversions for rapid access to information stored in different computer systems. It simplifies call setup, and records any part of a session for future use. **Share** permits real-time desk-to-desk multimedia communication between users. The users can interact with the same information on their respective display screens. **Directory** provides an electronic telephone directory that ties in other information services. Users can create directory listings easily, and can include all pertinent call setup

instructions, particularly if the call is going to a terminal or system outside the Meridian SL. **Computing** is another key module within ISN that permits access to various application programs such as word processing, calendar management, and database management. The applications are designed to operate under XENIX, which resides in ISN. Several **Resource Management** programs are available to help users operate their terminals efficiently, including **Help**, with single keystroke operation; **User Guide**, with comprehensive information on all system functions; **Filing**, a storage utility with multiple security levels; and **Printing**, which permits hard copy printing on any system printer.

Several new digital station devices were announced. The Meridian 2000 and 3000 sets all digitize voice in the set, rather than at the switch, and can be equipped with an integral RS-232C interface. The **Meridian 2112** has 12 programmable feature/line buttons and the **Meridian 2018** has 18 programmable line/feature buttons. The **Meridian M3000 Touchphone** has a revolutionary design, incorporating a membrane LCD display for activating the set's features. The LCD display changes quickly to a different screen when depressing various areas of the display. The **Meridian M4000** series of integrated voice/data workstations feature a Motorola 68010 microprocessor, up to 1.2M bytes of memory, 13-inch diagonal screen, and detachable keyboard that can upload or download various Meridian ISN features over a 2.56M-bps twisted-pair link to the switch. Two models are available: the **M4010** provides terminal features only; the **M4020** adds voice features like a handset, handsfree operation, and several programmable line/feature buttons.

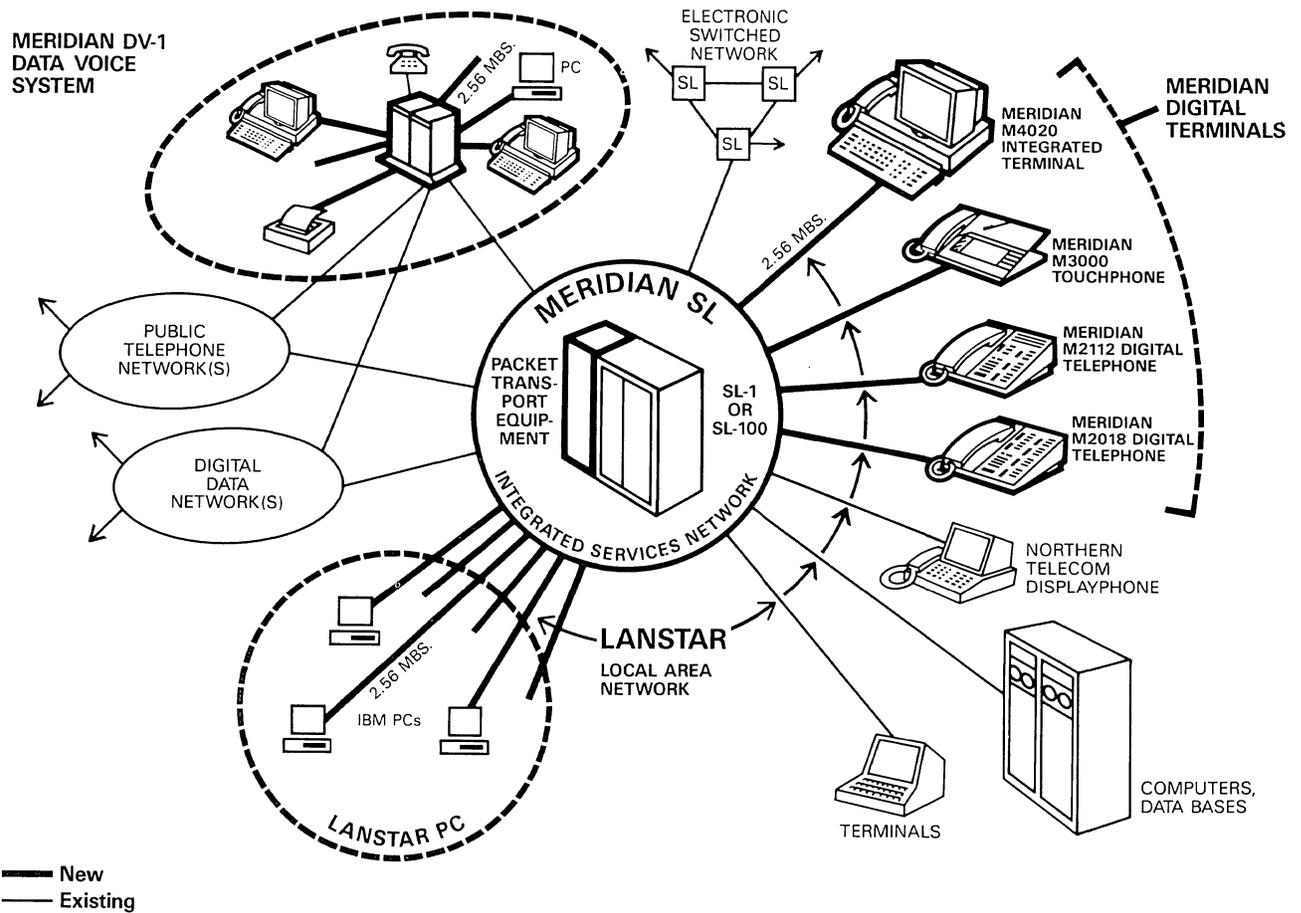
These devices join the SL-1 electronic telephone; the Link telephone, with a special button for feature activation; the Unity telephones, with 3 models for basic and multibutton operation; the SL-1 Compact telephone, a new version of the standard SL-1 set; and all the other Northern Telecom station sets available for the SL-1. Data communications through the standard SL-1 voice telephones is accomplished through various add-on and ancillary data modules. Both asynchronous and synchronous terminals can be supported.

LANSTAR is the local area networking capability of the Meridian SL-1/SL-100 systems, and builds around a 40M-bps dynamically allocated circuit/packet-switched network with a 2.56M-bps connection to each desktop, called LANLINK. It uses standard twisted-pair wiring, rather than coaxial, twinaxial, or shielded cabling. LANSTAR supports a variety of asynchronous and synchronous data communications, data options for Northern Telecom's new digital station terminals, and various line interfaces. Data support includes the following: Computer-to-PBX Interface (CPI), for high-speed connections to host computers; 3270 Protocol Converter, for connecting ASCII terminals to IBM hosts; multichannel data system (MCDS), for large-scale asynchronous connections to host computers; modem pooling, for efficient modem usage; LANSTAR Coax Elimination and Switching Module, which permits IBM 327X and 317X terminals to connect with the SL-1 over standard twisted pair; LANSTAR PC, which permits IBM Personal Computers to share data, disk drives, host computers, and remote databases; PC Terminal Emulator, which permits access to Northern Telecom's 3270 Emulator and X.25 Gateway, as well as the basic ISN information services; LANSTAR 3270 Emulator, permits users on the system to access programs designed for 3270 users; LANSTAR X.25 Gateway, which provides access to packet-switched public networks like GTE Telenet and Tymnet; and System 36 Gateway, which emulates the IBM 5251 remote workstation and 5256 printer for communications with IBM Systems 34/36/38. Northern Telecom has aggressively provided compatibility with most major communications standards, a formidable task for any major organization, and appears to have effectively solved numerous incompatibility problems in doing so.

Getting to Integrated Services Network is a fairly simple matter, assuming a user has an existing SL-1 system, and not one of the newer Meridian SL-1 systems that will be shipped in volume later in 1985. A separate Packet Transport Equipment (PTE) cabinet sits next to the existing Common Equipment (CE) and Peripheral Equipment (PE) cabinets, and connects to the CE via a 1.544M-bps digital link. This line, called the Command and Status

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MERIDIAN SL PRODUCT ELEMENTS.

Link, provides the exchange of information and signaling between the CE and PTE modules. The PTE has its own control and software, plus LANSTAR facilities. Multiple application processors can be connected in each PTE (up to 4 PTE cabinets). A maximum of 8 PTE cabinets can be configured for ISN. The SL-1 must have Generic X11 software, Release 5. The ease of integrating ISN helps preserve Northern Telecom's extensive user base of SL-1 systems, and reaffirms the company's commitment to an all-digital communications environment, the OPEN World.

The current Meridian SL-1 product line has 4 models, the SL-1S, SL-1MS, SL-1N, and SL-1XN. The Meridian SL-1S is a single-cabinet system for 32 to 140 stations. It is nonredundant and has 192K words of memory.

The Meridian SL-1MS replaces the SL-1M, and supports from 80 to 400 lines. It, too, is a single-cabinet system with a single CPU and up to 256K bytes of memory. Upgrades to larger SL-1 systems are fairly simple, since the system cabinet is the same as for larger models. Specific circuit boards, such as for common control, memory, network, and signaling must be replaced, and the software generic must be updated when growing to larger systems. Station and trunk circuit boards can usually be reused. An ACD version is available, as is a hotel/motel version.

Next in line is the Meridian SL-1N, a 2-cabinet redundant system that supports from 200 to about 1,300 lines. It has 320K bytes of memory and is software compatible with both the SL-1MS and SL-1XN. An ACD version is also available.

At the top of the Meridian SL-1 line is the SL-1XN, which uses up

to 4 cabinets for 1,000 to 5,000 lines. It has a fully redundant common control and memory and achieves its larger line sizes through multiple network groups. SL-1XN memory can expand from 384K to 768K words, and the system is software compatible with its smaller siblings.

The Meridian SL-1 is ideal for small to medium businesses with moderate growth patterns. The Meridian SL-1MS can be used in small to medium businesses and hotel/motel sites with moderate to enthusiastic growth patterns. The Meridian SL-1N is targeted at medium-sized businesses and lodges with moderate to active growth patterns. The SL-1XN can be used in medium to large businesses with moderate to aggressive growth patterns. Beyond these systems, the Meridian SL-100 must be selected.

The SL-100 is a multicabinet, redundant system. System control consists of a 16-bit microcomputer with 512K words (1025K bytes) of memory; up to 3,000 trunks and over 30,000 stations. It is **not** processor-compatible with the SL-1 family nor are the modules interchangeable. It is targeted for large to very large-sized companies with large growth patterns in the industrial, health, military, educational, and services industries.

A system which is actively sold with the SL family should be mentioned, although it is not a PBX. The SL-10 is a Packet Data Switching System that can be used with all other Northern Telecom SL Systems. It gives the PBX family additional capabilities of transmitting data and information throughout the Northern Telecom Network and other universally known packet switching services. Communication compatibility includes CCITT X.25, X.3, X.28, X.29, X.75, IBM Bisync (2780/3780), HASP, and

Northern Telecom Meridian SL PBX Family

Models Meridian SL-1S, SL-1MS, SL-1N, SL-1XN & SL-100

TABLE 1: Meridian SL Feature Availability by System

Installed Systems	Digital Tele-phones	M4020 Terminals	DTI	LANSTAR Terminal/Host Connectivity	LANSTAR PC	IBM 3270 Protocol Conversion	X.25 Gateway	Computer-to-PBX Interface	IMS Attendant Messaging	IVMS Voice Messaging	Information Services	ACD-D
LE	future	yes	—	yes	yes	yes	yes	yes	yes	yes	yes	yes
XL	future	yes	—	yes	yes	yes	yes	yes	yes	yes	yes	yes
VLE	future	—	—	yes	—	yes	yes	yes	yes	yes	—	yes
N	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
XN	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
M	future	—	—	yes	—	yes	yes	—	yes	yes	—	—
S	future	—	—	yes	—	yes	yes	—	yes	yes	—	—
MS	future	future	future	yes	future	yes	yes	yes	yes	yes	future	—

Meridian SL-1 Model	Digital Tele-phones	M4020 Terminals	DTI	LANSTAR Terminal/Host Connectivity	LANSTAR PC	IBM 3270 Protocol Conversion	X.25 Gateway	Computer-to-PBX Interface	IMS Attendant Messaging	IVMS Voice Messaging	Information Services	ACD-D
S	future	—	—	yes	—	yes	yes	—	yes	yes	—	—
MS	future	future	future	yes	future	yes	yes	yes	yes	yes	future	—
N	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
XN	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes

IBM 2740 interfaces.

Northern Telecom has certainly reaffirmed, and indeed strengthened, its competitive position in the PBX industry with the Meridian announcements. In terms of the ability to support multiple information processing applications and services like Messaging, Access, and Share, the company has few, if any, competitors. Although some industry observers might say the SL-1 is 10-year-old technology, Northern Telecom has obviously said "bunk" to these doomsayers. The Meridian product line, and Integrated Services Network in particular, provide an effective mid-life boost to the venerable SL-1 system, assuring its competitive position will remain intact. The cost to implement Meridian features is realistic, when considering a logical alternative is a totally separate data processing system with suitable interfaces to the PBX. Northern Telecom has integrated many features into an intelligent, well thought out product. The design is excellent, the packaging is ideal for existing as well as new Meridian SL customers, and the product works, as evidenced at the 1985 International Communications Association Conference this past May in Dallas.

Northern Telecom Limited has been in business since just before the turn of the century as a supplier of telephone equipment to Bell Canada. Today, Northern Telecom is the primary telecommunication equipment supplier in Canada, and the second largest in the U.S. The corporation operates 29 manufacturing plants in Canada, 21 in the U.S., 2 in the Republic of Ireland, and 1 each in Brazil, England, Malaysia, and Turkey. Northern Telecom entered the PBX marketplace in the early 1970s. There are currently over 10,000 SL Family PBXs installed worldwide, with a total installed capacity of over 4 million lines, equivalent to about 18 percent of the market.

□ Strengths

Northern Telecom has dedicated itself to penetrating the medium-scale PBX marketplace over the past 10 years. Its studies have shown that the need for medium-user PBX applications can be a lucrative market, and it has been very successful in this marketplace.

As new marketing opportunities come under consideration, the requirements from very large, multidivisional companies were

carefully evaluated. Northern Telecom determined this marketplace was not actively pursued by any of the leading PBX vendors, and decided to pursue this marketplace with its large-scale SL-100 and the upper end of the SL-1XN.

The company has reorganized its product line such that a smooth migration path is available for most users. The current software for business applications is X11, and is available in all systems, as well as some older models. Hotel/motel software is available under generic X37. Military applications, such as requiring AUTOVON access, are supported on generic X11. Station and trunk circuit boards can be reused through all models, but specific common control and memory components must be replaced when going to larger models.

Adding Integrated Services Network capabilities is relatively easy, and existing SL-1 equipment does not need to be replaced.

The Meridian SL systems have powerful administrative capabilities, in which users can handle a wide variety of system feature changes, station relocation, and diagnostic routines. The systems provide sufficient statistical data for a high level of overall system management.

Call management features are extensive in the Meridian SL systems. The Call Detail Recording feature provides all call records necessary for call costing and management reports. The company's Omnifacts DDP system can be used as a standalone unit to process CDR data into management reports, or other similar products available on the marketplace can be used. Basic Automatic Route Selection (BARS) provides cost-effective utilization of bulk-discount trunk facilities. For larger networks, the Electronic Switched Network (ESN) can be used for total system management and a uniform numbering arrangement.

Northern Telecom's commitment to digital technology, and its ambitious pursuit of compatibility with numerous data communications standards, has made them the leader in a crowded field. The latest Meridian announcements reaffirmed the company's commitment to the OPEN World, an environment envisioned by Northern Telecom with full connectivity and ease of communications with all types of information systems.

The latest digital station equipment reflects great attention to ergonomics, especially in the new Meridian 3000 Touchphone,

Northern Telecom Meridian SL PBX Family

Models Meridian SL-1S, SL-1MS, SL-1N, SL-1XN & SL-100

TABLE 2: Meridian SL Feature Availability by Terminal

	Business Calling Features	LANSTAR Data Option	LANSTAR Connec- tivity	Modern Pooling	LANSTAR PC	DIREC- TORY	Voice Messaging	MESSAG- ING	FORMS	Computing
Meridian M4020	yes	—	yes	yes	—	yes	yes	yes	yes	yes
IBM PC	—	—	yes	yes	yes	yes	—	yes	yes	yes
ASCII VT100- compatible	—	—	yes	yes	—	yes	—	yes	yes	yes
TTY	—	—	yes	yes	—	—	—	—	—	—
Displayphone	yes	—	yes	—	—	—	yes	—	—	—
Displayphone Plus	yes	—	yes	—	—	yes	yes	yes	yes	yes
SL-1 Displayphone	yes	—	yes	yes	—	—	yes	—	—	—
Meridian M3000	yes	yes	—	—	—	Note 1	yes	Note 2	—	—
Meridian M2112	yes	yes	—	—	—	Note 1	yes	Note 2	—	—
Meridian M2018	yes	yes	—	—	—	Note 1	yes	Note 2	—	—
SL-1 Telephones	yes	yes	—	—	—	Note 1	yes	Note 2	—	—
500/2500-type Set	yes	yes	—	—	—	Note 1	yes	Note 2	—	—
Unity	yes	yes	—	—	—	Note 1	yes	Note 2	—	—
IBM 3270	—	—	yes	—	—	—	—	—	—	—

Note 1: These telephones when associated with a data terminal or personal computer can be used with DIRECTORY for automated calling.

Note 2: These telephones when associated with a data terminal or personal computer can be used with MESSAGING for recording and playback of voice annotations.

which looks unlike anything else on the market. It takes only a short time to get used to the LCD display and its dynamic screen changes when various areas of the membrane panel are touched. The Meridian 4000 terminals fully integrate voice and data communications and connect to the SL-1 via 2.56M-bps twisted-pair link. This in itself is significant in terms of the competition, as the link works at 2.56M bps in **both** directions. This is greater bandwidth than currently available in any other product on the market.

Northern Telecom has worked effectively in packaging the Meridian SL-1. In the SL-1S, up to 140 lines are provided in less than 4 square feet of floor space. The SL-1MS provides up to 400 lines in about 10.5 square feet of floor space for an even more effective arrangement. Larger systems also have similar economies of scale.

The company is a major manufacturer of VLSI (very large scale integrated) circuits, which will help ensure its ability to deliver products on time and with the advertised capabilities.

Where other PBX manufacturers talk about 2-, 3-, or 4-pair station cabling, Northern Telecom has brought an enormous amount of bandwidth to the end user over a single pair of wires. The company's efforts to utilize twisted-pair wiring are extensive, and not limited to voice terminals. A classic example of this is the Coax Elimination and Switching Module, which converts Coax A signaling from an IBM 3270 display to twisted pair for connection to the SL-1. Similar devices on the output side of the SL-1 convert the signal back to coax for connection to an IBM front end or 3274/3276 controller. The new digital telephones announced with Meridian SL systems all use a single twisted pair to the switch, and have a full 512K bps of bandwidth available. The Meridian 4000 integrated voice/data terminals also use a single twisted pair to the switch with 2.56M bps of available bandwidth.

Northern Telecom has made great strides in formalizing agreements with major computer vendors to design equipment that will integrate with the SL-1 family. To date, the following vendors allow interworking capabilities with the SL-1; Digital Equipment Corporation (DEC); Sperry; Hewlett-Packard; Wang; and Data General. These companies represent over 70 percent of the installed minicomputer base in the U.S. and will allow

Northern Telecom to penetrate the marketplace that uses these computers.

Northern Telecom supports nonblocking switching on the SL-1. A PBX is considered nonblocking only if the switching network can provide a path (time slot) from every input to every output. A nonblocking architecture ensures a switch connection between a given input line and any output line. In a blocking network, output lines are supported using a ratio of input lines to output lines. The blocking PBX will, therefore, share a common output among different stations.

Nonblocking PBXs are considered to be the wave of the future. The "4th Generation" PBXs all claim to be nonblocking. Northern Telecom's Meridian SL-1 can function as a nonblocking PBX. The SL-1N can support up to 720 nonblocking ports, while the SL-1XN can support up to 1,500 nonblocking ports.

Northern Telecom claims the SL-1N and 1XN are virtual nonblocking PBXs. This technique ensures each user a connection within a network group, but a finite probability of blocking exists between groups.

The Meridian SL-100 is the largest of the SL family PBXs. It uses a distributed microprocessor architecture to control an extremely large number of voice and data lines and devices. The SL-100 can control over 30,000 lines (stations or data terminals). It has the distinct advantage of controlling stations in multilocations up to 50 miles from the same controller. This advantage allows the SL-100 to manage a number of locations with a single PBX in lieu of multiple PBX controllers with shared features. This does not mean that the SL-100 cannot be used with other PBXs; rather, it underscores the capabilities and the strong position the SL-100 offers the user who is searching for a large to very large system to satisfy his application requirements.

The Meridian SL-100 is software compatible with the SL-1 family of devices. Even though it utilizes the latest in VLSI technology, it can run the application software of smaller family members. The SL-100 has its own proprietary software language (PROTEL) which allows Northern Telecom to develop a high degree of customer integration and matching of custom application programs.

Northern Telecom Meridian SL PBX Family

Models Meridian SL-1S, SL-1MS, SL-1N, SL-1XN & SL-100

TABLE 3: Meridian SL-1 Generics (Present Systems)

MODEL	X37	X05	X09	X11.1	X11.2	X11.3	X11.4	X11.5
SL-1M	737	—	—	711.1	711.2	711.3	711.4	711.5
SL-1LE	337	305	309	311.1	311.2	311.2	311.4	311.5
SL-1N	—	—	—	—	—	—	811.4	811.5
SL-1XL	637	—	609	611.1	611.2	611.3	611.4	611.5
SL-1XN	—	—	—	—	—	—	911.4	911.5
SL-1S	X37	—	—	—	—	—	X11.4	X11.5
SL-1MS	X37	—	—	—	—	—	711.4	711.5

Note: X11 = generic
.5 = release number

X05 Generics support Software Options 1-29 & 45-48.

X09 Generics support Software Options 1-29, 41-48 & 52.

X11 Generics support Software Options 1-13, 15-39 & 33-74.

X37 Generics support Software Options 1-29, 31-34, 36-38 & 40-56.

□ Limitations

Northern Telecom is still in the **no standard** syndrome. It is difficult to configure a system from an outsider's or novice's perspective. Users are totally dependent on distributors for the product in their area. The prices that are quoted and the support that is given to the customer is determined by the **individual distributor**. The markup that is passed on to the customer is dependent on the distributor's overhead.

The advantage of using twisted-pair cable for high-speed connections like LANSTAR also creates problems for users with extensive cabling systems in existing buildings. Where there is a lot of key equipment, there is usually lots of what is called **bridged tap**, which means a specific cable pair can be wired to appear in numerous locations, typical of 1A2 key equipment. This will cause problems for Meridian SL users, as bridged tap cannot be used with the high-speed data links—they must be direct runs with no bridged tap. This could mean some users will have to recable their building if they want to fully utilize this feature.

The new Meridian SL systems are gradually entering the marketplace and will be in full production by 4th quarter 1985. As such, their ability to perform as claimed is still to be proven. Initial indications are favorable, but the real verdict will not be forthcoming until at least 30 or 40 systems are installed, particularly with all or most of the Integrated Services Network features in operation. In addition, the various data communications interfaces announced prior to Meridian, and with it, have only been installed in a few user sites to date, and have yet to be fully proven in the field. If they are successful, and there is little reason to doubt that, Northern Telecom will occupy an enviable position in both telecom and datacom marketplaces.

Although there is a high level of software compatibility from Meridian SL-1S to SL-100 systems, a user who must expand beyond an SL-1XN must change systems to the SL-100. The architectures are completely different, as opposed to other products like the NEC NEAX 2400, which is capable of growing from 100 to 23,000 stations without any equipment changes. This dilemma is shared by several other major PBX manufacturers.

The user should be aware that the Northern Telecom Meridian SL family is essentially a voice and data PBX system. Users that need voice communication only may be surprised by the line cost of the SL series even though data communication support is not a standard part of the PBX pricing. All systems contain the hardware to support data transmission, and this must be paid for by all potential customers even though they may only need voice communication.

■ SOFTWARE

□ Terms & Support

Terms • Meridian SL-1 software is a proprietary product of

Northern Telecom and is not sold outright • for a single payment, the customer receives a paid up lease conferring a "Right to Use" (RTU) the designated software • the restriction is that the customer may not duplicate or modify the program tapes in any way or divulge their contents to a third party • the RTU lease is straightforward and self-explanatory and appears on a special label on the tape cassette as well as in a supplement to the terms and conditions of sale on the invoice • each generic is a complete operating system software program with its individual RTU fee • option packages are added to the basic program as required • fees for the option packages are listed separately, and software packages are maintained on a vintage control system similar to the Meridian SL-1 hardware • changing or replacing the software on a Meridian SL-1 system for another optional feature grouping or vintage issue is a simple procedure • the new software package, ordered as for a new system, is shipped in duplicate and billed at the current RTU fee plus a service charge • the new software is loaded into the Meridian SL-1 system, and the original tapes returned for credit • on receipt, the customer is credited the original invoice RTU fees • the following chargeable items apply to Meridian SL-1 software: basic program generic RTU fee; optional feature packages RTU fee; upgrade replacement service charge; and customer data preparation service charge • credit allowed on upgrade or replacement between versions and issues of the same generic only.

Support • PBX system software is supported under Northern Telecom Corporation and its associated dealers and distributors.

□ Software Overview

Call processing, maintenance, and administration of Meridian SL-1 systems are controlled by computer programs stored either as resident programs in the system memory or as nonresident programs on magnetic tape. These programs include several components.

Firmware includes fundamental programs consisting of machine instruction sequences, which manipulate data in the central processor, and control input/output operations, error recovery, and diagnostic routines. The sequences are common to all machines.

Software group includes programs consisting of instruction sequences that control call processing, peripheral equipment processing, administration, and maintenance functions. These sequences are interpreted by firmware programs. Several generic software programs with optional feature packages are available to satisfy varying customer requirements.

Office data software describes the characteristics of the machine and call-dependent information such as features and services for each terminating set or trunk. The data is arranged into blocks embracing peripheral equipment, system configuration, and transient data.

System memory is organized into 3 areas to implement various

Northern Telecom Meridian SL PBX Family

Models Meridian SL-1S, SL-1MS, SL-1N, SL-1XN & SL-100

functions. The unprotected **transient data (or call) store** is used to hold transient call processing information such as the network paths in use, digits dialed, state of Light Emitting Diodes (LED), etc. The protected **office data store** holds directory number translators and all the office data that includes class-of-service and key feature assignments, etc. The write-protectable **program store** holds all system call processing programs. Included is a 8K-word segment implemented in nonvolatile ROM used for storage of system firmware. The ROM is programmed during manufacture with instructions that are permanent and indestructible. A portion of this store is reserved for various nonresident overlay programs. These programs, required during automatic diagnostics service order change, traffic measurement, and maintenance routines, are held on magnetic tape and loaded as required into the "Overlay" area of storage.

Firmware contains routines used in system initialization, diagnostics, input/output operations, and error recovery. This recovery involves reloading software and office data from the magnetic tape after power has been corrupted. If the protected store is intact, but the unprotected store has been corrupted, a resident software initialization program is entered, which rebuilds the transient data.

The **overlay** portion of memory can be loaded with various nonresident software programs as required during automatic diagnostics, service order changes, traffic measurements, or manual maintenance. Such programs, held on magnetic tape, are referred to as "overlay programs," because the previous program is "overlaid" with the current program. Overlay programs are used infrequently. All inputs from the service terminal are processed by an overlay loader program and, on receipt of specific commands, this program loads one of over 25 overlay programs from tape. The loaded program then assumes control. Overlay programs are divided among the following classifications:

• Service Change & Print Routine

Service changes do not normally require hardware changes. Instead, service change programs are used to create or change all aspects of the system from individual feature key assignments to complete system configurations. There are also programs and print routines for retrieving the data from the system to check the status of the office data, e.g., whether a set is assigned with a certain feature.

• Maintenance Diagnostics

These programs, like all overlay programs that operate concurrently with call processing without interfacing with traffic, represent the prime instrument for maintenance. Individual programs are used for automatically or manually testing CE (common equipment), network, PE (peripheral equipment), and PTE (packet transport equipment). The programs are entered into the overlay area at the request of maintenance personnel, as the result of a fault detected by hardware, or as part of a daily maintenance check initiated by the system at a time specified by the customer. In addition, background and signaling diagnostic routines can occupy the overlay area when it is not in use.

• Miscellaneous Programs—Traffic

All systems are equipped with traffic data accumulation programs that are resident in memory and part of the normal call processing programs. There is a traffic print program that examines the schedules, transfers data from accumulating to holding registers in accordance with the schedules, and prints the traffic data. In addition, there is a traffic overlay program that is used to query and modify schedules, options, thresholds, system ID, and time of day.

• Equipment Data Dump

As service changes are made to the system, the added or changed data can be written onto the system tape at the end of the existing data. This increases the number of records and tends to increase the loading time. Depending on the extent of service change activity or when installing a new tape, it may be desirable to condense the service change records into the permanent area in the tape.

When the equipment data dump program is invoked, all office data in the read/write memory is written onto tape, eliminating

the change records. The program is also used to update the spare magnetic tape when installing a new generic version, or to issue and capture protected data store information that can be changed by the subscriber, e.g., speed call lists. The program can be invoked on a routine basis, providing an automatic data dump option.

• Software Audit

This program monitors system operation and gives an indication of the general state of the system operation. The program is concerned mainly with system software. When a software problem is encountered, the program attempts to clear the problem automatically.

□ Meridian SL-1 Feature Overview

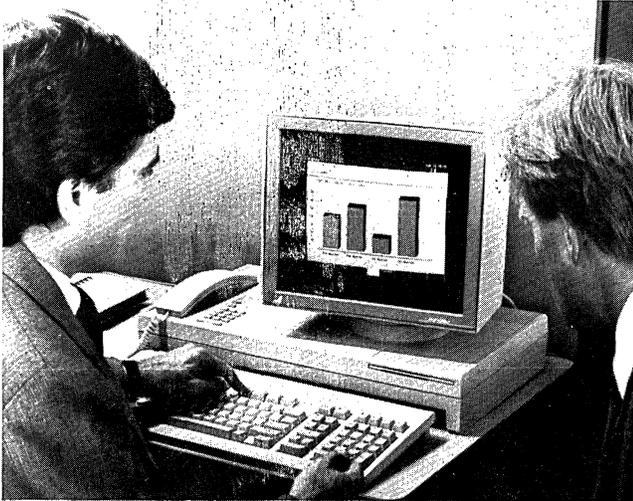
Features are built around software generics, the latest of which are "11" and "37," and are referred to as X11 and X37. Both are business generics with X37 serving the hotel/motel and healthcare industries. Military Autovon applications are also served by X11, Release 4 and later versions. Older generics still in use on earlier SL-1 systems are X05 and X09. Table 1 summarizes the generics of present SL-1 systems and lists the software options available for each. All SL-1 systems can be field upgraded to one of the current generics.

General System Features

Standard Features • Access to Paging: provides switching and trunk circuitry to interface loudspeaker or radio-paging equipment • Access to Recorded Telephone Dictation: access to and control of external dictation trunks and customer provided equipment • Automatic Daily Routines: allows service personnel to select maintenance routines that check PBX operation • Automatic Conversion: allows upgrading the software operating system and features to automatically convert to the new format • Bulk Data Load: feature changes programmed on tape off-site and then loaded into SL-1; system must be shut down during this procedure • Conditioned Data Dump: system automatically performs data dump when any significant data change has occurred since previous midnight or system load • Dual CPU: second CPU used for redundancy and backup; N and XN models only • Remote Administration: permits monitoring and administration of system from remote location • Segmented Networks: portions of system network hardware can be isolated so total blocking can be averted if system failure occurs • Service Charge: permits users to interact with system • Traffic Measurement: system accumulates statistics on system traffic activities based on specific customer-set parameters • Auxiliary Signaling: lights, bells, buzzers, etc connected to system for special requirements • CCSA Access: common control switching arrangements to selected networks • Class of Service: allows system to define features and services that can be accessed by a station assigned the COS • Flexible Attendant DN: allows service change of the DN (directory number) that provides access to the attendant • Manual Line Service: station access to a called party via attendant; no dial tone • Night Service: reroutes incoming calls normally directed to the attendant console to preselected station when console is unattended • Power Fail Transfer: provides service to the exchange network for a number of prearranged stations during a power or system failure • Ring Validation: allows the ringing time duration to be specified on CO trunk group basis • Tandem Switching: allows calls from other systems through PBX via tie line network switching • Tie Trunk: allows interconnection of switching machines within a subscriber's private communication network • Dial Pulse to DTMF Conversion: rotary telephone signals converted to DTMF tones • Direct Inward Dialing (DID): allows designated trunks to be assigned to specific stations • Direct Outward Dialing (DOD): stations can access trunks by dialing a trunk access code • Near Immediate Ringing: tone ringing or alerting buzz applied to a station within 0.5 seconds of the last digit of the directory number being dialed • Special Dial Tone: distinctive dial tone that recognizes call transfer, conference, or ring again • Station-to-Station Calling: station can call another station within the same customer group without attendant assistance • Line Lockout: an off-hook condition that lasts for a predetermined time period is logged and the transmission path is released for use of other calls • Private Line Service: access to a DN on either a 2500

Northern Telecom Meridian SL PBX Family

Models Meridian SL-1S, SL-1MS, SL-1N, SL-1XN & SL-100



MERIDIAN M4020 VOICE/DATA WORKSTATION.

set or SL-1 telephone • Call Forward: station may have calls directed to another station automatically • Emergency Transfer Control: assignment of CO trunks to specified stations during a power transfer • Intercept: allows calls that cannot be completed to be routed to the attendant • Off-Premise Extension: allows a station to be located remote from the central control location • Trunk Access From Any Station (TAFAS): allows incoming calls to be directed to designated stations when attendant is not present • Hunting: routes a call to a busy station to the next idle station in a group • Circular Hunting: occurs over all DN's in the hunt chain, regardless of the starting point • Linear Hunting: hunting starts at the called DN and ends with the last DN in the chain; unless the first station in the hunt chain is called, only a portion of the group will be tested • Secretarial Hunting: a specific DN, generally a secretarial position, is used as the last DN in 2 or more hunt chains • Short Hunting: hunting takes place over the DN's assigned to one station only; hunting continues over the assigned stations until encountering a feature key, an unassigned key or the key specified as the Last Hunt Key (LHK).

Basic XII Software • provides basic system features; price varies depending on model of system:

\$720 to \$23,040 approx prch

Multicustomer Operation Option • option group 2 • up to 32 user companies can have their own independent features.

SL-1S; SL-1MS:

720 prch

SL-1N; SL-1XN:

2,880

Recorded Announcement (RAN) Option • option group 7 • provides a means of responding automatically to incoming calls by prerecorded announcements:

720

Automatic Number Identification (ANI) Option • option group 12 • automatically identifies a station originating an outgoing toll call and its destination, and transmits the information to a recording office:

14,400

Route Selection for ANI Option • option group 13 • automatically routes toll calls to ANI trunk in an ANI system:

1,440

Remote Peripheral Equipment Option • option group 15 • extends maximum distance between common equipment (CE) and peripheral equipment (PE) modules up to 70 miles using T1

digital circuits.

SL-1S; SL-1MS:

720

SL-1N; SL-1XN:

1,440

Office Data Administration System (ODAS) Option • option group 20 • provides detailed records of specific system data, including feature assignments, directory numbers, terminal numbers, station type, etc.

SL-1S; SL-1MS:

144

SL-1N; SL-1XN:

864

Direct Inward System Access (DISA) Option • option group 22 • allows a station user to access the SL-1 from the public network and use system resources.

SL-1S; SL-1MS:

360

SL-1N; SL-1XN:

1,440

Call Park • option group 33 • calls can be placed in a system hold for future retrieval.

SL-1S; SL-1MS:

720

SL-1N; SL-1XN:

4,320

System Speed Call • option group 34 • system stores frequently dialed numbers for subsequent calling with access code.

SL-1S; SL-1MS:

720

SL-1N; SL-1XN:

4,320

Integrated Messaging System (IMS) Option • option group 35 • provides text messaging capability.

SL-1S; SL-1MS:

5,040

SL-1N; SL-1XN:

30,240

Message Center Option • option groups 40 and 46 • routes internal and attendant-connected calls to dedicated message phone(s) • either console or SL-1 phones can receive calls.

SL-1; SL-1MS:

720

SL-1N; SL-1XN:

1,440

Music Package Option • option group 44 • allows attendant and station access to music on hold.

SL-1S; SL-1MS:

360

SL-1N; SL-1XN:

1,440

Basic Message Center Option • option group 46 • provides basic call routing to designated message station on DN, attendant-originated, and ACD calls.

PRCH: price for Right to Use Fee. APPROX PRCH: approximate purchase price range. NA: not available; price not disclosed by vendor. NC: no charge. Prices current as of July 1985.

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Models Meridian SL-1S, SL-1MS, SL-1N, SL-1XN & SL-100

SL-1S; SL-1MS: 180

SL-1N; SL-1XN: 720

Automatic Set Relocation Option • option group 53 • station users can move their own phones using special dial codes.

SL-1S; SL-1MS: 1,440

SL-1N; SL-1XN: 8,640

History File Option • option group 55 • allows users to allocate an area of protected data store for use as a history file where system messages can be stored until a printout is requested:
NC

Stored Number Redial Option • option group 64 • stations or attendant can store numbers with up to 31 digits for future automatic dialing.

SL-1S; SL-1MS: 216

SL-1N; SL-1XN: 1,296

AUTOVON Option • option group 68 • provides access to military AUTOVON network.

SL-1S; SL-1MS: 2,304

SL-1N; SL-1XN: 14,400

AUTOVON CDR Option • option group 69 • produces call detail records on AUTOVON calls:
NC

Distinctive Ringing Option • option group 74 • provides variable ringing cadences to identify specific types of calls.

SL-1S; SL-1MS: 216

SL-1N; SL-1XN: 1,728

Digital Trunk Interface Option • option group 75 • supports the transmission of digital voice and data between SL-1 network loop and DS-1 carrier terminal • emulates channel bank on carrier side and analog trunks on PBX side.

SL-1S; SL-1MS: 288

SL-1N; SL-1XN: 1,728

Feature Package I Option • option groups 7, 8, 10, 17, 19 • includes Recorded Announcement, Time and Date, End-to-End Signaling, Make Set Busy, and SL-1 Set Digital Display.

SL-1S; SL-1MS: 576

SL-1N; SL-1XN: 1,152

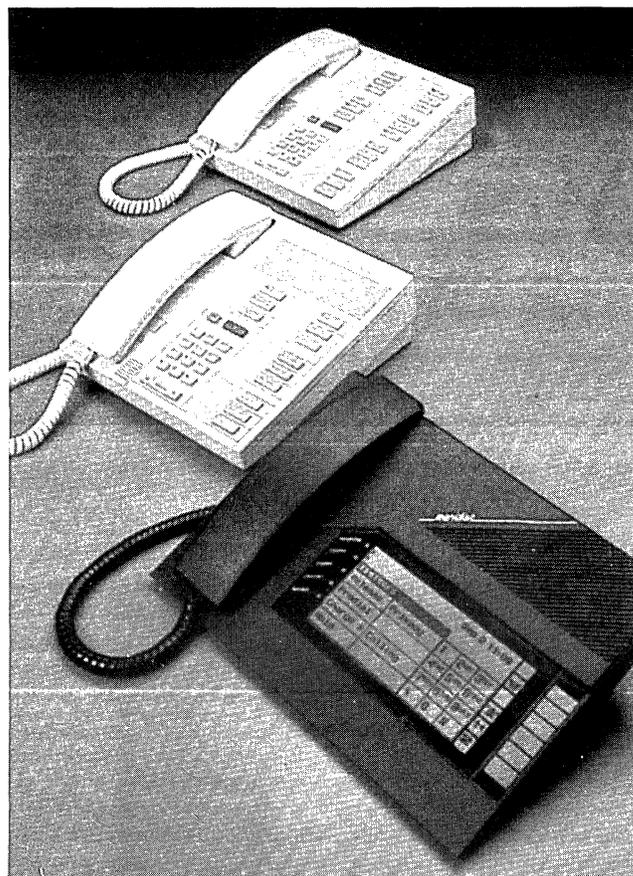
Feature Package II Option • option groups 9, 16, 18, 21, 40, 46, 47, 48 • includes Do-Not-Disturb 2500 Set Features, Dial Intercom, Message Center, Group Call, and Handsfree Answerback.

SL-1S; SL-1MS: NA

SL-1N; SL-1XN: 7,200

Restriction Features

Standard Features • Access Restrictions: control of station



MERIDIAN SL DIGITAL TELEPHONES (TOP TO BOTTOM) M2018, M2112, M3000.

access to designated trunks and call groups • Code Restriction: allows specification of area and exchange codes which are to be restricted from use by stations • Service and Feature Restrictions: determines which features and services stations have access to • Toll Restriction: denies station user dial access to the toll network or toll operator • Trunk Group Access Restriction (TGAR): code assigned to each station which defines the trunk or trunk groups the station may access.

Authorization Code Option • option groups 24 and 25 • stations with toll restriction can override restriction by dialing authorization code.

SL-1S; SL-1MS: \$360 prch

SL-1N; SL-1XN: 1,440

CDR Forced Charge Account Option • option group 52 • restricted stations can dial code to temporarily override restriction; activity recorded by CDR:
NC

Call Accounting Features

Automatic Identification of Outward Dialing (AIOD) Option • option group 3 • bills outgoing tolls to individual extension numbers.

SL-1S; SL-1MS: \$7,200 prch

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SL-1N; SL-1XN: 14,400

Call Detail Recording (CDR) List Option • option groups 4 and 5 • outputs data on external calls to a TTY printer.

SL-1S; SL-1MS: 2,376

SL-1N; SL-1XN: 14,400

Call Detail Recording (CDR) Link Option • option groups 4 and 6 • outputs data on external calls to magnetic tape.

SL-1S; SL-1MS: 2,376

SL-1N; SL-1XN: 14,400

Call Detail Recording (CDR) List & Link Option • option groups 4, 5, 6 • outputs external call data to both TTY and tape.

SL-1S; SL-1MS: 3,240

SL-1N; SL-1XN: 20,880

CDR Charge Account Code Option • option groups 23 and 24 • records use of charge account codes for billback to specific clients or projects:

NC

Call Routing Features

ARS Traffic/ARS Priority Queuing Option • option groups 29, 32, and 60 • provides route selection with queuing on customer-designated routes.

SL-1S; SL-1MS: \$475 prch

SL-1N; SL-1XN: 2,880

Basic Automatic Route Selection (BARS) Option • option groups 14, 28, 37, 57, 61 • provides route selection with numerous routing parameters to optimize use of toll facilities.

SL-1S; SL-1MS: 1,663

SL-1N; SL-1XN: 11,520

Network Features

Centralized Attendant Service (CAS) Option • designed for facilities located in same geographic area; each location has separate telephone system and centralized attendant, attendants are grouped together at 1 central location.

CAS Main Location Option • option group 26 • CAS control for main location.

SL-1S; SL-1MS: \$2,880 prch

SL-1N; SL-1XN: 5,760

CAS Remote Location Option • option group 27 • CAS control for remote locations.

SL-1S; SL-1MS: 1,440

SL-1N; SL-1XN: 2,880

Electronic Switched Network (ESN) Option • hardware/software networking for large-scale operations; includes special network classes of service (NCOS), centralized Communications Management Center (CMC), multiple route selection capabilities,

network queuing, authorization codes, uniform dialing plan, traveling class marks, traffic measurement, and call detail recording; cost heavily configuration dependent:

50,000 to 300,000 approx prch

Data Features

The Meridian SL-1 is inherently capable of supporting data communications. The **Integrated Services Network (ISN)** takes a basic SL-1 and adds extensive information management capabilities through extensive use of "loosely coupled" microprocessors and software to manage the overall operations. Using basic X11 software in a standard SL-1 configuration, increased capabilities are provided through Packet Transport Equipment (PTE) systems operating under the Voice Data Operating System (VDOS) and XENIX-based computing operating system. VDOS supports data communication functions like access to X.25 and 3270 emulation and information services like **messaging** (integrates voice and text features), **access** (data call origination), **forms** (forms design), **share** (information shared by multiple users online), and **computing** (XENIX-based applications programs for word processing, spreadsheet, calendar, etc).

LANSTAR is generic name for Meridian data communications terminal support, and includes the following components:

LANSTAR Data Option for Meridian Digital Telephones • supports data speeds up to 19.2K bps asynchronous on both Meridian 2000 and 3000 digital phones.

Add-On Data Modules (ADM) • provide synchronous and asynchronous transmission for SL-1 phones.

Asynchronous Interface Module (AIM) • provides asynchronous support on 500/2500 phones up to 19.2K bps.

PC Interface Card • plug-in board for IBM PCs that add asynchronous communications to Meridian SL-1.

RS-422 Interface • connects compatible terminals to Meridian SL-1 directly, up to 4,000 feet from switch.

Asynchronous/Synchronous Interface Module (ASIM) • provides RS-232C for both sync/async communications.

LANSTAR PC • local area network that connects PCs, storage units, peripherals in single network; full access to Meridian SL information services; 2.56M-bps bandwidth to each PC.

LANSTAR Host Connectivity (ASCII) • includes **Add-On Data Modules (ADM)** for individual asynchronous connections up to 19.2K bps; **Multi-Channel Data System (MCDS)** for up to 64 data ports (up to 19.2K bps async) per MCDS cabinet; and **Computer-to-PBX Interface (CPI)** that uses T1 digital circuits between PBX and host computer.

LANSTAR Host Connectivity (IBM) • includes **3270 Emulator** for connections to IBM 3270 controllers (emulates IBM 3274 Models I-C and 51-C, 3278 Models 2, 3, 4, 5, 3277 Model 12, 3287 matrix printer, and 3289 line printer), and **3270 Protocol Converter** for connects to IBM host or front end (emulates IBM 3767, 3271, 3274, 3276 controllers).

LANSTAR Coax Elimination & Switching • connects IBM 3270 terminals to Meridian SL by converting coax link from 3270 to twisted-pair for connection to SL system; can also connect to 3270 controllers.

System 36 Gateway • provides access to Systems 34/36/38 by emulating IBM 5251 workstation and 5256 printer.

Digital Telephones • new digital phones (Meridian 2018, 2112, 3000) and voice/data workstation M4010/4020 that digitizes voice at station and connect to Meridian SL at 512K bps (Meridian 2000/3000) or 2.56M bps (M4010/4020).

Attendant Console Features

Standard Features • Alarm Lamps: indicators that alert attendant to major or minor alarm • Attendant Interposition Transfer: allows calls to be transferred from one attendant to another attendant in the same customer group • Automatic Timed Reminders: automatically alerts the attendant when a call extended through the console has not been answered within the preselected time •

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Barge-in: allows attendant to establish a talking connection with any apparently busy trunk or special service • Busy Verification: allows attendant to establish a talking connection with any busy directory number to verify that the directory number is actually busy and in working order • Call Selection: allows attendant to answer incoming calls either in the order in which they are received or by selecting a call type from the Incoming Call Identification (ICI) lamps • Camp-On: allows the attendant to complete an incoming call to a busy directory number • Conference Call: allows up to 6 stations to establish a communications link • Control of Trunk Group Access: attendant control of station access to CO trunk lines • Emergency Transfer Control: calls assigned to preselected station when a power failure exists • Incoming Call Identification (ICI): indicators which show the status of the incoming call sequence • Lockout: denies attendant the ability to reenter an established call completed through and held on the console • Multiple Console Operation: permits each user to use up to 15 attendant consoles using circular hunting • Multiple Listed Directory Number: each station can have up to 4 listed directory numbers on DID trunks • Night Service Control: permits incoming calls normally directed to attendant to be routed to a preselected station when the console is unattended • Non-Locking Keys: keys which cannot be locked by a special key-dial pad • Position Busy: enables attendant to render the console busy and prevent the assignment of incoming calls to the position • Pushbutton Dialing: ability to use pushbuttons to dial numbers in lieu of rotary dialing • Secrecy: automatically splits the source and destination when a call is established through an attendant loop • Splitting: allows attendant to select and talk privately to either party of a call completed through the console, or the recall of a completed call that is held on a console loop • Through Dialing: allows station users to complete outgoing calls on trunks by dialing the desired number after attendant has selected the trunks facility.

Attendant Administration Option • option group 54 • allows limited service change activity such as charges to rotary and touch-tone assignments from the attendant console.

SL-1S; SL-1MS:	\$720 prch
SL-1N; SL-1XN:	4,320

Attendant Overflow Position Option • option group 56 • routes calls to designation station when console in "position busy" mode.

SL-1S; SL-1MS:	1,440
SL-1N; SL-1XN:	8,640

Do-Not-Disturb Option • option groups 9 and 16 • attendant can prevent incoming calls from ringing designated stations.

SL-1S; SL-1MS:	2,664
SL-1N; SL-1XN:	5,436

Station Features

Standard Features • Attendant Recall: allows a station user to recall the attendant by pressing a key or flashing the switchhook • Automatic Preselection: SL-1 station may use the directory number or feature associated with a key 0 by lifting the handset • Call Pickup: allows a station user to answer calls directed to other stations in the call pickup group • Call Status Indicators: 8 key/lamp pairs that display the status of the call associated with the key (SL-1 sets) • Call Transfer: allows a station user on any 2-party call to hold the existing call and originate another call to a third party • Call Waiting: informs a station user, when on an established call, that another call is waiting to be connected • Common Audible Signaling: provides ringing at SL-1 stations when a call is presented to any idle appearance of a DN on a station • Conference: allows a station, while on any established call, to hold the existing call and originate another call to another party or parties; 3-party available on all sets, 6-party available on SL-1 sets only • Handsfree Operation: allows voice

communication without a handset or headset (SL-1 sets) • Hold: SL-1 station user can, without assistance from the attendant, hold an established call, and originate or receive a second call • Loudspeaker/Amplifier: access to system loudspeaker/amplifier for tone ring, tone buzzing, voice message signals (SL-1 sets) • Manual Signaling: SL-1 set can manually signal (buzz) other SL-1 sets • Multiple Appearance Directory Number: allows the same multiple appearance directory number to be allocated to SL-1 and 500- or 2500-type stations • On-Hook Dialing: station user can originate a call by selecting a DN and dialing without lifting the handset • Prime Directory Number: key 0 on all stations designated as the prime key and the directory number assigned to this key is the prime directory number (SL-1 sets) • Privacy: when an SL-1 station user goes off-hook, this feature prevents another station user from entering the connection • Privacy Release: allows a third party to enter an established call of a private connection • Release: allows SL-1 station user to release an active call without going on-hook • Tone Buzzing: enables SL-1 station user, when off-hook, to be alerted by a buzzing tone through the loudspeaker of the station • Tone Ringing: adjustable ringing tone is used to alert an idle SL-1 station user of an incoming call • Bridging: 500-/2500-type stations may be connected parallel to the system • Manual Line: 500/2500 set can be arranged to automatically access attendant.

Advanced Station Features Option • option group 1 • includes Automatic Dialing, which allows a station user to dial a directory number of up to 16 digits by pressing a single key; Call Forwarding, which enables a station user to divert all calls to another extension; Secretarial Filtering, which permits stations that have calls forwarded to them forward calls back to the forwarding station; Override, in which a specified user can break into a conversation in progress; Ring Again, which allows a station user, on encountering a busy directory number, to have the system monitor the directory number, and when it becomes free, to alert the calling station and ring the called station; and Speed Call, which allows a station user to place calls to directory numbers by dialing a 1- or 2-digit code.

SL-1S; SL-1MS:	\$720 prch
SL-1N; SL-1XN:	7,200

Make Set Busy Option • option group 17 • enables SL-1 stations to have set appear busy to callers.

SL-1S; SL-1MS:	720
SL-1N; SL-1XN:	1,440

2500 Set Features Option • option group 18 • provides specific features for 2500 sets, including call forwarding; call hold, and speed calling.

SL-1S; SL-1MS:	1,440
SL-1N; SL-1XN:	2,880

Dial Intercom Option • option group 21 • sets up intercom groups of SL-1 phones with separate intercom link.

SL-1S; SL-1MS:	720
SL-1N; SL-1XN:	1,440

Automatic Handsfree Answerback Option • option group 47 • incoming calls to designated DN on SL-1 set automatically answered by user, handsfree, without depressing a button.

SL-1S; SL-1MS:	288
SL-1N; SL-1XN:	1,728

Group Call Option • option group 48 • permits SL-1 stations to

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Models Meridian SL-1S, SL-1MS, SL-1N, SL-1XN & SL-100

set up conference calls with designated groups of users; maximum 64 groups per system; maximum 10 users per group.

SL-1S; SL-1MS: 288

SL-1N; SL-1XN: 1,728

Stored Number Redial Option • option group 64 • stations or attendant can store up to 31-digit number for future dialing.

SL-1S; SL-1MS: 216

SL-1N; SL-1XN: 1,296

Flexible Hot-Line Option • option group 56 • permits 500/2500 set to automatically call another station by going off-hook.

SL-1S; SL-1MS: 216

SL-1N; SL-1XN: 1,296

Deluxe Hold Option • option group 71 • provides I-hold and exclusive hold on SL-1 sets.

SL-1S; SL-1MS: 288

SL-1N; SL-1XN: 1,728

Automatic Line Selection Option • option group 72 • SL-1 set can be programmed to originate or answer calls on designated DN.

SL-1S; SL-1MS: 288

SL-1N; SL-1XN: 1,728

500 Set Features Option • option group 73 • enables call forwarding; call hold, speed at 500 stations; requires feature option group 18:

NC

Meridian SL-100 Features

The function of the Meridian SL-100 Operating System is to control the operations of the SL-100 and implement features. It supervises all tasks that must be performed and is the link between all subsystems in the system. A custom-developed high-level system programming language, called PROTEL, is used on the SL-100 only. The use of PROTEL's modular structure allows the easy addition and deletion of features and more efficient software management, while simplifying fault diagnostic routines. Meridian SL-100 features are essentially the same as the Meridian SL-1.

Automatic Call Distribution

The Meridian SL systems provide a high degree of incoming call management support. Several ACD feature packages are available for specific customer needs.

ACD Basic Package A • includes incoming DNs, queuing, delay announcements, priority trunks, night service, agent position using modified SL-1 set, supervisor position using modified SL-1 set.

SL-1S; SL-1MS: \$2,160 prch

SL-1N; SL-1XN: 8,640

ACD Package B • includes all features in Package A, plus call forcing, automatic overflow, controlled interflow, post-call processing, music on delay, supervisory observation of agent calls, additional agent/supervisor position features.

SL-1S; SL-1MS: 2,880

SL-1N; SL-1XN: 11,520

ACD Package C1 • includes all features in Package B, plus statistical performance routing of specific system activities on either a CRT or printer.

SL-1S; SL-1MS: 3,600

SL-1N; SL-1XN: 14,400

ACD Package C2 • includes all features in Package C1 plus dynamic system reconfiguration capabilities by system supervisor.

SL-1S; SL-1MS: 4,320

SL-1N; SL-1XN: 17,280

ACD Package D • includes all features in Packages A, B, C2, and replaces C1; extends ACD capabilities of SL-1 through use of external PDP-11-based systems for enhanced reporting capabilities and dynamic load balancing.

SL-1S; SL-1MS: 5,060

SL-1N; SL-1XN: 20,080

Application Software

Northern Telecom has installed its more than 10,000 systems in numerous application environments; to date, application packages are available for the following industries: health care; retail; hotel/motel; government; and the service sector.

HARDWARE

Terms & Support

Terms • all PBX models are available for purchase or lease • lease terms can range up to 7 years • Northern Telecom Finance Corporation available to finance purchase/lease arrangements • purchase prices include installation and first year's maintenance • maintenance contracts available for subsequent years' maintenance • training for system administrator and employee trainer(s) included in basic system price • lease rates usually include maintenance unless otherwise arranged • purchase/lease prices vary according to factors including distributor overhead/markups, installation costs, training costs, cost for spare parts and supplies.

Support • equipment installed by Northern Telecom or its authorized distributors • training normally provided by Northern Telecom at specified training centers • subsequent training can be provided at distributor location or Northern Telecom • maintenance provided by distributor with full backup by Northern Telecom; major regional service facilities now in place by Northern Telecom for enhanced capabilities.

Overview

The Meridian SL family of digital PBX systems are built around stored program control of various voice and data communications functions. Voice signals are digitized by pulse code modulation (PCM) and time division multiplexing (TDM) is used for switching within the network buses. Internal switching in the SL systems is "4-wire", since separate send and receive paths are provided for each call.

Call processing, maintenance, and administration of the Meridian SL systems are controlled by computer programs stored either as resident programs in the system memory or as nonresident "overlay" programs on magnetic tape. Resident programs are stored in RAM.

The Meridian SL systems consist of station terminals, which can

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be either analog or digital; cabinets housing the control, power, switching equipment and line/trunk interface circuit cards; attendant consoles for handling incoming calls and specific administrative activities; packet transport equipment to connect various information processing components; a modular crossconnect system for the identification, interconnection, and distribution of wires and cables; a teletypewriter or CRT/display terminal for system access; and various station add-on devices to increase the overall functionality of the system.

Although the Meridian SL systems are excellent voice switching systems, their real significance is in their ability to handle data communications. Numerous refinements and enhancements since the product's first introduction in 1975 have resulted in a powerful data switching product, with few equals. The latest improvements, with the introduction of the Meridian SL product, include a high-speed 40M-bps packet/circuit-switched backbone network for attaching multiple application processors and networking devices, and LANSTAR, a local area network that brings data communications speeds of 2.56M bps to the workstation. Northern Telecom has developed a large array of devices to connect data terminals and systems through the Meridian SL systems, such as the 3270 Protocol Converter/Emulator, Coax Elimination and Switching Module, IBM PC interface card, Digital Trunk Interface (DTI) for connecting T1 carrier lines, various asynchronous/synchronous interface modules for station terminals, and the Computer-to-PBX Interface (CPI) for high-speed digital connections to computer systems.

All Meridian SL equipment is contained in cabinets that house common equipment (CE), peripheral equipment (PE), packet transport equipment (PTE), power supplies, and emergency transfer units. Common equipment cabinets include the CPU(s), memory, magnetic tape units, teletypewriter interface, switching network, and service circuits. Certain models can also have station and trunk circuit cards as part of the CE cabinet. Peripheral equipment cabinets house line circuit packs, trunk circuit packs, DTMF receivers (for detecting touch-tone signals), and RPE (remote peripheral equipment) modules. The packet transport equipment cabinet houses application processors, memory subsystems, disk subsystems, tone detectors, LANLINK interfaces, voice message subsystems, power supplies, and the high-speed packet/circuit-switched backbone network.

The Meridian SL-1S is the smallest model, and all components are housed in a single cabinet. The system supports from 32 to 120 stations, depending on features and traffic requirements, and has a single CPU and memory subsystem with 192K words. Northern Telecom offers 5 different SL-1S prepackaged systems, with different mixes of trunks and stations, and an assumed percentage of SL-1 station lines.

The Meridian SL-1MS is the next model, again a single-cabinet product that ranges from 80 to 400 stations. It replaces the SL-1M, which can be field-upgraded to the SL-1MS. A single CPU and memory subsystem is provided, and the system uses double-density line cards. Up to 256K words of memory can be configured, and the SL-1MS uses a faster CPU than the SL-1M. A hotel/motel version is available that uses Generic X37 software. Northern Telecom offers the SL-1MS in 3 packaged configurations, one each for business, hotel/motel, and an ACD version.

Next is the Meridian SL-1N, a 2-cabinet system (3 cabinets or more if Integrated Network Services is installed) that supports from 300 to 1300 stations. A redundant system, the SL-1N has 2 CPU/memory subsystems available for higher traffic and operational requirements. It supports up to 320K words of memory. The CE cabinet has several components, including the CPU/memory shelf, which contains the CPU(s), memory, tape unit interface, and interfaces to the system buses; the network shelf, which provides the time division multiplexed network, signaling capabilities, serial data interface for system teletypewriter/CRT, conference circuits, and various tone generators; tape shelf for the system magnetic tape drive; and cooling fans. The PE cabinet provides interfaces from trunk/line cards to the system bus card slots for various trunk/station circuit boards, and tone detectors for converting station-generated tones into signals the SL-1 can understand. The PTE (packet transport equipment) cabinet(s) provide Integrated Network Service features for the SL-1N. A cabinet includes various application processors, memory subsystems, disk subsystems, and interfaces

to various local area network facilities such as LANLINK. It has its own main CPU, memory, and operating system, that connects to the CE cabinet via up to 10 T1 digital links. A Computer-to-PBX Interface (CPI) card in the CE cabinet is tied into a DS-1 interface card (using a T1 link) in the PTE cabinet so that the INS features of the PTE can be implemented in the SL-1N. The SL-1N is available in 4 packaged models; two are for standard business applications and 2 are ACD versions.

The top-end Meridian SL-1XN grows from 1,000 to 5,000 lines in 2 to 4 cabinets (5 or more if INS is installed). Also a fully redundant system, the SL-1XN achieves its expansion to 5,000 lines through multiple network groups (up to 5). The SL-1XN CE and PE cabinets are configured similar to the SL-1N with additional shelf space dedicated to the system's multiple network group capabilities. Memory can be configured up to 384K words or as high as 768K in an enhanced version that was introduced at the end of 1984. PTE cabinet(s) are configured the same as in other Meridian SL models.

If expansion requirements are in excess of 5,000 lines, the Meridian SL-100 is available, and grows from approximately 3,000 to 30,000 lines. The SL-100 is based on the Northern Telecom DMS-100 central office switch, and uses specialized call processing software, based on the PROTEL operating system, to implement business telecom features and services. The SL-100 is completely different from the SL-1 products in terms of cabinetry, circuit boards, control equipment, and architecture. Users who envision expansion beyond their SL-1 should prepare for a complete system replacement when going to an SL-100. The Meridian SL enhancements available for the SL-1 product line this year will not be available for the SL-100 until 1986. The SL-100 can use standard SL-1-type station equipment, but also has its own attendant console and proprietary station set.

A wide variety of station equipment is available with Meridian SL systems. Aside from standard 500/2500 stations, the electronic SL-1 set, Unity Models I/II/III, the Compact set, Displayphone, and Meridian 2000/3000/4000 digital station terminals are available for voice applications. Numerous data modules, whether integrated within a station terminal or add-on, are available to interconnect numerous data terminal devices.

Integrated Services Network (ISN) is the major system enhancement for the SL-1, and offers numerous information services on an add-on basis that do not sacrifice the inherent switching capabilities of the SL-1. ISN features are implemented in up to 8 packet transport equipment (PTE) cabinets that connect to an SL-1 CE cabinet via T1 digital lines known as command and status links. Using a different operating system than the base SL-1, the PTE controls various data communications interfaces plus several information services for more efficient information flow, and support for a number of XENIX-based applications programs for specific requirements. Currently ISN uses Motorola 68010 microprocessors for control and application programs, and arranges these CPUs along a dynamically allocated 40M-bps circuit-switched and packet-switched network. This facility differs from the one provided in the company's Meridian DV-1 system by being fully redundant and dynamically available—whatever amount of bandwidth within the 40M-bps structure is needed for an application is made available. The DV-1's 40M-bps network is evenly divided: 20M for circuit-switched voice and 20M for packet-switched data applications. A maximum configuration in ISN supports up to 4 cabinets with CPUs and 4 cabinets with disk subsystems. Disk drive available is a 225M-bps (unformatted) Winchester unit. Application processors are "loosely coupled" on the 40M bus, such that a user can add or remove CPUs as desired without adversely affecting overall system performance. The company's method of connecting data terminals is called LANSTAR, and provides a wide range of data connectivity. The new Meridian 2000 and 3000 digital telephones connect to LANSTAR by a single twisted pair at 512K bps using time compression multiplexing (TCM) techniques. The Meridian 4000 integrated voice/data terminal connects to LANSTAR over a 2.56M-bps single twisted-pair link. The LANSTAR PC option connects multiple IBM Personal Computers to the Meridian SL-1 at speeds up to 2.56M bps. LANSTAR also supports the Computer-to-PBX Interface (CPI), which uses digital T1 links for connecting host computers to the SL-1.

System upgrades are relatively simple for Meridian SL-1 users.

Northern Telecom Meridian SL PBX Family

Models Meridian SL-1S, SL-1MS, SL-1N, SL-1XN & SL-100

Circuit boards are usually interchangeable, particularly station and trunk cards. CPUs, memory components, and network cards will vary among the various models, and the operating software must be changed when upgrading models. The SL-1S uses a different cabinet from the other models, which must be replaced when going to a larger model. The SL-1MS is a single-cabinet system, but uses the same cabinet as the larger SL-1N and XN models. Circuit boards for CE and PE are arranged differently than in the larger models, but many of the circuit boards can be reused. The SL-1N and XN are both multiple-cabinet systems with redundant common equipment components and similar PE configurability. Upgrades from the SL-1MS to XN are accomplished by changing the operating software, certain CE and network components, and adding cabinets to handle larger configurations. Upgrades from the Meridian SL-1 to SL-100 involve a complete switchout of equipment and software. ISN capabilities can be added to any SL-1 model, regardless of size, so long as X11 generic software is being used. The only additions to the existing SL-1 are Computer-to-PBX Interface (CPI) circuit cards in the CE cabinet/shelf that connect the 1.544M-bps Command and Status Link(s) to the ISN packet transport equipment (PTE) cabinets. ISN has been designed to preserve the user's original investment in SL-1 equipment.

Representative System Configurations

SL-1S Configuration • single-cabinet, nonredundant system.
 6 Trunks/32 Stations; 50 Percent SL-1 Sets:
\$16,500 to \$20,300 approx prch

SL-1MS Configuration • single-cabinet, nonredundant system.
 16 Trunks/80 Stations; 50 Percent SL-1 Sets:
39,400 to 45,200

SL-1N Configuration • multicabinet, nonredundant system.
 100 Trunks/450 Stations; 50 Percent SL-1 Sets:
362,000 to 456,000

400 Trunks/900 Stations; 50 Percent SL-1 Sets:
724,000 to 912,000

SL-1XN Configuration • multicabinet, redundant system.
 500 Trunks/1,200 Stations; 50 Percent SL-1 Sets:
960,000 to 1,200,000

1,250 Trunks/2,500 Stations; 50 Percent SL-1 Sets:
2,000,000 to 2,500,000

SL-100 Configuration • multicabinet, redundant system.
 500 Trunks/3,000 Stations:
2,400,000 to 3,000,000

3,000 Trunks/25,000 Stations:
20,000,000 to 25,000,000

Integrated Services Network Configurations

Integrated Voice & Text Messaging • incremental price for adding integrated voice and text messaging, per station equipped:
\$160 to \$400 approx prch

Information System for Meridian M4020 Users • complete information system for 60 users (providing Messaging, Access, Forms, Directory, Computing, and 3270 Emulation) with Meridian M4020 integrated voice/data terminals, personal printers, letter-quality printer, 450M-byte disk storage, per user:
6,000 prch

System Components

10V Convertor Pack • converts -48v DC to 10v DC for peripheral equipment:
\$374 prch

30V Convertor Pack • converts -48v DC to 10v DC for SL-1 line circuits:
330

48V Regulator Pack • converts AC power to -48v DC for system talk battery current:
220

Dual-Port Serial Data Interface (SDI) with Cable • connects to system teletypewriter or CRT:
854

Network Card • provides TDM network switching paths; 2 paths provided:
622

Cooling Unit • cooling fans for N and XN models:
742

500/2500 Line Card • 8 circuits per board:
1,669

SL-1 Line Card • 8 SL-1 circuits per board:
1,836

Message Waiting Line Card • used in place of 500/2500 card when message waiting is desired • 8 circuits per board:
1,066

OPX Line Card • increases loop resistance limit to 1400 ohms • 8 circuits per board:
1,225

Integrated Services Digital Line Card • connects Meridian 2000/3000 digital phones to SL-1 • 4 circuits per board:
700

Meridian M4000 Line Card • connects Meridian M4010 or 4020 to LANLINK; one circuit per board:
600

Attendant Console Line Card • connects SL-1 consoles • 8 consoles supported per board:
1,836

CO/WATS/FX Trunk Card • provides 2 circuits, loop or ground start:
750

DID Trunk Card • provides 2 circuits, also supports 2-wire tie trunk circuits:
910

E&M/DX Signaling/Paging Card • provides 2 circuits; 2-wire E&M tie trunk, 2-wire/4-wire DX signaling tie trunk, paging system trunk:
766

4-Wire E&M/DX Signaling Card • provides 2 circuits; 4-wire E&M tie trunk, 4-wire DX signaling tie trunk:
950

RAN Trunk Card • connects to customer-provided recorded announcement machine • 4 circuits per board:
1,002

Dictation Trunk Card • provides interface to customer-provided dictation equipment • 2 circuits per board:
1,030

Release Link Trunk Card • used for CAS applications • 2 circuits per board:
1,225

Digitone Receiver • converts DTMF signals from stations to DC signals for system processing • one circuit per board:
813

PRCH: purchase price; does not include discounts, maintenance, or installation. APPROX PRCH: approximate purchase price range; does not include discounts, maintenance, or installation. NA: not available; vendor will not disclose pricing. Pricing established by vendor and by individual dealers and distributors. Prices current as of July 1985.

Northern Telecom Meridian SL PBX Family

Models Meridian SL-1S, SL-1MS, SL-1N, SL-1XN & SL-100

Data Line Card • connects Add-on Data Module to system • 2 data lines, 2 voice lines per board:

953

Modem Pool Line Card • connects modems to system • 4 circuits per board:

953

Asynchronous Interface Line Card • interfaces Asynchronous Interface Module to SL-1 • 4 circuits per board:

953

Remote Peripheral Equipment • permits PE cabinets to be located apart from main SL-1 switch room • network interface connects into switching network • carrier assembly connects into high-speed digital trunk connecting RPE.

RPE Local Network Interface:

2,419

RPE Local Carrier Shelf Assembly:

1,829

RPE Remote Network Interface:

2,215

RPE Remote Carrier Shelf Interface:

1,829

Station Equipment—Voice/Data

SL-1 Attendant Console • primary function to service incoming calls; connects incoming calls to appropriate internal stations • places outgoing calls • provides information concerning status and types of calls being handled • handles certain administrative functions • desktop unit • includes line card:

\$4,275 prch

SL-100 Attendant Console • primary function to service incoming calls originating outside the Northern Telecom System; connects incoming calls to appropriate internal stations • places outgoing calls • provides information concerning status and types of calls being handled • handles certain administrative functions • desktop unit • includes line card:

3,650

SL-1 Electronic Telephone • proprietary DTMF telephone • programmable line/feature buttons • designed for use with SL-1 family • compatible with industry-standard touch-tone phones:

160

SL-1 Electronic Telephone with 16-Digit Display • same as standard SL-1 set but with 16-digit numeric display:

346

SL-1 Electronic Telephone with 16-Digit Display & Dual Headset Jack • same as previous set but used for ACD agent sets:

475

SL-1 10-Button Add-On Module • adds 10 programmable line/feature buttons • plugs in side of SL-1 set:

215

SL-1 20-Button Add-On Module • adds 20 programmable line/feature buttons • plugs in side of SL-1 set:

300

SL-1 Speakerphone with Adapter • provides handsfree operation:

285

Link Telephone • 2500-type telephone with special button to generate correct hookswitch closure for feature activation:

70

Unity I Telephone • same as standard 2500 set:

55

Unity II Telephone • same as Unity I, includes message waiting light, link button (feature activation), and release button:

75

Unity III Telephone • same as Unity II, plus 4 programmable

buttons, save/redial button:

110

Compact • similar to SL-1 telephone, uses same line card • 8 programmable line/feature buttons, handsfree capability:

145

Meridian M2112 Digital Telephone • includes 12 programmable line/feature buttons • digitizes voice in set • optional RS-232C interface:

325

Meridian M2018 Digital Telephone • includes 18 programmable line/feature buttons • digitizes voice in set • optional RS-232C interface:

350

Meridian M3000 Touchphone • digital telephone with membrane display panel for all station features • LCD display changes with various functions • optional RS-232C interface:

695

Meridian M2000/3000 Asynchronous Data Option • provides RS-232C interface • speeds up to 19.2K bps supported:

295

Meridian M4000 Series Voice/Data Terminals • fully integrated voice/data terminal • Motorola 68010 microprocessor • up to 1.2M bytes of memory • full ASCII detachable keyboard • 8 programmable soft buttons • 13-inch diagonal screen • integral telephone with M4020 • no phone capabilities with M4010 • M4010 can be field upgraded to M4020 • integral RS-232C.

Model M4010:

1,195

Model M4020:

1,395

M4010 to M4020 Upgrade:

300

SL-1 Displayphone • voice/data station • supports 2 voice lines and 1 data line • transmits data at up to 9600 bps • integrates a telephone, handsfree speaker, 7-inch CRT screen, retractable keyboard, and modem:

1,595

SL-100 Electronic Telephone • proprietary DTMF telephone • designed for use with SL-100 system • compatible with industry-standard touch-tone phones:

195

Data Communications

3270 Protocol Converter • allows ASCII terminals to access asynchronous, bisynchronous, and SNA/SDLC host databases • connects to SL-1 with Add-on Data Modules (ADM) or Asynchronous Interface Module (AIM).

7-Port Unit:

\$7,000 prch

16-Port Unit:

20,000

Add-on Data Module (ADM) • allows synchronous and asynchronous protocol devices to communicate with the SL-1 • can be connected to computer ports, modem pools, or printers:

430

Asynchronous Interface Module • connected to asynchronous ASCII terminals and can originate or answer calls • does not require telephone set • requires 2-pair wiring • does not interface to data modules:

350

Asynchronous/Synchronous Interface Module • standalone unit that provides RS-232C interface for sync/async communications • used with station equipment except for SL-1/Meridian telephones:

395

Northern Telecom Meridian SL PBX Family

Models Meridian SL-1S, SL-1MS, SL-1N, SL-1XN & SL-100

Direct RS-422 Connection • provides RS-422 interface for asynchronous communications up to 19.2K bps at distances up to 4,000 feet from SL-1:

695

PC Interface Card • designed for use with IBM Personal Computer or the PC XT • allows the SL-1 to communicate at speeds up to 9600 bps • card connects in the IBM PC, and connects via standard 2-pair wiring to the Asynchronous Interface Line Card (AILC):

195

LANSTAR PC Interface Card • plugs into spare board slot in back of PC • provides asynchronous communications up to 9600 bps • provides total 2.56M-bps bandwidth to PC:

720

Digital Trunk Interface (DTI) • trunk interface between Meridian SL-1 network and external T1 carrier interface • provides 24 channels which can be shared between voice and data transmission on an as-required basis:

4,800

Computer to PBX Interface (CPI) • jointly announced with Digital Equipment Corporation (DEC) • multiplexed interface for a bidirectional data communication link between a PBX and host computer • allows DEC, Data General, and Hewlett-Packard to connect to Rolm, Intecom, Mitel, and Northern Telecom; 24 ports:

4,000

X.25 Gateway • provides packet-switched interface to specialized networks • 16-user system:

19,000

System 36 Gateway • connects Meridian SL-1 to IBM Systems 34/36/38 by emulating IBM 5251 Remote Workstation and 5256 Printer:

4,000

Coax Elimination & Switching Module • connects IBM 3278 terminal to any IBM 3274 or 3276 cluster controller on the SL-1 system • allows more than 32 terminals to be assigned to a controller:

925

Multi-Channel Data System (MCDS) • provides up to 64 asynchronous channels from SL-1 to host computer • single- or 2-shelf versions • 8 async line cards per shelf • 4 circuits per card.

MCDS Cabinet for Single Shelf:

500

MCDS Cabinet for Double Shelf:

1,300

MCDS Shelf:

1,155

MCDS Line Card:

955

MCDS Power Supply:

1,185

□ Peripherals

Teleprinters • used for system diagnostic reporting • list moves and changes within the system • can be used with remote PBX. AT&T Teletype Model TP 1000:

\$3,400 prch

AT&T Teletype Model 43:

1,750

CRT Terminals • used for data management and accounting features • over 17 different vendors identified with compatible CRT terminals:

1,400 to 2,300 approx prch

Printers

Band Printer, 300 lpm, Serial Interface, Pedestal Mounting:

\$8,130 prch

Band Printer, 300 lpm, Parallel Interface, Pedestal Mounting:

7,480

Band Printer, 300 lpm, Serial Interface, Cabinet Unit:

9,745

Band Printer, 300 lpm, Parallel Interface, Cabinet Unit:

8,980

Band Printer, 600 lpm, Serial Interface:

13,785

Band Printer, 600 lpm, Parallel Interface:

12,900

Letter-Quality Printer:

2,700

□ Subsystems

SL-10 Packet Data Switching System • proprietary data communication transmission device • interfaces SL-1 or SL-100 systems • automatic error checking • network compatibility with CCITT X.25, X.3, X.28, X.29, X.75; IBM 3270 HASP, IBM 2780/3780, IBM 2740 • network management:

\$200,000 prch

Automatic Call Distributor (ACD) • used to support large number of incoming calls • designed to distribute incoming calls equally through a variety of routing options • supports up to 320 agents, 380 trunks • available MS, N, XN:

45,000 to 500,000 approx prch

Integrated Voice Messaging System (IVMS) • answers the telephone • delivers a personal greeting • records • digitizes • stores messages • notifies called party of message waiting • allows system user to retrieve and manipulate messages • uses Commterm voice messaging hardware.

For 200-User System:

82,000 prch

For 1,000-User System:

150,000

Omnifacts • proprietary CDR reporting system based on Northern Telecom 585 distributed processing system • software available for basic CDR reporting, expanded reporting, automatic directory look-up (ADLU), and resale of service • typical system includes 585 CPU, 512K-byte memory, 22M-byte hard disk, CRT/keyboard, interface to SL-1, modems, and cables:

22,000 to 85,000 approx prch

■ SYSTEM MAINTENANCE & DIAGNOSTICS

System Reliability • redundant CPUs • error-correcting memory • redundant critical electronics • reserve memory power • backup battery • automatic program load.

System Diagnostics • system continuously diagnoses operation • major/minor alarm indications at attendant console and cabinets • audit trail generated on system service teleprinter • remote diagnostics by Northern Telecom service centers.

System Maintenance • Northern Telecom and its distributors have an extensive menu of maintenance plans, with support ranging from response times of 24 hours to 1.5 hours or less • a 1-year warranty is standard with all Meridian SL systems.

System Management • users can change such functions as pick-up groups and call routing, perform station relocations • system CRT or teleprinter used.

• END

Northern Telecom Vantage

Models 12, 24 & 48 Electronic Key Systems

■ PROFILE

Function • electronic key telephone system for switching voice.

Applications Supported • targeted at small businesses with up to 48 telephones • general businesses: accounting services, health care, financial firms, insurance, legal offices, real estate, travel agencies.

System Parameters • analog space division switching • wiring: 1-pair, 2-pair, 25-pair • modular connections • centralized with stored program, microprocessor controlled.

Traffic Capacity • Vantage 12: up to 10 unblocked connections • Vantage 24: up to 17 unblocked connections • Vantage 48: up to 21 unblocked connections.

Trunks/Stations/Consoles • Vantage 12: 6 trunks, 12 stations • Vantage 24: 12 trunks, 24 stations, 2 consoles • Vantage 48: 16 trunks, 48 stations, 2 consoles.

Voice Equipment • vendor supplied: proprietary multibutton electronic telephone sets • industry standard 500/2500 sets • Beta Series single-line sets • headset • DSS/BLF/CAP (central answering position).

Data Equipment • vendor supplied: Displayphone.

First Delivery • 1980.

Systems Delivered • over 700.

Installation Interval • 4 to 6 weeks ARO.

Comparable Systems • AT&T Information Systems ComKey, Merlin • Comdial Maxkey • Executone Equity II, Encore, Command 8/16 and 20/56 • Inter-Tel Phoenix/Hitec • ITT EKS-701, EKS-801 • Iwatsu Omega III and IV • NEC Electra 616 and 16/48 • TIE Businesscom and Ultracom • Toshiba Strata.

Environmental Specifications • temperature operating range 32 to 120 degrees fahrenheit • humidity range 5 to 95 percent • air conditioning: not required • dimensions of common equipment: Vantage 12—20.1x15.3x11.2 (WxDxH) inches; Vantage 24 and 48—18.7x18x10.8 (WxDxH) inches; secondary cabinet Vantage 48 same dimensions as primary cabinet • power: standard 115VAC at 60 Hz • FCC Registration: Vantage 12—AB6982-69211-KF-E, Vantage 48—AB67UJ-70632-MF-E • ringer equivalence: 1.2B.

Vendor • Northern Telecom; 565 Marriott Drive, Suite 300, Nashville, TN 37210 • 615-885-3510.

Canadian Headquarters • Northern Telecom Canada Ltd; 304 The East Mall, Islington, ON M9B 6E4 • 416-232 2000.



Distribution • nationwide through approved distributors/dealers.

Service/Support/Training • service, support, and training is handled nationwide through Northern Telecom's direct sales force and authorized distributors • maintenance contracts available after first year.

GSA Schedule • listed.

■ ANALYSIS

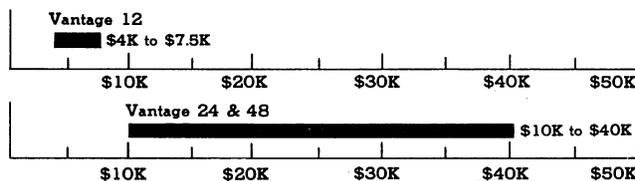
In 1976, Northern Telecom established its Advanced Telephone Products Division in Nashville, Tennessee. This division is responsible for the manufacture of residential decorator sets and public coin telephones, as well as teleconferencing equipment and the Logic family of business telephones. The Vantage 12 was introduced to the U.S. market by this subsidiary in 1980. In 1982, a decision was made to create a separate sales and marketing organization dedicated solely to the Vantage 12. In 1984, Vantage 48 was added to the Model 12 to satisfy the need for a mid-range system.

The Vantage 12, 24, and 48 are electronic key telephone systems that can support up to 16 trunks and 48 telephones. The systems are stored program, microprocessor controlled, using space division switching, and modular packaging. Equipment cabinets for Vantage models can fit in a standard closet, with only minor alterations needed to accommodate the Vantage 48.

Vantage is targeted toward the small business sector. It provides small businesses the opportunity of utilizing sophisticated electronic telephone features previously available only to larger PBX users while maintaining a competitive price with other

PURCHASE PRICE RANGE

hardware & software



NORTHERN TELECOM VANTAGE PURCHASE PRICING bar graphs cover price ranges between "small" and "large" configurations; installation and first year's maintenance included • Vantage 12 configurations range from 2 trunks/6 stations to 6 trunks/10 stations • Vantage 24 and 48 configurations range from 8 trunks/12 stations to 14 trunks/40 stations.

Northern Telecom Vantage Models 12, 24 & 48 Electronic Key Systems

low-end key systems. Features like last number redial, 3-party conferencing, and on-hook dialing are standard features on the Vantage. Optional features consisting of a 15-number speed dial directory, full handsfree operation, off-premise extensions, and Station Message Detail Recording are available.

Its modular design reduces downtime from hours to minutes. Additional features can be added on an as-needed basis instead of being purchased up front. The system is easy to operate and its flexibility to accommodate many different types of business is important to have in a phone system. Rigorous testing is carried out on all Vantage systems to ensure their reliability. They are backed by Northern Telecom, the 2nd largest manufacturer of fully digital telecommunication systems in the world.

□ Strengths

The Vantage product line offers the user an impressive list of features. The system is completely modular and requires very little office space. Electronic components in the system's control cabinet can be replaced or reprogrammed in minutes, eliminating unnecessary downtime. The system has self-diagnostics for internal malfunctions. The Vantage can be field upgraded with minimal disruption of service.

□ Limitations

Users need to consider the amount of growth they think their businesses will experience when considering a Vantage telephone system. The system is presently limited to 16 trunks and 48 telephones. Until recently, an intermediate system between the Vantage and Northern Telecom's SL-1 series of PBXs was not available. The company's new Meridian DV-1, is designed to support voice/data communication up to 100 stations, which should be sufficient to fill the product gap between Vantage and the SL-1.

■ SOFTWARE

□ Terms & Support

Terms • software provided either as part of basic system or through plug-in feature package modules • basic system software bundled with system price • feature modules available separately.

Support • Vantage software is supported by Northern Telecom and authorized dealers.

□ Software Overview

Vantage software controls all system operations, provides features, and handles system diagnostics. Features are either built into the system or are user-programmable. Operating functions are implemented in ROM (Read Only Memory) while user programmable features are implemented in RAM (Random Access Memory).

□ Features Overview

Features are functions of plug-in feature package modules • system comes equipped with basic features • optional features are added by inserting specially programmed modules into the existing main equipment and the proprietary Vantage phones. Software modules will run in all Vantage systems with some limitations on the Vantage 12 • for detailed description of specific features, refer to the Glossary in Section 1100 of this volume.

General System Features

Standard Features • automatic line selection; call hold; call waiting; end-to-end signaling; LED illumination; last number redial button; pause button; 3-party conferencing; pushbutton dialing; ringing cut off.

Optional Features • Vantage 12: intercom module—direct station selection; station busy visual indication; calling party identification; tone and voice signaling; call transfer; all call paging; dialer and intercom module—DSS/BLF intercom; 15-number directory; store button with LED; Vantage 24 and 48: programmable expansion module; programmable direct station selection; programmable CO line keys; programmable feature keys; paging; programmable expansion with dialer; 15-number

dialer; store button with LED.

Restriction Features • Vantage 12, 24, 48: outgoing call denial; toll and 411 denial; private lines.

Call Accounting Features • Vantage 24, 48: station message detail recording (SMDR) capability (printer not supplied).

Attendant Console Features • Vantage 24, 48: programmable 16-button, CO module; add-on DSS/BLF module; night service; test buttons; page; system alarm indicator; call splitting; transfer button.

Station Features • Vantage 12, 24, 48: single set color; nonlocking buttons; designation cards; pushbutton dialing; visual line status indication; recall button; automatic privacy with release; call progress tones; saved number redial button; 3-party conferencing; hold button; personal directory.

Additional Station Features • Vantage 24, 48: tone and voice signaling; call transfer; call pick-up; automatic prime line selection.

■ HARDWARE

□ Terms & Support

Terms • Vantage is available for direct purchase or for 24 and 48 month lease plans • lease rates may or may not include maintenance • installation rates are separate from equipment cost • Northern Telecom or authorized distributor will provide total installation • end-user pricing will vary based on costs such as distributor markups, discounts, and overhead, as well as installation, maintenance, and training costs.

Support • equipment supported by Northern Telecom • training by Northern Telecom.

□ Overview

Vantage uses a central processor with analog space division switching. It is housed in a compact equipment unit. Expansion occurs by adding plug-in modules to the existing system. Wiring consists of 1-, 2-, and 25-pair cables. The Vantage 12 and 24 use a primary equipment cabinet that houses the power supply, optional ringing generator, and line/trunk cards. Optional features are inserted into the system as needed. The Vantage 48 uses the primary equipment cabinet and a secondary cabinet to support a maximum of 16 trunks/48 stations. All 3 systems have CPU (central processing unit) cards, memory cards, precise tone cards, paging cards, and a power supply.

In its various configurations, the Vantage 12 can hold a DSS module or a Convenience Dialer module, line cards, and a dialer memory card (if one or more dialers are used in the system). An Emergency Transfer Line card together with an ET station set can be used to provide basic telephone service in the event of a power or system failure. The Vantage 24 requires the basic components plus Group Switch cards, station cards, and ringing generator. The Vantage 48 builds on the Vantage 24 and includes the Dialer and Handsfree module and the DSS module. The DSS module of the Vantage 12 becomes a Programmable Expansion Module (PEM) in the Vantage 48, offering 14 programmable buttons for feature assignment. All modules are interchangeable among systems.

□ Representative System Configurations

Vantage 12 • basic system—common equipment, line cards, fully modular station sets, intercom module.

2 Trunks/4 Stations:	\$3,850 prch
6 Trunks/4 Stations:	7,640

Vantage 12 • feature system—common equipment, line cards, fully modular station sets, intercom module, handsfree module, dialer memory card.

PRCH: purchase price; price ranges include installation and first year's maintenance. Prices current as of March 1985.

Northern Telecom Vantage Models 12, 24 & 48 Electronic Key Systems

2 Trunks/4 Stations:	4,340
6 Trunks/4 Stations:	8,840
Vantage 24 • basic system—common equipment, line cards, station card, group switch card, station set (EKT), station set with 52-button module, PEM, handsfree unit.	
6 Trunks/12 Stations:	11,910
12 Trunks/24 Stations:	18,750
Vantage 48 • basic system—common equipment, primary and secondary; line cards; station card (EKT); group switch card; station set (EKT); station set with 52-button module; 16-button PEM; PEM; handsfree unit.	
14 Trunks/28 Stations:	23,590
16 Trunks/48 Stations:	34,000

System Components

Common Equipment Cabinet (Vantage 12) • equipped with connectors wired to backplane; supports up to 6 trunks and 12 stations:	\$1,750 prch
Common Equipment Cabinet (Vantage 24 & 48) • equipped with power supply, CPU, memory, tone and paging cards; supports up to 12 trunks, 24 stations:	2,750
Expansion Cabinet (Vantage 48) • equipped with power supply and bus terminator card; supports expansion to 16 trunks and 48 stations:	1,450
Line Circuit Boards (Vantage 12) • provides 1 trunk and 2 stations:	150
Emergency Transfer Circuit Board (Vantage 12) • provides power failure transfer:	225
Controller Circuit Board (Vantage 12) • provides CPU and memory:	450
Power Supply (Vantage 12):	350
Station Circuit Board (Vantage 24 & 48) • connects up to 4 stations; either 500/2500 or electronic types.	

500/2500 Telephones:	375
Electronic Telephones:	195
Trunk Circuit Board (Vantage 24 & 48) • connects up to 4 trunks or PBX extensions:	275
CPU Circuit Board (Vantage 24 & 48):	695
Memory Circuit Board (Vantage 24 & 48):	750
Power Supply (Vantage 24 & 48):	550

Station Equipment

Basic Electronic Key Telephone • available with all models:	\$250 prch
Basic Electronic Key Telephone • equipped with emergency transfer capability:	375
Handsfree Module • available with all models:	90
Programmable Expansion Module (PEM) • 14 programmable buttons for intercom or DSS/BLF; available with all models:	85
Expanded DSS/Dialer Module • 30 programmable buttons for intercom, speed dialing, or DSS; in lieu of PEM; available with all models:	150
48-Station DSS/BLF Module for Vantage 24 & 48 • supports up to 48 station lines:	575
Headset Assembly • connects headset to Vantage 24 or 48; includes lightweight headset:	295

SYSTEM MAINTENANCE & DIAGNOSTICS

System Reliability • backup battery for memory and other logic circuits.	
System Diagnostics • self-diagnostic testing/display.	
System Maintenance • performed by either Northern Telecom, distributor, or customer maintenance by replacement.	
System Management • users can change various system parameters, moves, and rearrangements; system console used.	

• END

Rolm CBX Family

Models VSCBX & CBX II

■ PROFILE

Function • stored program computerized branch exchange (CBX) systems for switching voice and data.

Applications Supported • office automation: word processing, dictation, facsimile • healthcare • retailers • hotel/motel • banking • military • education • service sector.

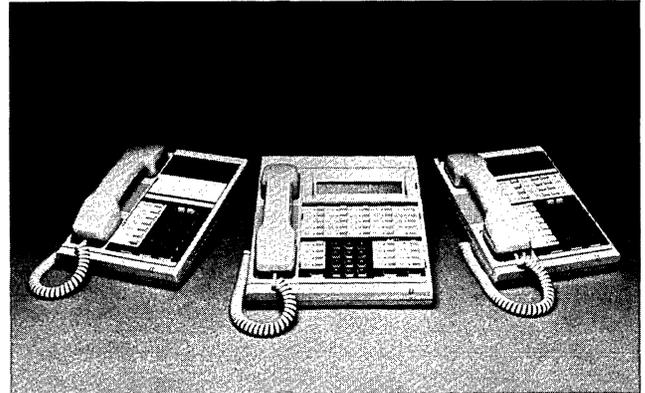
System Parameters • switching technology: digital switching using TDM/PCM • architecture: VSCBX—centralized processor tied to high-speed bus; CBX II—distributed processing tied to high-speed bus; nonblocking configuration available • common control: stored program • transmission: 4-wire internal switching; maximum bus speed 295M bps • wiring plan: stations—uniform 3-pair; internode—coaxial, fiber optic, or T-1 • data switching capability: 64K-bps full-duplex at station • dynamic bandwidth allocation; submultiplexing; supermultiplexing; shared access.

Traffic Capacity • VSCBX—14 CCS per line; CBX II—6 to 36 CCS per line (voice), 36 CCS per line (data) • grade of service: P.01 • simultaneous conversations: VSCBX—150; CBX II—192 (Rolmbus 74), 768 (Rolmbus 295) per node • nonblocking architecture: VSCBX—no; CBX II—yes • see Table 1 for configuration limits.

Trunks/Stations/Consoles • VSCBX: 8 to 44 trunks; 24 to 144 stations; 1 console • CBX II: 16 to 10,000 users; any combination • trunks supported: central office—1-way (in/out), 2-way; DID; FX; tie lines; OCC; AUTOVON; CCSA • attended and unattended operation • see Table 1 for configuration limits.

Voice Equipment • vendor supplied: analog and digital telephones • nonvendor equipment supported: all rotary (500 type) and Touch-Tone (2500 type) telephones • electronic feature telephones: Rolm ETS-100A, ETS-200 Centralized Attendant Service, ETS-300 Automatic Call Distribution • digital telephones: Rolmphone 120, 240, 400; Juniper • flashphones.

Data Equipment • vendor supplied: Cypress Personal Communication Terminal; Cedar Personal Communication Terminal; IBM Personal Computer Interface; Personal Computer Terminal for Managers (emulates DEC VT-100 and IBM 3270) • nonvendor equipment supported: terminals that support IBM 3270, BSC, ASCII, VT-100 • data rates: synchronous 1.2K to 64K bps; asynchronous 110 to 19.2K bps; full duplex • aggregate data rate: 4.4G bps • modems: all types; modem pooling • multiplexers: all types • protocol converters: 3270, X.25 • data modules: datacom module for Rolmphone; data terminal interface



(DTI) for standard phones • interfaces supported: RS-232C, RS-449 • printers: service printer • data storage: digital cassette unit, diskette subsystem, magnetic tape subsystem • data terminals: ASCII, TTY, 3270, VT-100 • computers: minicomputers, personal computers.

Subsystem Support • automatic call distributors: ACD 9000 • call detail recording: Insite application processor • voice message systems: PhoneMail • message center systems: Telephone Message Management System • centralized attendant service • energy management systems: GE Programmable Load Control System • hotel/motel management systems: Insite Resale Manager; interfaces to most management systems.

Communications/Networking • abbreviated dialing • off-network dialing • on-network dialing • dialed digit translation • route optimization • tandem switching • satellite operation • transmission rates: maximum bandwidth per node 295M bps • protocols: X.25, SNA, BSC, ASCII • asynchronous to 19.2K bps • synchronous to 64K bps • T-1 interface • gateways: X.25, SNA/SDLC.

First Delivery • VSCBX: 1980; CBX II: 1984.

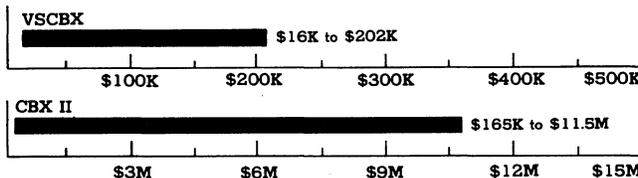
Systems Delivered • over 13,000 systems, all models.

Installation Interval • VSCBX: 12 to 16 weeks ARO • CBX II 12 to 16 weeks ARO (Rolmbus-74).

Comparable Systems • VSCBX: American Telecom Focus, AT&T Dimension 400 and System 75, Ericsson Prodigy, Executone Eclipse, GTE Omni SI, Harris/Digital D1200, Hitachi DX, IPC Technologies 160 DPX III, ITT 3100, Mitel SX-200, NEC NEAX 2400, Northern Telecom SL-1S, Siemens Saturn II, Solid State Systems D-TEL, TIE/Communications Data Star • CBX II: American Telecom Focus, Anderson Jacobson IOX, AT&T Systems 75 and 85, CXC Rose, Ditrans 580 DSS, Ericsson MD110, Executone Summit, GTE Omni SIII, Harris/Digital D1200, InteCom IBX, Mitel SX-2000, NEC NEAX 2400, Northern Telecom SL-1/SL-100, Siemens Saturn III, TIE/Communications Mercury, United Technologies/Lexar UTX, Zitel PBX.

Environmental Specifications • temperature: 50 degrees to 80 degrees Fahrenheit (normal), 32 degrees to 122 degrees Fahrenheit (maximum) • humidity: 30 to 60 percent (normal), 20 to 80 percent (maximum) • power: VSCBX-117 VAC (+10% to 15%) at 60 Hz; CBX II—208 VAC (+10% to 15%) at 60 Hz; all systems 48 VDC (+1.7% to 8%); separately fused outlet 30-amp service per cabinet • air conditioning: VSCBX—0.850 KWH, 0.24

PURCHASE PRICE RANGE hardware & software



ROLM CBX PURCHASE PRICING bar graphs cover price ranges between "small" and "large" configurations; installation and first year's maintenance included • VSCBX small configuration consists of 8 trunks and 24 stations; large of 40 trunks and 144 stations; single console • CBX II small configuration consists of 50 trunks and 200 stations; single console; voice only • medium configuration consists of 200 trunks and 1,200 stations; 3 attendant consoles; 3 CBX II nodes; 10% data • large configuration consists of 400 trunks and 4,000 stations; 6 attendant consoles; 6 CBX II nodes; 20% data.

Rolm CBX Family Models VSCBX & CBX II

TABLE 1: CBX II CONFIGURATION LIMITS
SINGLE NODE CBX II

	Rolmbus 74			Rolmbus 295		
	8000	9000 Number of Users	Maximum	8000	9000 Number of Users	Maximum
Voice Only, Analog ¹	850	880	1,320	850	1,000	6,144
Voice Only, Digital ²	850	1,200	1,320	850	1,000	6,144
Data Only, 19.2K ³	608	528	1,375	608	1,200	1,280
Voice/Data, 19.2K ⁴	416	416	673	416	675	1,059
Data Only, 64K ⁵	275	275	275	608	1,200	1,280
Voice/Data, 64K ⁶	228	228	228	416	675	1,059
Voice NB, Data 64K ⁷	143	143	143	416	673	673

15 NODE CBX II

	Rolmbus 74		Rolmbus 295	
	9000 Number of Users	Maximum	9000 Number of Users	Maximum
Voice Only, Analog ¹	7,350	19,800	12,000	92,160
Voice Only, Digital ²	4,500	19,800	12,000	92,160
Data Only, 19.2K ³	7,500	20,625	15,750	19,200
Voice/Data, 19.2K ⁴	4,500	10,102	8,250	15,890
Data Only, 64K ⁵	3,375	4,125	15,750	19,200
Voice/Data, 64K ⁶	2,250	3,414	8,250	15,890
Voice NB, Data 64K ⁷	1,650	2,152	8,250	10,091

Notes

The upper chart defines the limits for 8000 and 9000 single node systems • lower chart defines the limits for 9000 15 node systems.
Configuration 1 • each user has a telephone only, with 6 CCS traffic and one 18 CCS trunk for every 10 users.

Configuration 2 • same as 1 but with ROLMphones replacing analog telephones.

Configuration 3 • each user is a data device (terminal or computer port) running at a maximum of 19.2K bps • all devices nonblocking (NB or 36 CCS per line traffic).

Configuration 4 • each user has a ROLMphone, a data terminal, and one computer port for every 5 terminals • voice traffic same as in configuration 1 — 6 CCS data traffic same as in configuration 3 — 19.2K bps.

Configurations 5 and 6 • same as 3 and 4 except that data speed is 64K bps.

Configuration 7 • same as 6 • includes nonblocking (NB) voice traffic (36 CCS/line).

Maximum capacity columns refer to the theoretical limits imposed by the switching architecture chosen, either Rolmbus 74 or Rolmbus 295 • other columns refer to capacities actually available in the current version of CBX II; these capacities take into account processor, power, and physical space constraints of the current systems.

tons; 8000 processor—1.28 KWH (0.98 KWH for nonredundant CPU), 0.36 tons (0.31 tons for nonredundant CPU); 9000 processor—1.34 KWH, 0.36 tons; expansion cabinets—1.30 KWH, 0.36 tons • dimensions: VSCBX—36"W x 28"D x 71"H; CBX II—59"W x 28"D x 65"H • weight: VSCBX—650 pounds; CBX II—1,000 pounds, 1,200 pounds (redundant CPU) • floor loading: 100 pounds per square foot • minimum equipment room dimensions: 8'W x 10'D x 8'H.

Vendor • Rolm Corporation; 4900 Old Ironsides Drive, Santa Clara, CA 95050 • 408-988-2900.

Distribution • nationwide and worldwide through Rolm direct sales offices (ROCOs) and independent dealers and distributors • Canada through Rolm Canada, Willowdale, Ontario, and Montreal, Quebec • Australia through Plessey Communication Systems, North Sydney; Argentina through Didefon S.A.C.I., Buenos Aires; Chile through Teknos, Santiago; Egypt through Telcom, Cairo; Mexico through Datatron S.A., Mexico 5 D.F. • United Kingdom through Plessey Communications and Data Systems Ltd, Nottingham • Japan through Sumitomo/Omron.

Service/Support/Training • service, support, and training by ROCO or distributor • installation by ROCO or distributor; subcontractors • warranty one-year parts and labor; maintenance contracts available • local and remote maintenance.

■ ANALYSIS

In a major announcement that sent shock waves throughout the

information processing industry, IBM Corporation announced on September 26, 1984 that it would buy Rolm Corporation. Assuming the stock transactions required to buy Rolm are approved, and there is no major backlash from other major firms in the industry, Rolm will become an independent but wholly owned subsidiary of IBM.

Adding support to its line of digital terminal equipment, Rolm announced 2 new products, Cedar and Juniper on November 2, 1984. Cedar combines an IBM PC-compatible computer with an integrated voice/data workstation to produce a full-featured management workstation. Juniper provides a bridge from an IBM PC to the CBX such that users can retain their PCs yet add all the communications features of the CBX. Cedar looks exactly like a Rolm Cypress Personal Communications Terminal, except for the addition of dual diskette drives in the main module. Cedar also includes 512K bytes of memory, the CPU, and Rolm Personal Communications Software (PCS), which gives users increased flexibility in programming specific functions. Juniper is based on, and looks exactly like, a ROLMphone digital telephone. A special option board connects to a PC, a cable connects the option board to the Juniper, and PCS software is provided on a diskette for loading into the PC. Both units became available December, 1984.

These latest developments, coupled with Rolm's November 17, 1983 announcement of its newest version of the CBX product line, the CBX II, sends a strong message to the PBX industry that the Rolm/IBM organization is indeed a powerful force to be

Rolm CBX Family

Models VSCBX & CBX II

reckoned with. The CBX II is seen as the successor to the venerable CBX, with over 14,000 systems installed worldwide.

A nonblocking, modular, digital PBX system with "revolutionary system architecture," CBX II, introduced November 17, 1983, is aimed at recapturing Rolm's eroding market share resulting from dwindling sales of its "aging workhorse," the CBX family, which claims 13,000 installations worldwide. CBX II replaces CBX Models S, M, L, and VL that will no longer be produced; Rolm will continue to offer its VSCBX. A technically advanced product targeted at the automated office environment, CBX II is designed to satisfy existing as well as future user requirements while protecting the Rolm user's investment in existing CBX systems. CBX II retains compatibility with CBX systems, which are easily, and cost-effectively upgraded to a CBX II.

The low-end VSCBX is the only model from the original product line to be retained. It is a single-cabinet nonredundant system. The system control consists of a 16-bit processor with 48K to 144K words of memory, depending on the system size. The VSCBX can grow from 24 stations and 8 trunks to 144 stations and 40 trunks, and is targeted at small businesses with moderate growth.

The CBX II uses digital switching technology (TDM/PCM) and supports 16 to 10,000 voice and data users within a maximum 15-node network. Product availability is in 2 phases which differ by 4 times the switch bandwidth capacity. CBX II Phase I (available now) has a Rolmbus node capacity of 74K bps, while Phase II (available December 1984) will have a Rolmbus node capacity of 295M bps. Rolmbus, a high-speed TDM bus, is a key architectural element of CBX II.

According to Rolm, CBX II is not only a product, it is an architecture, and the basis for all future Rolm products; see Figure 1. Rolm's uniform wiring plan for CBX II calls for a 3-pair cable between each station and the switch; however, only a single pair is required to support concurrent data and voice communication. Terminal devices connect to CBX II via Rolmlink, a bidirectional 256K-bps channel which allocates 64K bps to voice and 192K bps to data.

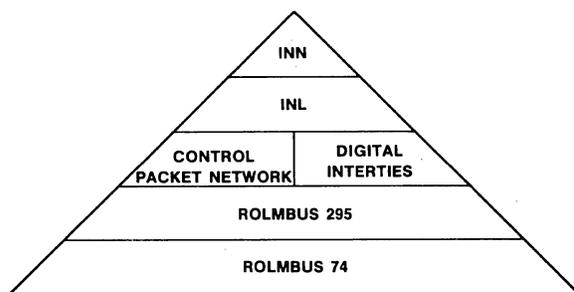


Figure 1 • CBX II Systems Architecture Hierarchy. CBX II architecture begins at the Rolmbus 74 level, for most current applications, and grows through the higher performance Rolmbus 295. Multinode applications tie together with the Control Packet Network and Digital Interties. Larger installations requiring substantial data capabilities build on Inter-Node Links and Inter-Node Network.

Rolmbus 74 is a 74M-bps 16-bit parallel bidirectional bus supporting 192 communication channels (165 for voice/data traffic) and clocked at 4.6 MHz for a total bandwidth capacity of 74M bps; see Figure 2. Each full-duplex channel samples 16 bits at 12,000 samples per second (12 KHz) for a 192K-bps channel bandwidth in each direction. Rolmbus 74 converts to Rolmbus 295 through simple card changes for an expanded bandwidth of 295M bps over 768 192K-bps full-duplex communication channels; see Figure 3. A 15-node Rolmbus 295 system expands total system bandwidth to 4.4G bps.

Intercommunication between nodes with full-nodal bandwidth

availability is accomplished via Inter-Node Links (INL). Each INL accommodates 384 full-duplex channels, each with a 192K-bps bandwidth (per each direction). A node can support up to 12 INLs. A pair of nodes requires up to 4 INLs for full internode bandwidth availability, depending on the total number of devices per node and bandwidth requirements per device; therefore, a 3-node system could have up to 12 INLs per node, with up to 4 INLs linking nodal pairs.

Nodes can be separated by 200 feet via coaxial-cable INLs or up to 20,000 feet via fiber optic interfaces and cable. Nodes separated at distances greater than 20,000 feet can intercommunicate over T1 carrier facilities at 1.544M bps using Digital Interties (DI), which support 8 T1 channels per link.

Intercommunication between nodes with full bandwidth availability can also be achieved through the Inter-Node Network (INN) that supports systems with 4 or more nodes. Each node links with the INN over up to 4 INLs or DIs. Each INL link supports 384 channels (at 192K bps per channel each direction) for a total of 1,536 channels over 4 INLs. A fully configured INN supports 23,040 fully available channels over 15 nodes. The INN is required for configurations of more than 4 nodes when there are as many as 1,536 devices per node, and is located at the hub of nodes arranged in a star configuration. Each node can be located up to 20,000 feet from the INN for node-to-node separation of up to 40,000 feet. The cost effectiveness of the INN increases in proportion to the number of network nodes. The INN is fully redundant and contains a pair of 9000 processors among other components; the processors can be switched with the other redundant components for maximum redundancy.

The CBX II can be equipped with either a 16-bit Rolm 8000 or 32-bit Rolm 9000 Series processor. However, the 9000 processor is required for multinode operation. The 16-bit 8000 can address up to 1 million 16-bit words and supports up to 10K calls per hour. The 32-bit 9000 can address up to 16 million words and supports 82.5K calls per hour.

Rolmbus 74 is supported by all 9000 releases starting with Release 9002. Rolmbus 295 and the INL subsystem are supported by Release 9004. The INN is supported in Release 9005.

CBX II Fundamental Operating Software (FOS) includes as standard features the following items that were chargeable in the CBX: Advanced Features; System Forwarding; Expanded Traffic; DTMF/Rotary Conversion; Toll Restriction; Automatic Program Load; Message Waiting; and Data Communication.

Supermultiplexing, Submultiplexing, and Shared Access are 3 prominent CBX II features implemented by Dynamically Allocated Bandwidth (DAB). Supermultiplexing allocates up to 37M bps of switch bandwidth to a full-duplex channel according to demand. Submultiplexing divides the bandwidth of a 192K-bps data channel according to the bandwidth requirements of attached devices, e.g., 2400 bps for 240-cps printer, 9600 bps for display terminal, etc. Shared Access supports broadcasting where one station transmits to many receiving stations, or local area network applications where multiple high-speed devices intercommunicate.

Accompanying its announcement of CBX II Rolm introduced 2 new Rolmphones (Models 120 and 240), that, with the Model 400 announced in May 1983, form a family of electronic digital phones that can also be used on existing CBX systems. Rolmphones feature single-button, on-hook dialing, contain a codec for analog-to-digital (and D to A) voice conversion, and accommodate a data communication module.

Rolm will upgrade any existing CBX model to a CBX II Phase I model for 20 percent over the original model's cost (including installation), and it will upgrade Phase I systems to Phase II systems for an additional 10 percent.

A cornerstone of the Rolm CBX design is compatibility throughout the various models. A user starting with a basic VSCBX can migrate to larger CBX models with only minor disruptions to service at each upgrade point. Operating software, known as releases, can run virtually unchanged on all models, provided there is sufficient system memory. Switching on all models is accomplished using time division multiplexing with pulse code

Rolm CBX Family Models VSCBX & CBX II

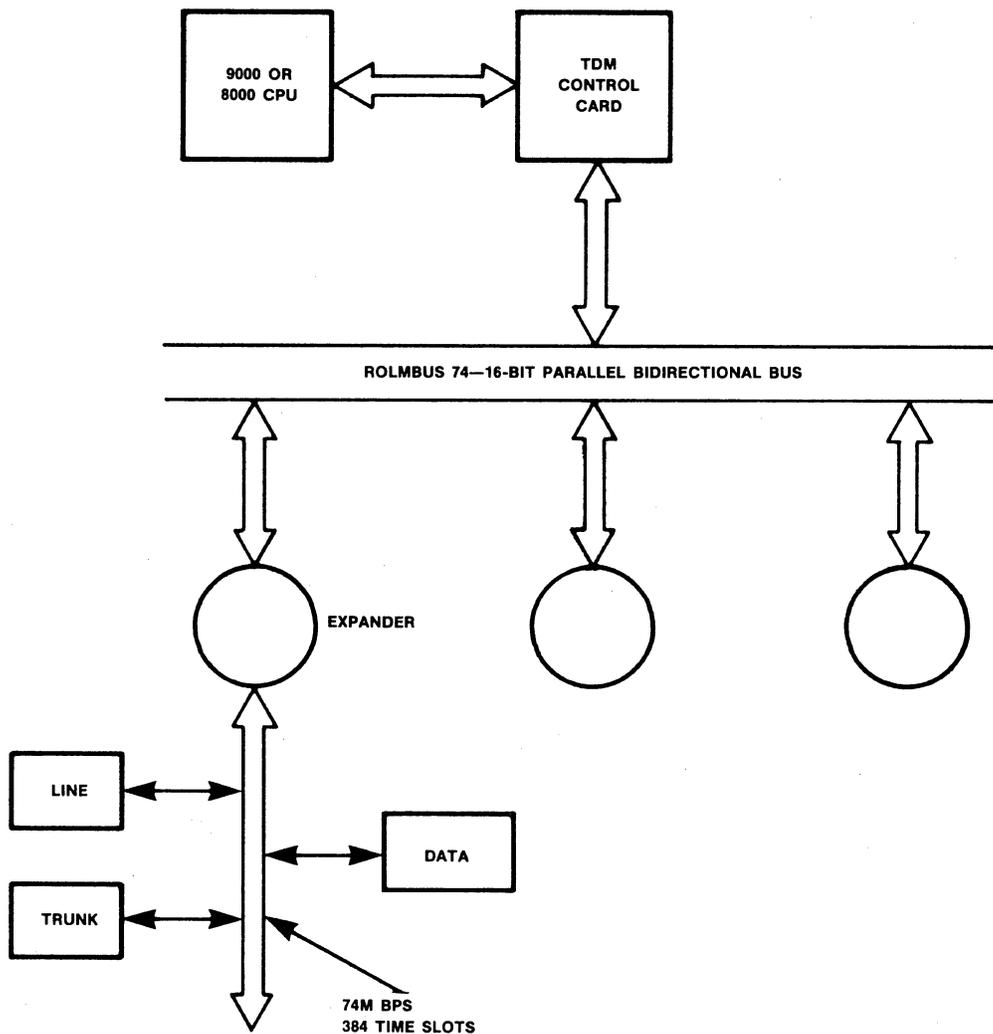


Figure 2 • Rolm Bus 74 configuration. Lines, trunks, and data terminals are connected to expander via Rolmlink; 256K-bps slot is available for voice, data, and control signals. The connection to Rolm Bus 74 is via expander; all system control functions are handled by 8000 or 9000 CPU connected to Rolm Bus via TDM control card.

modulation (PCM). All CBXs interface with a wide variety of trunks and tie line facilities, and can operate in most non-CBX network environments.

Aside from the CBX product line, Rolm has developed additional systems that can enhance the CBX. Automatic Call Distribution (ACD) and Centralized Answering Service (CAS) have made the CBX a formidable competitor in such markets as banking, retail, and the airlines. A pioneer in the field of communication management, Rolm has numerous features and systems, such as Call Detail Recording, Trunk Queuing, Insite Applications Processor, Rolm Analysis Center to effectively control telephone expenses. Having developed a digital phone system that had the ability to handle both voice and data, Rolm made early advances into the voice/data market in 1977, before the issue reached today's proportions, and today boasts one of the most powerful data switches in the industry. Realizing an opportunity to achieve market presence in the voice message industry, Rolm developed its own proprietary system, PhoneMail, which can support hundreds, and even thousands, of users.

Rolm Corporation was founded in 1969 by 4 electrical engineers

who saw the need for an off-the-shelf minicomputer that could handle the tough environmental demands of military applications. Having successfully developed a ruggedized mil-spec minicomputer, the company turned to the telecommunications marketplace in 1973. In May 1975, the Rolm CBX was one of the first computer-controlled telephone systems offered to factories, hospitals, hotels, department stores, large offices, banks, and government agencies.

□ Strengths

Headlines in mid-1983 told of the IBM purchase of a 15 percent interest in Rolm, particularly sweet for Rolm since the computer giant had been planning a stock buy of Mitel. Today this interest is now 100 percent, and several Rolm/IBM products have already entered the market, such as the Series/1-based Telephone Message Management System, the IBM Personal Computer Interface, and support for the IBM Cabling System. This merger with IBM has indeed reinforced Rolm's and IBM's presence in the PBX and office automation marketplaces, and has legitimized the PBS's role in the office of the future.

Users typically praise the CBX's ease of operation, ease of

Rolm CBX Family

Models VSCBX & CBX II

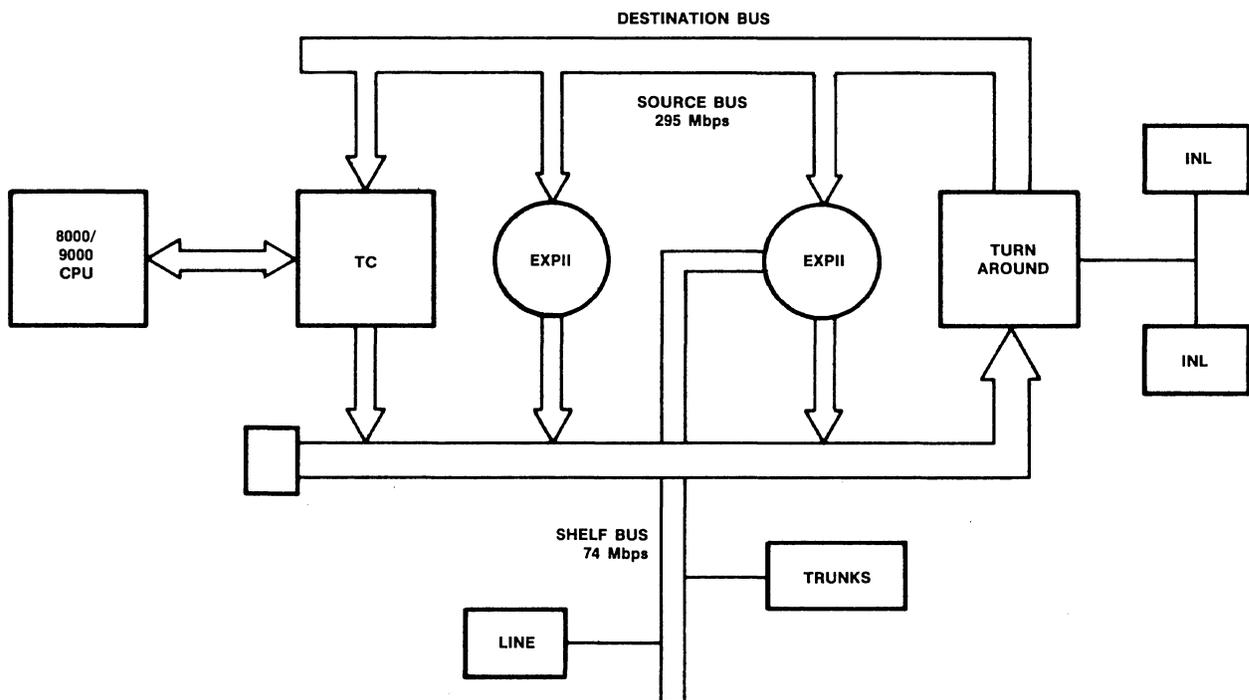


Figure 3 • Rolimbus 295 configuration. The intershelf bus (Rolimbus 295) consists of 2 unidirectional buses (source and destination buses). Expander II cards interface the source and destination buses to the shelf bus, which runs at 74 Mbps and is Rolimbus 74 compatible. The TDM Controller (TC) card drives the Rolimbus 295 at 18.432 Mhz, while the Turn Around (TA) card serves to synchronize the Rolimbus 295 either intranode or internode across the Internode Link.

installation, hardware reliability, and ease of upgrading. Rolm has developed a strong field support presence, and its efforts to bring some of its larger distributors into the organization points to a greater commitment for operations control. Rolm's policies toward upgrading from older CBX models to the new CBX II are very liberal and should encourage many users to migrate to the newer product.

Rolm has the philosophy that the customer should be concerned with a system that will accomplish the tasks that are currently being serviced. The future needs can be handled within the system because of its upward growth and compatibility with members of the other Rolm models. This sales approach alleviates many problems that were previously thought of as being associated with telephone systems. The **Future is Now** syndrome can be easily adapted to any Rolm system without the expensive task of bringing in analysts for future growth predictions.

□ Limitations

The Rolm CBX is typically one of the higher-priced systems on the market. Competition from some of the newer digital PBXs, particularly the AT&T System 75 and the NEC NEAX 2400, is going to lose sales for Rolm unless it reevaluates its pricing structures. A trouble spot for Rolm, as well as for most major manufacturers, is the method of distribution. Since the interconnect companies that sell PBXs apply a varying amount of markup, it's very difficult to achieve any price uniformity, a critical problem in the telecommunication industry. Rolm's competitive position will be strengthened dramatically once it adopts nationwide pricing, such as that being done by AT&T Information Systems.

Another limitation mentioned by CBX users was concern over the power used by the system. Assuming clean, filtered power was available, the systems operated without problems. If the power was suspect, it was felt the CBX was too sensitive to power noise, a situation easily corrected with the proper line filtering.

Earlier CBX releases were backed up with an 8-hour battery. If a power outage extended beyond 8 hours, a technician was required to deliver a tape to the site to reload the configuration into the CBX. This can be an annoying inconvenience. In the newer releases (Software Release 6 and later), a floppy disk system can be purchased with the CDR option that enables user reconfiguration in minutes. This is an optional feature, however, without it the user must wait for the service technician to arrive at the site to reconfigure the system.

■ SOFTWARE

□ Terms & Support

Terms • all software is bundled into the CBX system price with the exception of optional features.

Support • CBX system software is supported by Rolm and its associated dealers and distributors • field-developed software is supported by the individual dealer or distributor that authors the programs.

□ Software Overview

CBX software is used to control operations, conduct self-test functions, and provide features. It should be noted that all features of the Rolm CBX family are software driven and targeted at 3 areas: (1) System Features; (2) Attendant's Features; and (3) Station Features. System software consists of the Operating System, Self-Test, and Configuration Tables.

The operating system defines major parameters and functions. The distribution of calls and methods of route selection and optimization is also controlled by the operating system.

The self-test provides online testing of the CBX system performance. Error table printouts are available upon request. System fault error codes are stored in the CBX memory and made available to local or remote access.

Rolm CBX Family Models VSCBX & CBX II

The configuration tables contain information unique to each Rolm installation. These tables may be changed or moved. The tables are used to define station characteristics and control assignments.

Diagnostic software is used to diagnose problems not found by the self-test programs. They are recorded serially on cassette tape. When diagnostics are run, nonredundant systems will not be able to function. Redundant CBX systems will not experience any interruption in service while the diagnostic routines are being executed.

□ Features Overview

All features are a function of various software releases • **Release 8** (8000, 8001, 8002) is the current version and supports all features of **Release 4** through **Release 7** plus additional capabilities • **Release 9** will support the 9000 processor particularly for large multilocation systems • **CBX II Fundamental Operating Software** will make the following standard: advanced features, system forwarding, expanded traffic, DTMF/Rotary conversion, toll restriction, automatic program load, message waiting, data communication • all releases will run partially or totally in all CBX models • **all standard features are bundled into the system price** • optional features are **extra-cost** items.

□ VSCBX System Features

VSCBX General System Features

Standard Features • automatic error correcting memory: appends error correcting bits to each word stored in memory • auxiliary equipment access: connect various devices such as tape and disk drives • bad line reporting: reports stations out of service • distinctive ringing: indicates specific feature is active on incoming call • electronic telephone set (Release 5 and up): proprietary Rolm feature phones • feature usage statistics: system tracks feature utilization • flexible station numbering: stations can be numbered to correspond with specific requirement (e.g., hotel rooms) • intercom blocking: prevents station-to-station calls • key telephone features using 3-pair wiring: modules simulate key features but eliminate 25- and 50-pair cables • multiple console operation: up to 2 on 144-line model • multiple trunk groups: supports C.O., WATS, tie, etc • music-on-hold/camp-on: access to customer-provided music source when call is on hold or camped-on • night service fixed: calls directly routed to designated stations after hours • night service universal (also trunk answer from any station): incoming calls can be answered by any station • off-premises extensions: stations located remote to CBX • paging: access to customer-provided paging system via attendant and/or users • power failure transfer: predesignated trunks and extensions automatically connected during power outage • recorded announcements/intercepts: alerts caller that station or facility is not available • remote administration: system can be monitored or exercised remotely via dial-up telephone line into CBX • self-test and fault isolation: CBX detects and isolates malfunctions • station release with howler: stations left off-hook receive burst of tone notifying of condition followed by release from system control • system forwarding: calls routed to designated station on busy or don't answer condition • tie lines: facilities connecting other PBXs with CBX • TTY/CRT interface: connects display terminal and hard-copy output unit.

Automatic Program Load Option • provides floppy disk as alternate system loading device if system goes down; requires floppy disk hardware interface and drive; can be ordered after system installation as field upgrade:

NA prch

Direct Inward Dialing Option • designated group of trunks that can complete incoming call directly to station without attendant assistance:

4,000

Direct Inward System Access Option • provides direct access into CBX via trunk; user dials authorization code to access system features:

NA

DTMF to Dial Pulse Conversion Option • converts tones generated by CBX into rotary dial pulses:

NA

Redundant Critical Electronics Option • provides duplicate electronic components as backup:

NA

Restriction Features

Standard Features • class of service: programmed codes that determine station access to specific features and facilities • fully restricted station: station permitted to make and receive calls from within CBX only • inward restriction: DID calls blocked from completion to station; routed to alternate point • manual line service: attendant intervention required for all calls • toll restriction 0/1: outside calls requiring 0 or 1 prefix denied.

Account Code for CDR Option • requires dialing code for chargeback to specific business activities:

NA prch

Area Code Restriction Option • permits or denies station user outside trunk based on 3-digit area code:

NA

Controlled Outgoing Restriction Option • permits attendant control of outgoing call restriction for stations:

NA

Forced Authorization Code Option • requires dialing special code (password) before system will process call:

NA

Toll Restriction Option • permits or denies station user outside trunk access based on area code and local exchange (NXX) code:

NA

Call Accounting Features

Standard Features • feature usage statistics: stores system usage data into CBX memory • remote polling for Rolm analysis center: CBX queried online by Rolm for data used in Rolm analysis center.

Call Detail Recording Option • outputs data on outside calls to printer, mag tape, diskette, or Rolm data center:

\$16,000 prch

CBX Management Reporter Option • stores and processes CDR data into management reports; requires on-site terminal:

NA

Expanded Traffic Measurement Option • records additional detail on internal call activity in CBX:

NA

Rolm Analysis Center Option • CDR data processed by Rolm into management reports:

NA

Telecommunications Analysis Center Library Option • traffic analysis programs available from Rolm:

NA

Call Routing Features

Standard Features • attendant control of trunk group access: controls station access to outside trunks.

Call Queuing Option • prioritizes all outgoing long-distance calls; when trunk is busy, call is held and connected to most economical trunk available; 2 types—callback and standby:

\$6,000 to \$10,000 prch

Route Optimization Option • selects most economical outgoing trunk facility:

7,000 to 13,000

Data Features

Data Communications Option • provides interface support for both asynchronous and synchronous data terminals • capability

PRCH: purchase price. NA: not available; price not disclosed by vendor. NC: no charge. Prices effective as of September 1984.

Rolm CBX Family

Models VSCBX & CBX II

available with Release 7 and later software • data privacy: prevents other stations or attendant from interfering with data call in progress • modem pooling: provides for sharing of modems for both incoming and outgoing data calls • data speeds: up to 19.2K-bps asynchronous, 64K-bps synchronous; full duplex • auto-call: CBX automatically dials specific number when Request for Service activated:

NA prch

Data Line Interface Option • connects data terminal interface to CBX backplane:

1,450

Data Terminal Interface Option • connects data terminal to station line into CBX; includes RS-232C interface:

450

Network Features

Automatic Network Dialing Option • provides automatic dialing of all network calls; uses 3-digit code for off-premises locations; requires Rolmnet:

NA prch

Rolmnet Option • capability of building large-scale tandem tie line networks with Rolm switches:

NA

Satellite Operation Option • permits multiple locations in regional area to develop uniform numbering plan; includes automatic dialing, attendant consolidation, trunk consolidation, centralized CDR:

NA

Centralized Attendant Service Option • groups attendants for multiple CBX locations in centralized site; incoming calls to branch CBXs routed to central site for answering, then returned to desired station at originally called location:

NA

Attendant Console Features

Standard Features • alphanumeric display: allows attendant to process calls; identification of the source of an incoming or recalled call; calling extension class of service or trunk traffic group; called number or calling extension/trunk number • automatic recall: places call to busy extension after operator release • busy verification: check of off-hook condition on dialed line • camp-on busy: wait until off-hook condition ceases; place call when station is idle • conference call: more than 2 parties speak together • digital clock • emergency trunk override: accesses busy trunk or station • hold: calling party or conference is placed in a position waiting for an internal party • intercept: automatically forwards call to attendant if the call station is vacant, down, or in use • paging access: attendant connected to paging system when PAGE button depressed and lights • serial calls: initiates a series of calls for the same party • speed dialing: assigns abbreviated codes to selected stations • system alarm indication: indicates the existence of a system malfunction; steady for minor alarm, flashes for major alarm; audible alarm also sounds • tone silence: silence ringing at attendant's console due to arrival of incoming or recalled calls or system alarm • trunk connection: reinstate station user access to all trunk groups • 2-way splitting: alternates between calling and called party on a selected loop • universal cancellation of call forwarding and do-not-disturb; cancels call forwarding and/or do not disturb arrangements on a system-wide basis.

Station Features

Standard Features • add-on conference: permits an internal extension to add one inside or outside call to an existing conversation • call hold: places call on hold • call park: places call on hold within CBX for retrieval at another station • call pick-up: stations can answer another phone either by dialing a code and the ringing extension, or by dialing the pick-up code and answering a ringing station in the same pick-up group • call transfer: station can transfer a call to another station • call waiting: station on a call can answer a second call after being alerted to the incoming call by a special tone; also called Connect •

CDR/Account Coding: permits station to assign account code when placing call • direct outward dialing: permits station to originate outside call without operator.

Advanced Station Features Option • automatic camp-on: station user trying to reach busy extension dials code and stays on line until busy station frees up • camp-on callback: station user trying to reach busy extension dials code and hangs up; system calls back once busy extension frees up • do not disturb: prevents incoming calls to a station • executive override: designated stations can break into existing conversations or can override the do not disturb feature • forwarding: calls can be diverted to another extension • message reminder: station user can leave a callback message on a Rolm ETS or ROLMphone telephone • privacy: prevents call from interruptions such as camp-on or barge-in tones • queuing: permits station to access busy trunk facility by dialing a code and either staying on the line (standby) or hanging up (callback) • save/repeat: permits user to store an outside number for ease of redialing at a future time • station speed calling: users can program their extensions with up to 10 frequently dialed numbers • system speed calling: users can access additional numbers stored in CBX memory • trunk select: stations can access specific trunk lines:

NA prch

□ CBX II System Features

CBX II General System Features

Standard Features • the CBX II includes all VSCBX standard features plus the following that are options in the VSCBX: advanced station features, system forwarding, expanded traffic statistics, DTMF/rotary conversion, toll restriction, automatic program load, message waiting, data communications • all other VSCBX options are options in the CBX II.

Restriction Features

Standard Features • all features of the VSCBX plus the following VSCBX options: area code restriction, controlled outgoing restriction, toll restriction.

Account Code for CDR Option • same as for VSCBX.

Forced Authorization Code Option • same as for VSCBX.

Call Accounting Features

Standard Features • all features of the VSCBX plus the following VSCBX options: expanded traffic measurement.

Call Detail Recording Option • same as for VSCBX.

CBX Management Reporter Option • same as for VSCBX.

Rolm Analysis Center Option • same as for VSCBX.

Telecommunications Analysis Center Library Option • same as for VSCBX.

Call Routing Features

Standard Features • all features of the VSCBX.

Call Queuing Option • same as for VSCBX.

Route Optimization Option • same as for VSCBX.

Time of Day Routing Option • completes call routing as a function of the time of day; important when operating in multiple time zones:

NA prch

Camp-on Callback Between Systems Option • user trying to reach busy station in another CBX II node can dial code and stay on line until busy station releases:

NA

Traveling Class Marks for ETNs Option • provides special code which carries class of service/facilities access information while traveling over an AT&T Electronic Tandem Network:

NA

Trunk Queuing Callback Between Systems Option • user trying to complete off-network call at distant CBX II node can dial

Rolm CBX Family Models VSCBX & CBX II

special callback code; system will call user back and complete call once facilities at distant node are available:

NA

Data Features

Standard Features • data communications feature option in VSCBX standard in CBX II.

Data Line Interface Option • same as for VSCBX.

Data Terminal Interface Option • same as for VSCBX.

16-Port T1/D3 Interface to T1 Facility Option • provides connection to T1 carrier circuit:

\$8,700 prch

8-Port X.25 Interface Option • provides interface for connection to X.25-based networks:

11,200

Rolm IBM Gateway • access to IBM mainframes from CBX switches • enables asynchronous ASCII terminals, personal computers, or word processors to communicate with IBM computers in a 3270 communication environment • enables communication with minicomputers, printers, modem pools, public data networks, and public databases • prices below are for 8 ports and 16 ports, respectively:

9,000 to 20,000

IBM Personal Computer Interface • connects the IBM PC to the Rolm CBX data communication network:

450

Network Features

Automatic Network Dialing Option • same as for VSCBX.

ROLMNET Option • same as for VSCBX.

Satellite Operation Option • same as for VSCBX.

Centralized Attendant Service Option • same as for VSCBX.

Attendant Console Features

Standard Features • all features of the VSCBX console.

Station Features

Standard Features • all of the VSCBX standard features plus the Advanced Station Features option.

Application Software

Rolm has installed its system in numerous application environments. To date, Rolm has application packages for the following industries: health care; retailers; and office automation in all commercial areas; military; lodging; and service sector.

■ HARDWARE

Terms & Support

Terms • the CBX models are available for purchase or on a 1-, 2-, 3-, or 5-year lease • lease rates do not include maintenance • purchase prices do not include installation.

Support • equipment can be installed by Rolm Operating Companies (ROCOs) or distributors and Telcos • service and maintenance is based on the policies established by individual dealers and distributors.

Overview

The CBX family includes 2 specific product lines designed for stored-program activities using TDM digital switching of voice and data. The range of station support grows from 24 for the VSCBX to over 10,000 for the CBX II. The basic philosophy of the CBX is a commonality of components and software throughout the product line. Users with a VSCBX can migrate to a fully equipped CBX II with minimal interruption to service.

There are 3 CBX processors: the 7000, 8000, and 9000. Most existing systems use the 7000; the newer CBX II is equipped with either the 8000 (for single-site installations up to about 800 lines)

or the 9000 (for larger single sites and multinode operation). Existing 7000 users can upgrade to the 8000 by simply installing an Inter-Shelf Bus and changing CPUs and associated operating system software. Existing 8000 users can upgrade to the 9000 by replacing the TDM Controller, Expander, and the CPU/operating system, and by adding a Rolmbus Turnaround card.

The 8000 processor is for single-node systems only. It has a 16-bit architecture, addresses up to one million 16-bit words, and supports up to 10,000 calls per hour.

The 9000 processor is required for all multinode systems, yet can support single-node systems if required. It has a 32-bit architecture, addresses up to 16 million words, and supports up to 82,500 calls per hour.

The CBX II uses Rolmbus 74, which is supported on all 8000 series software releases beginning with 8001. Rolmbus 295 is supported by Release 8005. Rolmbus 74 is supported on 9000 Series processors using Release 9002; Rolmbus 295 requires Release 9004.

The VSCBX is a single-cabinet system. It uses multiple shelves to house circuit cards for trunks, stations, memory, CPU, the TDM bus, and various control functions.

The CBX II is a 3-cabinet system. Line cards are arranged in groups of 32 on each shelf, and 6 shelves make up a single cabinet. Each shelf has its own high-speed backplane, capable of switching 74M bps. Each of these shelf backplanes is connected to the main system backplane, called Rolmbus 74, by an expander card. A higher-speed backplane, Rolmbus 295, provides 4 times the capacity of Rolmbus 74. Large systems are built by connecting nodes in a distributed processing network. Nodes are connected via digital interties, which use T1 carrier facilities, or coaxial or fiber optic cables.

All Rolm CBX family members support voice and data switching. Rotary and touch-tone phones, as well as proprietary electronic and digital Rolm telephones, are supported. Rolm also supplies its users with selected peripherals, if desired.

Representative System Configurations

VSCBX Configuration • a single-cabinet nonredundant system • 3 models • **Model I** includes 48K-byte memory; minimum 8 trunks/24 stations; maximum 40 trunks/80 stations • **Model II** includes 96K-byte memory; minimum 8 trunks/24 stations; maximum 40 trunks/144 stations • single-attendant console • **Model III** includes 144K-byte memory; trunk and station capacity same as Model II • field upgrade from Model I to Model II to Model III.

Small System • Model I includes 48K-byte memory; 8 trunks/24 stations:

\$15,600 to \$33,600 approx prch

Large System • Model II/III include 96K-byte memory; 40 trunks/144 stations:

93,600 to 201,600

CBX II Configuration • 3-cabinet redundant system • one basic product that can be upgraded directly to largest configuration with minimal downtime • over 10,000 stations/trunks can be configured • up to 48 attendant consoles.

Small System • 50 trunks/200 stations; single console; voice only:

168,000 to 297,900

Medium System • 200 trunks/1,200 stations; 3 attendant consoles; 3 CBX II nodes; 10% data:

966,800 to 1,604,500

Large System • 400 trunks/4,000 stations; 6 attendant consoles; 6 CBX II nodes; 20% data:

3,520,000 to 5,700,000

APPROX PRCH: purchase price; price ranges are approximate and include installation. Prices effective as of September 1984.

Rolm CBX Family Models VSCBX & CBX II

□ Station Equipment—Voice/Data

Attendant Console • primary function to service incoming calls generated outside the Rolm System and connect appropriate internal station • place outgoing calls • provides information concerning status and types of calls being handled • desktop unit • price includes 12K-byte memory:

\$4,000 approx prch

ETS 100A • proprietary Rolm telephone • microprocessor control • includes display panel; leaves 1 or more messages on any outgoing extension; calls elapsed time of call; supplies listing of speedcall numbers • programmable pushbutton functions • RS-232C port • 3-pair wiring:

495

Flashphone • proprietary Rolm telephone • solid-state keypad • message-waiting lamp; interchangeable with standard pushbutton telephones; accesses all system features at touch of a key • 3-pair wiring:

105

Rolmphone • digital telephone designed to provide combined voice and data capability simultaneously over standard twisted-pair telephone wiring • includes an optional Datacom Module that acts as a communications interface for terminals and personal computers • single-pair wiring • 3 models.

Model 120 • single-line, 12 feature buttons:

100

Model 240 • 11 lines, 24 feature buttons, integral speakerphone:

330

Model 400 • 29 lines, 40 feature buttons, integral speakerphone, 60-character LCD display:

575

Data Communication Module • asynchronous • 19.2K bps • RS-232C • plugs into Rolmphone:

400

Async/Sync Module • asynchronous/synchronous • up to 64K bps • RS-449 • plugs into Rolmphone:

1,000

Cypress Personal Communication Terminal • contains a display screen; an integrated data communication module; a detachable alphanumeric keyboard; and a combined digital telephone and speakerphone • data interface operates at speeds up to 19.2K bps • single-pair wiring:

1,950

Cedar Personal Communications Terminal • contains a display screen; an integrated data communications module; a detachable alphanumeric keyboard; and a combined digital telephone and speakerphone • contains an IBM PC-compatible CPU; 512K bytes RAM; dual 5.25-inch diskette drives; Rolm Personal Communications Software:

4,995

Juniper Personal Computer Terminal Interface • includes modified ROLMphone; plug-in board that connects in IBM PC board slot; cable connecting PC to Juniper; Personal Communications Software on diskette for PC:

1,495

□ Data Communication Equipment

Simultaneous voice and data communication support at data speeds up to 19.2K bps between on-premise terminals or terminal and transmission facility • eliminates modems for internal communication; reduces long-distance modems by pooling data lines • adds data without compromising voice communication; allows up to 40 data connections in the system bandwidth of 1 telephone conversation • 56K-bps X.25 Data Network Interface • TI/D3 Interface for TI service • upgradable • single Data Terminal Interface (DTI) required for each terminal or data resource connected to the system and 1 Data Line Interface (DLI) for each 16 DTIs in system.

Data Terminal Interface (DTI):

\$450 approx prch

Data Line Interface (DLI):

1,450

16-Port TI/D3 Interface to TI Facility:

8,700

8-Port X.25 Interface:

11,200

Rolm IBM Gateway • access to IBM mainframes from CBX switches • enables asynchronous ASCII terminals, personal computers, or word processors to communicate with IBM computers in a 3270 communication environment • enables communication with minicomputers, printers, modem pools, public data networks, and public databases • prices below are for 8 ports and 16 ports, respectively:

9,000 to 20,000

IBM Personal Computer Interface • connects the IBM PC to the Rolm CBX data communication network:

450

□ Peripherals

Service Teleprinter • instructs system computer when moves and changes are performed • connected to equipment cabinet in local mode • can be used for remote CBX communications • lists Self-Test Error Table; Audit Table; Traffic Table; extension and trunk attributes; establishes security key:

\$1,300 approx prch

Floppy Disk System • used to record Call Detail Recording (CDR) information • records average of 15,000 call records in Rolm format or 11,000 call records in IBM format • contains hardware self tests • provides automatic error correction by reading call records after written • uncorrected errors reported to CBX error table and attendant console • price for CDR with 2 cabinets and 500 stations:

10,500

Magnetic Tape System • 1600-bpi, 9-channel tape unit • stores to 80,000 call records • provides error checking; automatic restart after power failure; on-site self testing; CDR formatting available • price includes controller and drive:

23,000

Digital Cassette Unit • used for program loading; initial recording move and change tables • connected to equipment cabinet with operating system or diagnostic cassette • portable unit:

2,500

□ Subsystems

ACD 9000 • Automatic Call Distributor System for the VL CBX • used to increase the incoming calls to accommodate up to 10,000 voice and data extensions • designed to distribute incoming calls equally through a variety of routing options:

\$36,000 to \$275,000 approx prch

PhoneMail • voice store-and-forward system • designed specifically for CBX • either 8 or 16 channels to associated CBX • 1 to 7 disk drives:

50,000 to 165,000

PhoneMail Software:

20,000

Insite Applications Processor • based on 8086 • 512K bytes of RAM • 5-, 10-, or 15M-byte disk • CallCost Manager software for tracking call detail • Resale Manager software for reselling call expenses.

Call Cost Manager:

18,500 to 30,500

Resale Manager:

18,900 to 30,900

Rolm CBX Family Models VSCBX & CBX II

■ SYSTEM MAINTENANCE & DIAGNOSTICS

System Reliability • redundant CPUs • error-correcting memory • redundant critical electronics • reserve memory power • backup battery • automatic program load.

System Diagnostics • system continuously diagnoses operation • major/minor alarm indications at attendant console • audit trail generated on system service teleprinter • remote diagnostics by Rolm service centers • automatic facilities test system (AFACTS) monitors trunks, tie lines, etc.

System Maintenance • Rolm has an extensive menu of maintenance plans, with support ranging from response times of 24 hours to 1.5 hours or less • a 1-year warranty is standard with all CBX system • available plans include:

Standard: Monday through Friday • 6:00 AM to 6:00 PM • major alarm: 3 hours • minor alarm: 24 hours • \$3.85 per equipped port per month.

Extended 127: 7 days per week • any 12-hour period • major alarm: 3 hours • minor alarm: 24 hours • \$4.25 per port per month.

Extended 247: 7 days per week • 24-hour service • major alarm: 3 hours • minor alarm: 24 hours • \$4.50 per port per month.

Per Visit (Time & Material): Monday through Friday • 8:00 AM to 5:00 PM • major/minor alarm: 24 hours • \$95 first hour, \$65 additional hours • overtime based on time-and-a-half rates.

Dedicated: technician on site • Monday through Friday • 8-hour shift • prices available upon request • immediate response while on duty.

VIP Response: available on Standard and Extended Plans • major alarm: 1.5 hours • rates 20 percent over Standard/Extended prices.

Rapid Response: 3-hour response major alarm—Per Visit Plan • 3-hour response minor alarm—all plans • \$250 each request.

System Management • users can change such functions as pick-up groups and call routing, perform station relocations • system CRT or teleprinter used.

• END

Siemens PBX Family

Models SD-80, SD-192/192MX, SD-232, Saturn II & Saturn III

■ PROFILE

Function • stored program computerized branch exchange systems for switching voice and data.

Applications Supported • office automation • health care • retailers • hotel/motel • banking • military • education • service sector • general business.

System Parameters • switching technology: SD—analogue space division using a crosspoint matrix, Saturn—digital using PCM/TDM • architecture: SD—central processor tied to single-stage matrix through system address/data bus; Saturn—central processor tied to high-speed bus, disk controlled, nonblocking configuration available • common control: stored program • transmission: SD—2-wire external, single-wire internal crosspoint; Saturn—4-wire internal switching • wiring plan: SD—2-wire stations, 25-pair console, and busy lamp field; Saturn—1 pair for 2500-type sets, 2 pair for digital sets, and attendant • console • data-switching capability: Saturn—up to 19.2K-bps asynchronous.

Traffic Capacity • SD-80—8CCS/line at 70 stations and 30% intra-office traffic; SD-192—192 8CCS/line at 192 stations and 30% intra-office traffic; SD-232—3CCS/line at 232 stations and 30% intra-office traffic; Saturn—up to 36CCS per port (voice or data) • grade of service: P.01 • simultaneous conversations: SD—48; Saturn—up to 10,000 busy-hour calls.

Trunks/Stations/Consoles • SD-80—16 trunks/80 stations; 1 console • SD-192/-192MX—48 trunks/192 stations; 2 attendant consoles • SD-232—12 trunks/239 stations or 35 trunks/216 stations; 1 attendant console • Saturn II—72 trunks/184 stations; 4 consoles • Saturn III—512 trunks/992 stations; 12 consoles • trunks supported: CO trunks (loop or ground start) both way/incoming/outgoing; foreign exchange (FX); WATS; DID; E&M tie trunk (2- or 4-wire) • attended or unattended operation.

Voice Equipment • vendor supplied: attendant consoles, busy lamp fields, calling number display; SD-80/-192/-192MX—16-button feature phones; SD-232—electronic message registration; Saturn—Digital Premium Instruments (DPI), digital data interface (DDI) • nonvendor equipment supported: all standard rotary or touch-tone phones • electronic feature telephones—DYAD sets,



Saturn III Data Communications Interface

DPI sets, SET-30E, SET-10 • digital telephones: DYAD, DPI, DPI-II.

Data Equipment • vendor supplied: Saturn—Digital Data Interface (DDI) • nonvendor equipment supported: Saturn—terminals that support ASCII, TTY, VT100 • data rates: 19.2K-bps asynchronous (Saturn) • modems: all types; modem pooling (Saturn) • multiplexers: all types • data modules: DDI • interfaces supported: RS-232C • printers: service teleprinter • data storage: cassette, floppy disk, hard disk • data terminals: ASCII, TTY, VT100 • computers: personal computers.

Subsystem Support • automatic call distributors (ACD) • call detail recording systems: Summa 4, Techtron, and most others • voice message systems • message center systems • centralized attendant service • energy management systems • hotel/motel management systems: SD-232—wake-up service, calling number display to station, do not disturb, electronic message registration.

Communications/Networking • abbreviated dialing • off-net calling • on-net calling • dialed digit translation; incoming on DID trunks • route optimization • Tandem switching • satellite operation • asynchronous to 19.2K bps (Saturn).

First Delivery • SD-80—1984; SD-192/-192MX—1980; SD-232—1978; Saturn II—1983; Saturn III—1982.

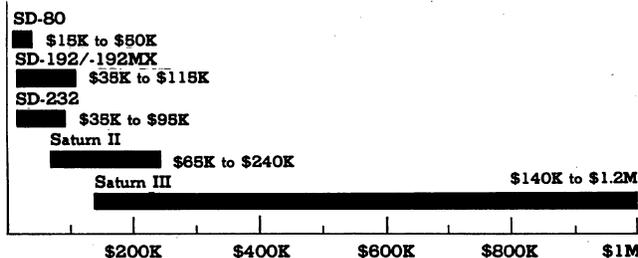
Systems Delivered • SD—over 9,000; Saturn—over 500.

Installation Internal • SD-80: 6 to 8 weeks ARO • SD-192/-232: 8 to 12 weeks ARO • Saturn: 12 to 18 weeks ARO.

Comparable Systems • SD Series: American Telecom Focus, AT&T Dimension 400 and System 75, Ericsson Prodigy, Executone Eclipse, GTE Omni SI, Harris/Digital D1200, Hitachi DX, IPC Technologies 160 DPX III, ITT 3100, Mitel SX-200, NEC NEAX 12A and 2400, Northern Telecom SL-1S, Solid State Systems D-TEL, TIE/Communications Data Star • Saturn: American Telecom Focus, Anderson Jacobson IOX, AT&T Systems 75 and 85, CXC Rose, Ditrans 580 DSS, Ericsson MD110, Executone Summit, GTE Omni SIII, Harris/Digital D1200, Intecom IBX, Mitel SX-2000, NEC NEAX 2400, Northern Telecom SL-1/SL-100, TIE/Communications Mercury, United Technologies/Lexar UTX, Ztel PBX.

Environmental Specifications • temperature: SD—32 degrees Fahrenheit to 122 degrees Fahrenheit; Saturn—40 degrees

PURCHASE PRICE RANGE hardware & software



SIEMENS SD SERIES/SATURN PURCHASE PRICING bar graphs cover price ranges between "small" and "large" configurations; installation and first year's maintenance included • SD-80 configurations range from 4 trunks/16 stations to 16 trunks/80 stations; single console • SD-192/-192MX configurations range from 6 trunks/25 stations to 40 trunks/180 stations; 2 consoles • SD-232 configurations range from 6 trunks/30 stations to 30 trunks/215 stations; single console • Saturn II ranges up to 224 ports; any combination; 4 consoles • Saturn III ranges up to 992 ports; any combination; 8 consoles.

Siemens PBX Family

Models SD-80, SD-192/192MX, SD-232, Saturn II & Saturn III

Fahrenheit to 104 degrees Fahrenheit • humidity: SD—95 percent maximum; Saturn—20 to 80 percent operating, 0 to 95 percent storage • power requirements: SD—85 to 130 VAC, 57 to 63 Hz, 8 amperes maximum at 115 V; Saturn—110 or 220 VAC at 60 Hz, 220 VAC at 50 Hz, 48 VDC • weight: SD80—250 pounds; SD-192/-192MX—640 pounds; SD-232—650 pounds; Saturn—750 pounds • floor loading: SD—131.3 pounds per square foot; Saturn—111.1 pounds per square foot • Dimensions: SD—27x26x78 inches (WxDxH); Saturn—36x27x72 inches (WxDxH).

Vendor • Siemens Telephone Division; 5500 Broken Sound Boulevard, Boca Raton, FL 33431 • 305-994-8100.

Distribution • nationwide through independent dealers and distributors.

Service/Support/Training • service, support, and training by Siemens or distributor • installation by distributor • warranty 1-year parts and labor • local and remote maintenance.

■ ANALYSIS

Until the introduction of its Saturn digital PBX in 1982, Siemens Communications Systems provided a line of analog PBX systems that fit neatly into both business and hotel/motel applications. The SD family of systems, the SD-192 business switch, the expanded memory SD-192MX, and the SD-232 hotel/motel system, provide solid, dependable telephone service for a reasonable price. They are not particularly glamorous systems, but if basic telephone service is required, the SD products are a good choice. To better accommodate communications requirements at very small line sizes, Siemens announced another member of the SD family, the SD-80, early in 1984. Using the same analog switching technology as the larger SD models, the SD-80 satisfies requirements at line sizes under 80 lines/16 trunks more cost-effectively than the larger models. It is packaged in a single floor- or wall-mounted cabinet.

Seeing the inevitable trend toward digital PBX systems, particularly with support for simultaneous voice and data communications, Siemens brought out its entry for this increasingly competitive market, the Saturn, in May, 1982. Saturn comes in 2 versions, the II and III. The II handles requirements below 200 stations, and the III can grow to just under 1,000 stations. Using time-division multiplexing and pulse code modulation, the Saturn is a fully nonblocking switch, which means station users, whether voice or data, will not get blocked when attempting to originate a call within or outside the system, provided sufficient outside trunks are provided. It requires only 1 cabinet (Saturn II) or 2 cabinets (Saturn III) for fully configured systems. Ports can be programmed as analog/digital stations, trunks, or attendant consoles.

Both the SD and Saturn product lines have a full mix of features to satisfy most communications needs. Interaction with the systems is by English-language commands, a rather commonplace capability today, but when this feature was announced with the original SD back in 1977, it was one of the first electronic PBXs to have it. Station message detail recording (SMDR) and automatic route selection (ARS) are available, and are compatible to the best in the industry.

Data communications support in the Saturn is limited in comparison with the current crop to digital PBXs on the market. Data speeds of 19.2K-bps asynchronous are supported, but that's it right now. It's likely Siemens will bring out synchronous communications at 64K-bps speed within 6 months simply to stay competitive. Interfacing data terminals to the Saturn requires a Digital Data Interface (DDI), which connects to either the proprietary Digital Premium Instrument (DPI) or a standard analog telephone. An RS-232C interface is part of the DDI, which can be located as far as 4,000 feet from the switch. Simultaneous voice and data is supported only with the DPI/DDI combination. The system transmits voice and data over 2 pairs to the switch; the DDI digitizes voice, rather than the switch. Full-duplex communications are supported. A recent addition to the voice/data product area is the Dyad digital telephone, which is similar to the DPI. It attaches data terminals via a Data Communications Interface (DCI) similar to the DDI. Data capabilities are the same as the DDI/DPI. Incoming and outgoing

modem pooling is available, and the system will select the correct modem pool based on the originating terminal. Queuing into modem pools is available if the devices are actively in use.

Siemens has made several announcements during 1984 that indicate the company is gearing up for a major push in 1985. A new software product, Office Communications II, enhances the data communications capabilities of the switch. Centralized Attendant Service/Main Satellite service provides improved networking of multilocation systems. New station equipment was announced, including the SET-10, SET-30E, and the DYAD digital telephone. The company still has not brought out a fully integrated voice/data station set with RS-232C interface, such as those provided by Rolm and InteCom, although it is likely it will during 1985.

Siemens sells its products through 2 paths of distribution. The ubiquitous analog systems are sold by numerous distributors around the country as a low-cost easy-to-install system for small to medium businesses. The SD's inherent simplicity makes it an ideal product for an interconnect company. Digital systems, on the other hand, are more complex, and require more attention. Siemens established a program of "Gold Seal" dealers whose organizations have the necessary financial and technical service qualifications to install and maintain digital switches. At this time, there are over 40 such dealers, plus the 60 offices of Tel-Plus Communications, a newly formed Siemens/Telecom Plus International interconnect company, which was created specifically to handle Saturn switches.

The Office Systems Group of Siemens Communications Systems, Inc develops and manufactures telephone products and systems for the U.S. market. It is a part of Siemens AG, one of the world's largest manufacturers of electronic components and systems.

□ Strengths

Siemens manufactures telephone products with an enviable performance record. They are easy to install, program, and maintain. Attendant consoles are easy to operate, and the man-machine interface uses English-language commands. With over 9,000 systems installed, particularly the SD models, Siemens has achieved considerable success in the tough U.S. market. The Saturn is a fully nonblocking system, a claim only a few PBX manufacturers can legitimately make. Its configuration is very flexible, being port-oriented. The Saturn III can be had in a fully redundant version to ensure continued operation.

□ Limitations

The SD systems are analog, which for some is considered dated technology. The fact that Siemens has not only brought out a new model, the SD-80, but has enhanced some features in the SD, says the company doesn't feel "analog is dead." The SD models are not data-switching PBXs, and should not be purchased for that purpose. Saturn is the company's voice/data system, but its data communications support is not up there with the competition. Saturn handles only asynchronous communications up to 19.2K bps; synchronous communications is not yet supported. There is no fully integrated digital telephone that digitizes voice in the set and multiplexes the voice signal with the data signal over the same line. If this is desired, the ancillary Digital Data Interface (DDI) must be bought. There is also no integrated voice/data workstation from Siemens, all of which says the company still has a way to go before competing on a like-for-like basis with the heavyweights in the industry.

■ SOFTWARE

□ Terms & Support

Terms • all software is bundled into the Siemens price with the exception of optional features.

Support • SD and Saturn system software is supported by Siemens and its associated dealers and distributors.

□ Software Overview

Siemens software is used to control operations, conduct self-test functions, and provide features. It should be noted that all features of the Siemens SD and Saturn family are software driven and

Siemens PBX Family

Models SD-80, SD-192/192MX, SD-232, Saturn II & Saturn III

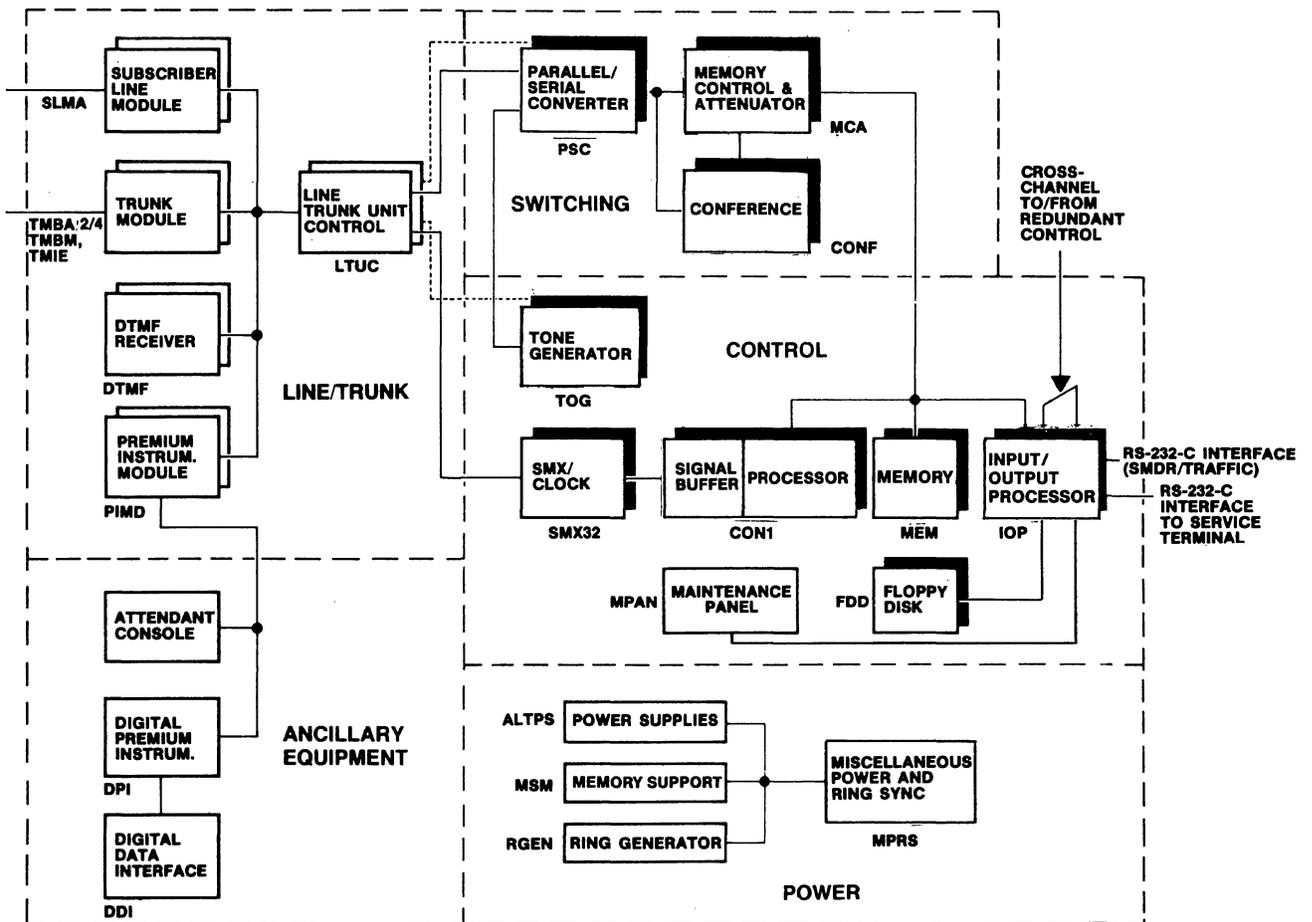


Figure 1 • Saturn III System Block Diagram

targeted at 3 areas: (1) system features; (2) attendant features; and (3) station features. System software is contained in 2 areas: online (resident) and off-line (nonresident and stored on floppy disk or tape).

Online memory is divided into 3 segments: generic system software, customer memory, and an overlay area. Switching control is performed by the central processing unit (CPU), and uses data that is stored in generic software. The generic software cannot be altered by the customer. Customer features are contained in the customer memory area and can be altered. The overlay area of memory contains administrative and maintenance programs that are called occasionally.

SD systems are shipped from the factory with a basic database that can be altered by the customer unless otherwise specified. Saturn software is structured such that maintenance and feature upgrades can be easily performed.

□ Features Overview

All features are a function of various software releases. Some software releases require additional hardware.

□ SD Series System Features

SD Series General System Features

Standard Features • access codes: allows outside features and calls to be completed • assigned night answer: incoming calls can be assigned to a designated station • automatic station release:

extensions will be taken out of service when a station is off hook and no activity occurs after a predesignated timeout period • brownout protection: permits the system to operate with no degradation of service for prescribed input voltage and frequency variations • code call access: allows attendant and extension to dial an access code and activate external code call equipment • combination trunks: provides trunks capable of incoming or outgoing operation • confirmation tone: indication that certain features have been activated or cancelled • console-less operation: permits incoming and outgoing calls to be handled without aid of an attendant • customer memory update: provides ability to enter or change system database information associated with customer memory • dictation access: allows station users and attendant to have dial access and control of remotely located dictation equipment • direct-in line (SD-80/-192/-192MX): permits central office trunks to bypass console and ring a preassigned station • direct-in dialing (SD-80/-192/-192MX): allows an incoming central office call to reach stations and attendant directly via listed directory number • dual console operation (SD-80/-192/-192MX): allows operation of 2 consoles simultaneously • failure transfer: provides automatic switching of central office trunks to preassigned station during a power failure or major system malfunction • immediate ring (SD-192): station receives ringing immediately • maintenance diagnostic circuitry: specific printed circuit boards provided with light emitting diodes (LED); test points and service switches provided for control of operations and fault isolation • maintenance diagnostic program: used for off-line testing and troubleshooting of equipment • memory support: back-up power

Siemens PBX Family

Models SD-80, SD-192/192MX, SD-232, Saturn II & Saturn III

for memory storage • multiple listed directory number (SD-80/-192/-192MX): additional identification for incoming calls for attendant when more than 1 listed directory number (LDN) is used • multiple trunk groups: 16 for SD-192/-192MX; 8 for SD-232 and SD-80 • music on hold (SD-80/-192/-192MX): music is provided for all stations and trunks put on hold; source is customer provided • power failure restart/remote customer memory update: customer memory update feature can be accessed locally or remotely using a remote keyboard/printer or data terminal • remote alarm indication/access: allows alarms to be monitored remotely • remote traffic metering: allows traffic analysis to be performed remotely • reserve power: provides DC to DC battery backup during commercial AC power failure • DTMF to pulse conversion: translates DTMF tones to dial pulses when a rotary dial central office is used • station flexible numbering: stations can be numbered with 3 or 4 digits • tie trunk access: supports trunks to other PBXs • transfer dial tone: distinctive second dial tone to indicate a transfer function • universal night answer (SD-80/-192/-192MX): allows station to answer an incoming trunk call by dialing an access code • universal night answer (SD-232): allows only administrative stations to answer trunk calls by dialing an access code • vacant number intercept: calls to an unassigned station are routed to attendant • variable system timers: permits customer to change system timing parameters • voice paging access: allows dial access to customer-provided paging equipment.

Restriction Features

Standard Features • 8-digit toll restriction: monitors up to 8 dialed digits to allow or deny access to specific central office exchanges, area codes, operator, and service codes • intercept treatment tone: provides special tone when an unassigned station, trunk access, or feature access is dialed • trunk group class of services (SD-80/-192/-192MX): allows trunk-related features to be activated per trunk group • class of service: determines which features are available to a station.

Call Accounting Features • station message detail accounting (SD-80/-192): provides telephone management usage reports and call costing, works in conjunction with station message detail recording • station message detail recording (SD-80/-192/-192MX): provides record of incoming and outgoing trunk call details.

Call Routing Features

Standard Features • optional routing: hunts through as many as 3 alternate trunk groups when original accessed group is busy.

Data Features • data line security: prevents other stations or attendant from interfering with data call • data speeds up to 2400 bps • interface for modem at speeds up to 2400 bps; used for data, remote maintenance, and traffic monitoring.

Network Features • tandem switching: supports tie trunks from multiple PBXs for call routing through switch.

Attendant Console Features

Standard Features • abandoned trunk recall to attendant (SD-80/-192/-192MX): allows incompleted transfer calls to ring at attendant console • attendant answering priority (SD-80/-192/-192MX): enables trunks to be assigned a priority level for ringback or recall to attendant • attendant audible altering: audible signal at console if system malfunctions • attendant busy lamp field (SD-80/-192/-192MX): displays busy status of extensions • attendant busy override: attendant overrides busy station • attendant call hold: console can place calls on hold • attendant calls waiting indicator: from 1 to 254 calls waiting at console will cause a light to illuminate on console • attendant alphanumeric display: readout of console status • attendant console out of service: allows attendant to disable console and place system in night service • attendant console switched-loop operation: specialized console circuits used for trunk calls that release and free up for additional calls • attendant control of trunk group access (SD-80/-192MX): allows attendant to restrict and control access of up to 16 trunk groups • attendant controlled conference (SD-80/-192/-192MX): allows attendant to set up an 8-port conference with 8 stations or 5 stations and 3 trunks • attendant direct paging: access to 1 paging zone at a time • attendant dial pulse/DTMF sender: allows attendant to

automatically outpulse tone or dial pulse signals depending on central office requirements • automatic recall redial: allows attendant to reconnect a recall to an extension by pressing a button instead of redialing extension • individual trunk access: attendant can access specific trunks • automatic call splitting: attendant alternates between called and calling parties at console • trunk testing by attendant: attendant can test status of trunks • trunk-to-trunk connections by attendant: allows attendant to connect incoming trunk with an outgoing trunk.

Hotel/Motel Features (SD-232) • automatic make-up: allows attendant to enter room make-up calls and turn off room phones at check out • controlled room-to-room restriction: allows attendant to restrict all direct room-to-room dialing • do-not-disturb: restricts stations from incoming calls • electronic message registration (EMR): provides a means for recording information on toll calls through the central office • manual originating line: provides a ring-down type of service to attendant when a specific station goes off-hook • message waiting: attendant alerts station user of message • single-digit dialing for service: special house functions that are accessed by dialing single digit • vacant room restriction: restricts stations from all access to features and outside calls: activated by EMR console.

Station Features

Standard Features • call forwarding (SD-80/-192/-192MX): stations can forward calls to alternate locations • call parking (SD-80/-192/-192MX): allows attendant and station to park a trunk call in 1 of 10 available park zones • call lockout: denies attendant the ability to enter an established call • call transfer: stations can transfer calls without attendant assistance • city call park (SD-80/-192/-192MX): allows an extension to put a trunk call on an exclusive hold to that station • consultation hold: station can put a call on hold, call another station, and return to first call • data line security: blocks insertion of call progress tones in data call • dial call pickup: any station can dial a code and answer a ringing station within its pickup group • direct outward dialing: stations can originate outgoing trunk calls • direct call pickup: station can intercept call ringing at a station by dialing an access code followed by the extension number • station call back (SD-80/-192/-192MX): station can instruct system to call busy station when it frees up • station hunting: calls to busy station route to alternate stations • station transfer/3-way conference: stations transfer a call or set up a 3-way conference.

□ Saturn System Features

Saturn General System Features

Standard Features • Saturn II and III include all SD-192/-192MX features plus the following digital pad switching: proper gain or loss is inserted in all connection paths to ensure correct transmission levels • direct inward system access: system features can be accessed by an outside party that dialed an incoming trunk marked for DISA operation • enhanced private switched communication service (EPSCS) access: allows station to dial an access code followed by EPSCS number to complete an on- or off-network call on EPSCS network • 15-digit toll restriction: blocks calls on up to 15 digits received • online diagnostic testing • uniform call distribution/recorded announcement service: provides the capability of connecting an incoming trunk call to a recorded announcement device when all stations are busy in a UCD group.

Restriction Features

Standard Features • same as for SD.

Call Accounting Features

Standard Features • same as for SD.

Call Routing Features

Standard Features • same as for SD.

Data Features

Standard Features • asynchronous data switching at speeds up to 19.2K bps.

Network Features

Siemens PBX Family

Models SD-80, SD-192/192MX, SD-232, Saturn II & Saturn III

Standard Features • same as for SD.

Attendant Console Features

Standard Features • busy verification of trunks: allows attendant capability of determining the busy/idle status of trunks without bridging into trunk • control of facilities: attendant can intercept station attempts for features and complete them as required • control of SMDR facilities: allows attendant to deactivate and activate trunk groups to be recorded on SMDR printout • serial calling: attendant completes series of calls to same calling party • locked-loop operation: calls extended by attendant will remain on a switched loop until call is completed.

Station Features

Standard Features • call forwarding to outside network: allows incoming calls to be forwarded to number outside of switch • speed calling: 4 groups, 64 numbers per group, up to 16 digits each • executive override: station can enter existing conversion • call queuing: system will place calls into holding pattern until desired trunk frees up • uniform call distribution: incoming calls to a specific group will ring on stations in the group in a uniform pattern; 64 UCD groups, 30 stations in each group.

Digital Premium Instrument (DPI) Features • multiline pickup: access to more than 1 station line • automatic line preference: allows line buttons to be assigned for incoming or outgoing calls with first or last priority • digital data interface (DDI): optional hardware device that enables data transmission over DPI extension • direct station, destination, trunk group, or individual trunk access: allows direct connection from DPI by pressing a specific feature button • exclusive or manual hold: allows user to put call on hold exclusive to that station or manual hold that can be picked up by other station users • displays: allows user to identify calls forward, calls waiting, duration of call, incoming call, call park location, message waiting, account code, time of day, and speed call individual list display • on-hook dialing: originate call without lifting handset • handsfree operation: allows user to originate and answer calls without lifting the receiver • voice calling: allows user to dial another DPI station and establish a connection to that station's built-in loudspeaker.

Application Software

Siemens has installed both the SD Series and Saturn in numerous applications, particularly hotel/motel, retail, general business, banking, and government.

HARDWARE

Terms & Support

Terms • SD and Saturn models are available for purchase or on 1-, 3-, 5-, 7-, and 10-year lease plans from Siemens or authorized distributors.

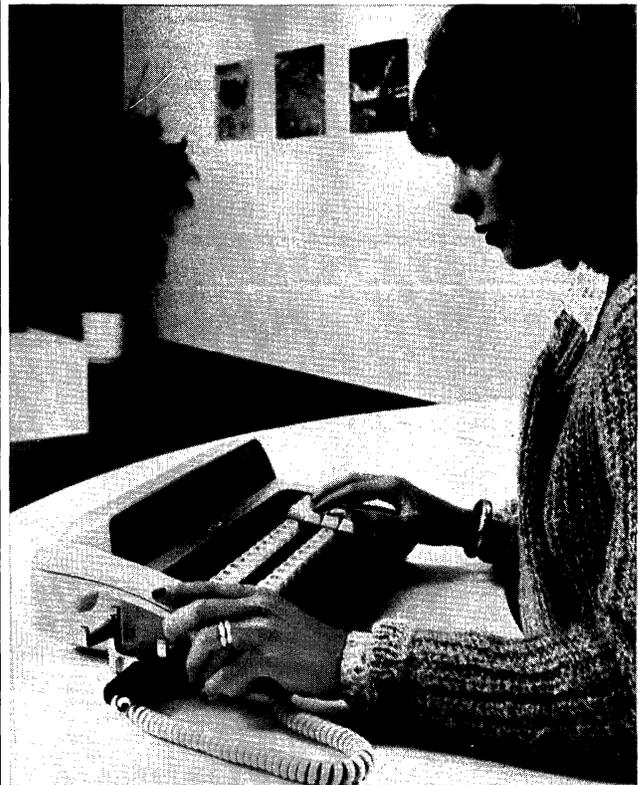
Support • equipment can be installed by Siemens operating companies or distributors • service and maintenance based on policies established by individual distributors, dealers, or can be provided by Siemens regional service offices.

Overview

The Siemens product falls into 3 categories: the business SD-80/-192/-192MX, the hotel/motel SD-232, and the Saturn digital switch.

The new SD-80 is a single-cabinet unit that can be floor- or wall-mounted. System capacities are 80 stations, 16 trunks, and 1 console. Growth increments are 16 stations and 4 trunks.

The SD-192/-192MX have an overall capacity of 191 stations, 1 maintenance circuit, 48 trunks, and 2 attendant consoles. The system can handle 54 DTMF trunks or 59 dial pulse trunks without any major system modifications. The basic system is equipped with a single 2-level shelf assembly, which is mounted on a common backplane. One shelf is the control shelf; the other is line shelf 0 and contains accommodations for up to 48 stations, 12 trunks, and 1 attendant console. This basic system is common to the SD-232 also. Expansion is accomplished by adding more line shelves. The only difference between the SD-192 and



Siemens SD-192 Attendant Console

SD-192MX is expanded memory capabilities in the MX utilizing a disk-formatted program instead of tape.

The SD-232 has an overall capacity of 238 stations and 12 trunks or 226 stations and 23 trunks, in addition to 1 maintenance circuit and 1 attendant console. The system database is stored on tape and does not offer the expanded disk package. Both types of SD systems are software-oriented, and both use a microprocessor for the central processing unit. All system programming is done in English through a maintenance administration panel (MAP) or an optional terminal or KSR printer.

Saturn is a digital PBX using pulse code modulation (PCM)/time-division multiplex (TDM) switching. The Saturn is capable of switching both voice and data. The Saturn II is a single-cabinet system with a capacity of 224 ports and 4 consoles. The larger Saturn III is housed in a lightweight cabinet with expansion to 2 cabinets. Plug-in printed circuit boards are installed in the cabinets to make up the common control and peripheral switching circuits required for system operation. The Saturn III provides 480 ports in 1 cabinet or 992 ports total with 2 cabinets. Both systems support conventional as well as proprietary digital instruments and up to a total of 8 attendant consoles. The system is organized into 5 functional areas: (1) line/trunk, (2) switching, (3) control, (4) power, and (5) ancillary equipment.

All stations and trunks are connected to line/trunk circuit boards. Connections are supervised by the line trunk unit control that multiplexes and demultiplexes both voice and signal highways. The SMX/clock handles control and status signals for 32 speech highways, each of which has 32 time slots. The central processor,

APPROX PRCH: price ranges are approximate and include installation. PRCH: purchase price; includes installation. Prices effective as of December 1984.

Siemens PBX Family

Models SD-80, SD-192/192MX, SD-232, Saturn II & Saturn III

memory I/O processor, and the parallel-to-serial converter are connected to a parallel common bus on one side and analog trunk shelves on the other. All information interchange with the central processor is handled through the parallel-to-serial converter interface. The power block provides all operating and backup power for the overall system, memory components, and ringing generators. All Saturn family members support voice and data switching, as well as rotary and touch-tone telephones.

□ Representative System Configurations

SD-80 Configuration • single-cabinet nonredundant system • up to 80 stations/16 trunks; single console • floor or wall mounted.

Small System • 4 trunks/25 stations; 1 console:
\$15,800 to \$17,500 approx prch

Large System • 12 trunks/65 stations; 1 console:
42,000 to 46,800

SD-192/-192MX Configuration • single-cabinet nonredundant system • up to 192 stations/48 trunks; 2 consoles • floor-mounted cabinet • larger memory in MX version.

Small System (SD-192) • 8 trunks/60 stations; 1 console • 55 single-line telephones • 5 electronic SET-30E telephones:
38,900 to 43,800

Large System (SD-192) • 20 trunks/150 stations; 2 consoles • 100 single-line telephones • 25 electronic SET-30E telephones:
83,500 to 87,400

Large System (SD-192MX) • 20 trunks/150 stations; 2 consoles • 100 single-line telephones • 25 electronic SET-30E telephones • least-cost routing • speed calling • SMDR:
101,400 to 105,800

SD-232 Hotel/Motel Configuration • single-cabinet nonredundant system • up to 12 trunks/239 stations or 35 trunks/216 stations; 1 console • floor-mounted cabinet.

Small System • 10 trunks/60 stations; 1 console • 60 single-line telephones • message registration:
39,400 to 43,900

Large System • 20 trunks/150 stations; 1 console • 150 single-line telephones • electronic message registration • paging access:
79,700 to 83,900

Saturn II Configuration • single-cabinet nonredundant system • up to 224 ports; 4 consoles • integrates voice/data.

Small System • 10 trunks/80 stations; 1 console • 75 single-line telephones • 5 digital telephones • paging access • music on hold:
71,600 to 100,400

Large System • 20 trunks/170 stations; 2 consoles • 150 single-line telephones • 20 digital telephones • paging access • music on hold • SMDR • LCR:
182,200 to 213,400

Saturn III Configuration • 1 or 2 cabinets • redundant • up to 992 ports; 8 consoles • integrates voice/data.

Small System • 25 trunks/180 stations; 1 console • direct inward dialing • 150 single-line telephones • 30 digital telephones • paging access • music on hold • redundant common control • SMDR • LCR:
185,300 to 216,600

Large System • 80 trunks/650 stations; 2 consoles • 2 cabinets • direct inward dialing • 550 single-line telephones • 100 digital telephones • paging access • music on hold • redundant common control • SMDR • LCR:
722,500 to 876,900

SD-192/-192MX/-232 Equipment Components

SD-192 Common Equipment:
\$4,930 prch

SD-192MX Common Equipment:
6,285

SD-232 Common Equipment:
4,930

8-Line Station Circuit Board:
445

4-Line Trunk Circuit Board:
480

4-Line E&M Tie Trunk Circuit Board:
700

Direct Inward Dial (DID) Trunk Circuit Board:
675

Conference (8-Party) Circuit Board:
380

64K RAM Memory Expansion Board (SD-192MX):
700

Saturn II & III Equipment Components

Saturn II Common Equipment:
\$9,250 prch

Saturn III Common Equipment:
33,100

Analog Line/Trunk Unit (ALTU) Shelf • used for station/trunk circuit cards:
1,720

Line/Trunk Control Module • provides control signals, timing:
1,430

Power Supply for ALTU:
965

Power Supply—System:
1,370

Power Supply—48VDC:
840

Additional Cabinet (Saturn III):
4,200

Redundant Common Control:
11,200

Floppy Disk Drive:
800

Redundant Common Control Power Supply:
1,100

Memory Backup Battery Supply:
300

Parallel/Serial Converter • interfaces switching network with speech highways:
600

Analog Station Circuit Board • 8 circuits per board:
1,100

Digital Station Circuit Board • 4 circuits per board:
720

Trunk Line Circuit Board • 4 circuits per board:
790

Tie Trunk (4-Wire E & M) Circuit Board • 2 circuits per board:
950

Tie Trunk (2-Wire E & M) Circuit Board • 2 circuits per board:
900

Siemens PBX Family

Models SD-80, SD-192/192MX, SD-232, Saturn II & Saturn III

Direct Inward Dialing (DID) Trunk Circuit Board • 4 circuits per board:

850

DTMF (Dual-Tone Multifrequency) Receiver Circuit Board • detect and convert touch-tone signals:

1,060

Station Equipment—Voice/Data

Attendant Console • primary function to answer incoming calls and connect to desired station • place outgoing calls • provides information on system status • interface to system for administrative changes.

SD-80/-192/-192MX/-232 Systems • includes Busy Lamp Field:
\$1,125 prch

Saturn Systems • includes 40-character alphanumeric display:
2,150

SET-10 • proprietary Siemens telephone • single line • 10 programmable feature access buttons:
90

SET-30E • proprietary Siemens telephone • executive version single line; secretarial version up to 32 lines • 32-character LCD display • programmable feature access buttons:
\$350 to \$500 approx prch

Digital Premium Instrument (DPI) • proprietary Siemens digital telephone • 16-character LCD display • 10-, 18-, or 26-button versions • integral speakerphone.

10-Button Model:
\$475 prch

18-Button Model:
530

26-Button Model:
585

DYAD Station Set • proprietary digital telephone • 24-character LCD display • 10-, 18-, or 26-button versions • integral Speakerphone.

10-Button Model:
300

18-Button Model:
800

26-Button Model:
900

Calling Number Display (SD-232):
175

Electronic Message Registration Console (SD-232):
640

Data Communications Equipment

Simultaneous voice and data communications support at data speeds up to 19.2K-bps asynchronous only. Digital Data Interface (DDI) provides connection to data terminal; connects to Digital Premium Instrument (DPI) or standard telephone. Simultaneous voice and data support not provided when terminal is connected to standard analog telephone; DPI required. Voice is digitized at DDI when simultaneous voice and data are required; otherwise, voice is digitized at switch. System supports RS-232C interface, incoming and outgoing modem pooling, and auto-answer on incoming data calls. Protocol conversion not supported at this time. Interfaces to local area networks not provided at this time.

Digital Data Interface • connects data terminals to DPI or standard telephone • RS-232C interface:
\$650 prch

Data Communications Interface (DCI) • connects data terminals to DYAD • RS-232C interface:
\$800 to \$900 approx prch

Peripherals

Service Teleprinter • interface to system for administrative activities • output for SMDR reports • output for system performance audit trails:
\$650 to \$1,300 approx prch

Floppy Disk Subsystem • used to record SMDR records • used for additional system memory backup:
800 to 1,500

SYSTEM MAINTENANCE & DIAGNOSTICS

System Reliability • redundant CPUs (Saturn III) • error-correcting memory • redundant critical electronics • reserve memory power • backup battery • automatic program load.

System Diagnostics • system continuously diagnoses operation • major/minor alarm indications at attendant console • audit trail generated on system service teleprinter • remote diagnostics by Siemens service centers.

System Maintenance • normally performed by Siemens authorized distributor • larger systems typically include inventory of line cards, trunk cards, phones, cable, test equipment, etc, for customer or vendor maintenance.

System Management • users can change such functions as pick-up groups and call routing, perform station relocations • system CRT or teleprinter used • English-language commands for ease of interface.

• END

Summa Four Call Accounting Systems

Models PCX-2000, PCX-3000, MCX-6000, MCX-7000, MCX-7700 & MCX-8000

■ PROFILE

Function • call accounting systems that process telephone call records into detailed management reports; data is captured by the associated telephone system or by the call accounting system when located between the phone system and the telco central office.

Configuration • processor: MOS Technology 6502 (all models) • data rates: 300 to 1200 bps (PCX-2000); 110 to 4800 bps (PCX-3000); 110 to 9600 bps (MCX-6000/7000/7700); 110 to 19.2K bps (MCX-8000) • maximum call records: 500 to 2400 (PCX-2000/3000); 20,000 to 40,000 (MCX-7000/8000); 800 (MCX-7700); 24,000 (MCX-6000) • RS-232C ports: 2 (PCX-2000/3000, MCX-6000/7000/7700); 4 (MCX-8000).

Associated System • all PBX/Key and Centrex systems • RS-232C interface for SMDR output; tip and ring connection for non-SMDR systems.

System Parameters • maximum system size supported: 1,024 stations • minimum configuration: 16 stations • management reports produced: 16 • refer to Tables 1 and 2 for individual system parameters.

First Delivery • October 1982 (PCX-2000); March 1983 (MCX-6000); June 1983 (MCX-3000); September 1983 (MCX-7000); January 1985 (MCX-7700/8000).

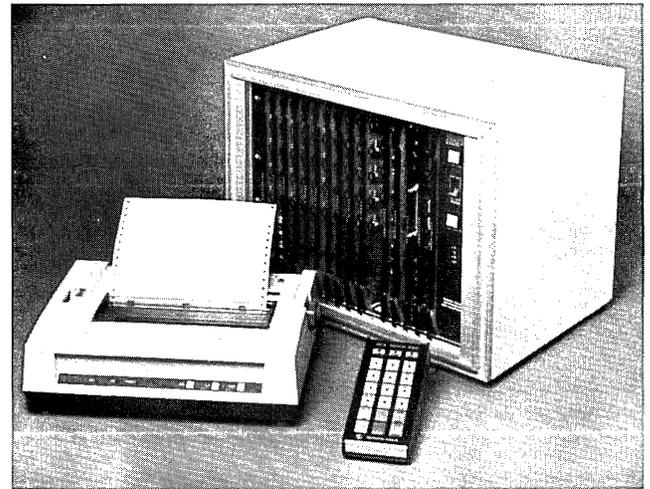
Systems Delivered • 1300 (PCX-2000); 950 (PCX-3000); 150 (MCX-6000); 730 (PCX-7000), 120 (MCX-7700); over 30 (MCX-8000).

Installation Interval • 3 to 6 weeks ARO.

Comparable Systems • Control Key FM 5000; Mitel Dart; Moscom M5000; Sykes Datatronics Telemiser; Telematic Products RBC-2.

Environmental Specifications • refer to Table 3.

Vendor • Summa Four, Inc; 2456 Brown Avenue, Manchester, NH 03103 • 603-625-4050.



Summa Four MCX-8000.

Canadian Distribution • contact U.S. headquarters.

Distribution • nationwide through authorized distributors, including Pactel, RCA, Service Company, and Telecom Plus.

Service/Support/Training • service, support, and training are provided by Summa Four or its authorized distributors.

GSA Schedule • listed.

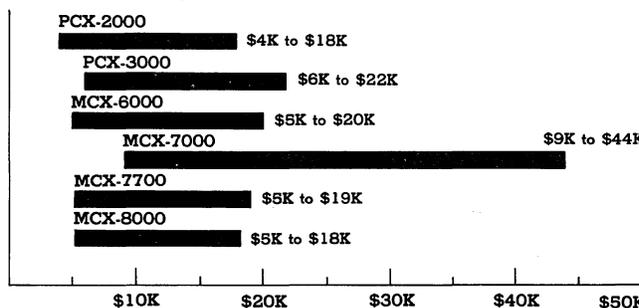
■ ANALYSIS

The Summa Four call accounting product line provides the largest array of models for small to medium businesses and hotel/motel users in the industry. The PCX (Profit Center Exchange) series interfaces with all types of telephone systems using either tip and ring wire connections on older systems or receiving call data directly from the PBX via an RS-232C port on systems equipped with SMDR. PCX models are programmed with rate data for billing on a per-extension basis. The rate tables can be updated from a remote location. The PCX series is designed for the lodging industry, and generates reports that inform hotel managers of the profit realized on local, intrastate, interstate, and international calls. PCX models are capable of storing from 500 to 24,000 calls and can support from 50 to 1,000 stations.

The MCX (Management Control Exchange) is designed for general business and lodging applications and is also capable of interfacing with all types of telephone systems. The MCX series provides comprehensive management reports, stores from 800 to 40,000 call records, and supports systems with up to 1,000 stations. Both the PCX and the MCX call accounting systems are based on the 6502 microprocessor, and use stored telephone management software. All Summa Four systems use the most current technology, have a high level of dependability, and have been well received by both the hotel/motel and business communities.

Summa Four is a fast-moving, aggressive company with a well thought out product line that effectively covers the needs of its

PURCHASE PRICE RANGE hardware & software



SUMMA FOUR CALL ACCOUNTING SYSTEMS PURCHASE PRICING bar graph covers purchase price ranges for small to large configurations • PCX-2000 is tip/ring scanner for small- to medium-sized PBX systems • PCX-3000 is SMDR recording device for small to medium hotel/motel PBXs • MCX-6000 is trunk scanner for up to 16 trunk lines • MCX-7000 and 7700 are SMDR recorders that can handle from 50 to 1,024 PBX stations • MCX-8000 is tip/ring scanner that can handle up to 250 PBX stations • purchase prices include installation and first year's maintenance.

Summa Four Call Accounting Systems

Models PCX-2000, PCX-3000, MCX-6000, MCX-7000, MCX-7700 & MCX-8000

TABLE 1: SYSTEM PARAMETERS—MCX SERIES

	MCX-7700	MCX-7000	MCX-7100	MCX-8000	MCX-8100	MCX-6000
Type of Telephone System Interface	SMDR	SMDR	SMDR	Tip/Ring	Tip/Ring	Trunk
SYSTEM CAPACITY:						
Extensions	50	256	1024	250	250	16 (Trunks)
Departments	10	16	64	16	64	8
Accounts	800	1000	2000	1000	2000	2000
Call Storage—Standard	800	1500	1500	1500	1500	800
Call Storage—Optional	N/A	20,000	40,000	20,000	40,000	24,000
REPORTS:						
Basic Package	Yes	N/A	N/A	N/A	N/A	Yes
Expanded Package (see menus below)	N/A	Yes	Yes	Yes	Yes	N/A
ACTIVE FEATURES:						
Speed Dialing	N/A	N/A	N/A	N/A	N/A	Yes
Forced User Code	N/A	N/A	N/A	N/A	N/A	Yes
Toll Restriction	N/A	N/A	N/A	N/A	N/A	Yes

N/A = Not Applicable

market. The company's success has been acknowledged by its inclusion in Inc. Magazine's top 30 list of fastest growing small businesses. In addition to product strength, the company has a distribution network that fully covers the United States and many parts of the world. The products are distributed nationwide by Pactel, Telecom Plus, RCA Service Company, UCS (Universal Communication Systems), Stromberg Carlson Business Communication Systems, and approximately 130 regional and local distributors. Effective distribution channels, ongoing product enhancements, dependable equipment, solid financial backing, and a commitment to the industry have made Summa Four a leader in call accounting.

Strengths

Summa Four is one of the few call accounting equipment manufacturers to maintain a steady flow of new products and product enhancements over the past few years. The product line has been structured to provide call accounting solutions for most users in the under-1000-line market and is compatible with new and old telephone systems alike. One of the company's current development projects is a more efficient method of obtaining call records from Centrex systems, other than the traditional tip and ring approach. Results of these efforts will most likely appear before the end of 1985.

A particularly important feature of Summa Four systems is their ability to be remotely programmed. The remote programming feature is very important in call accounting because of the constant change in long distance rates. Users can rest assured that their systems will have the most current call pricing tables, which will result in the most accurate management reports. Summa Four systems are easily installed and require minimal space on the user's premises. Management reports are provided with each system and cover all aspects of telephone system usage and expense. A strong commitment to the product and telecom marketplace, combined with an excellent distributor network are Summa Four's most important strengths.

Limitations

Summa Four products have very few, if any, limitations. All call accounting systems have a common limitation, in that they all require constant updating of their rate tables. Summa Four, however, seems to have effectively overcome this problem through remote updating and a well-trained and motivated distributor network. The major shortcoming of the product line is its limit of 1,000 extensions on an associated PBX system. Most users of call accounting systems, however, are under 1,000 lines, but there is, nonetheless, a market for larger systems, and only a few players to date.

SOFTWARE

Terms & Support

Terms • software bundled with system price • additional memory is optional.

Support • software is supported by Summa Four and authorized distributors • rate updates can be made remotely or by booting updated rates into each system's memory on-site.

Software Overview

Summa Four system software controls all system operations, provides features, and handles system diagnostics. Operating features are implemented in ROM while call records are stored in RAM and rate tables are stored on EPROM.

Features Overview

All features are included in each Summa Four operating program.

Standard Features • customer operation with proprietary touch-pad control; remote downloading of rate database; subscription service for rate updates; remote diagnostics and maintenance; automatic report printing for periodic processing; costed call records for telephone company and OCC calls; online printing of call records.

Optional Features • none.

Reports Available • summary of extensions; individual extension summary; individual extension totals; account code summary; individual account code report; individual account code totals; department report; company summary report; area code summary; individual trunk usage report; trunk usage summary; selected number report; most expensive calls; longest duration calls; most frequently dialed numbers; listing of all call records.

HARDWARE

Terms & Support

Terms • Summa Four systems are available from authorized distributors for purchase or in various lease plans • lease rates usually include maintenance • end-user pricing will vary based on costs such as distributor markup, discounts, overhead, installation, maintenance, and training costs.

Support • installation and maintenance support is provided by Summa Four's authorized distributors.

Summa Four Call Accounting Systems

Models PCX-2000, PCX-3000, MCX-6000, MCX-7000, MCX-7700 & MCX-8000

TABLE 2: SYSTEM PARAMETERS—PCX SERIES

	PCX-2000	PCX-2100	PCX-2500	PCX-2600	PCX-3000	PCX-3100
Type of Interface with Telephone System	T/R	T/R	T/R	T/R	SMDR	SMDR
Costed Call Records	Yes	Yes	Yes	Yes	Yes	Yes
Print "on the fly"	Yes	Yes	Yes	Yes	Yes	Yes
Storage:						
500 Call Records	—	Yes	—	Yes	—	Yes
6000 Call Records	—	Optional	—	—	—	Optional
12000 Call Records	—	Optional	—	—	—	Optional
18000 Call Records	—	Optional	—	—	—	Optional
24000 Call Records	—	Optional	—	—	—	Optional
Reports (Audit & Profit)	Yes	Yes	Yes	Yes	Yes	Yes
Touch Pad	Optional	Optional	Optional	Optional	Necessary	Necessary

T/R = Tip and Ring (Wire Connections)
 SMDR = Station Message Detail Record from RS-232C Port

TABLE 3: ENVIRONMENTAL SPECIFICATIONS

	PCX-2000	PCX-3000	MCX-7000	MCX-7700	MCX-8000	MCX-6000
Temperature	32 to 122F					
Humidity	20 to 95%					
Power	115VAC	115VAC	115VAC	115VAC	115VAC	117VAC
Weight (pounds)	35	25	25	12	35	35
Width (inches)	17	5	5	18	17	8.6
Height (inches)	14	14	14	2	14	14
Depth (inches)	10.5	12	12	11	10	12

Overview

The Summa Four systems consists of 3 main components: the cabinet enclosure, the power supply, and the programmable processor module. The systems are installed in 1 of 2 ways: hard-wiring to the tip and ring leads of an existing telephone system or connecting to an RS-232C port on the existing telephone system. The equipment cabinets are small and simple to install. The heart of the system is the programmable processor module that accepts data from the telephone system, reformats the data, prices each call, and creates management reports based on the data.

Representative System Configuration

All configurations are based on a 6502 processor, 2 RS-232C ports, required memory, and designated number of call records.

PCX-2000 Series • 25 stations, 800 call records:	<u>\$15,000 prch</u>
100 Stations, 6,000 Call Records:	<u>17,800</u>
PCX-3000 Series • 25 stations, 800 call records:	<u>17,200</u>
100 Stations, 12,000 Call Records:	<u>21,500</u>

PRCH: purchase price ranges include installation and first year's maintenance. Prices effective as of May 1985.

MCX-6000 Series • 16 trunks, 800 call records:

19,000

MCX-7000 Series • 256 extensions, 1,500 call records:

34,200

500 Extensions, 3,000 Call Records:

42,000

MCX-7700 Series • 50 extensions, 800 call records:

18,500

MCX 8000 Series • 64 extensions, 1,500 call records:

16,800

System Maintenance & Diagnostics

System Reliability • error-correcting memory • automatic program boot after restart.

System Diagnostics • system continuously diagnoses operations • major/minor alarm indications • remote diagnostics • on-site diagnostics.

System Maintenance • performed by Summa Four or an authorized distributor • maintenance by replacement of faulty parts • inventory of spare parts maintained by distributor.

System Management • users cannot change parameters; vendor or distributor makes changes • reports printed on system printer.

• END

Tele/Resources T/R 150 Series PBX Systems

Models T/R 150C, T/R 150S, T/R 150M & T/R 150E

■ PROFILE

Function • stored program computerized branch exchange systems for switching voice.

Applications Supported • general business • healthcare • retailers • hotel/motel • banking • military • education • service sector.

System Parameters • switching technology: digital switching using TDM/PAM • architecture: centralized processor tied to high-speed bus • common control: stored program • transmission: 2-wire internal switching • wiring plan: stations—uniform 2-pair • data switching capability: 4800 bps; full-duplex at station.

Traffic Capacity • 1657 CCS per system • grade of service: P.01 • simultaneous conversations: 63 • nonblocking architecture: 150C, 150S, and 150M—yes.

Trunks/Stations/Consoles • 150C: 16 trunks; 48 stations; 1 console • 150S: 36 trunks; 96 stations; 2 consoles • 150M: 64 trunks; 128 stations; 2 consoles • 150E: 64 trunks; 256 stations; 2 consoles • trunks supported: central office—one way (in/out), 2-way; DID; FX; tie lines; OCC • attended and unattended operation.

Voice Equipment • vendor supplied: analog telephones • nonvendor equipment supported: all rotary (500 type) and Touch-Tone (2500 type) telephones • electronic feature telephones: none • digital telephones: T/R Twin Line and secretarial phones.

Data Equipment • vendor supplied: none • nonvendor equipment supported: terminals that support BSC, ASCII • data rates: asynchronous 110 to 4800 bps; full duplex • modems: all types • multiplexers: all types • interfaces supported: RS-232C • printers: service printer • data terminals: ASCII, TTY.

Subsystem Support • automatic call distributors: built into system • call detail recording: built into system • voice message systems: interfaces with most major products • hotel/motel management systems: interfaces to most management systems.

Communications/Networking • T/R Net: networks multiple switches for larger requirements • route optimization • tandem switching • satellite operation • asynchronous to 4800 bps.



First Delivery • 1980.

Systems Delivered • 200 systems; all models.

Installation Interval • 12 to 16 weeks ARO.

Comparable Systems • VSCBX: American Telecom Focus, AT&T Dimension 400 and System 75, Ericsson Prodigy, Executone Eclipse, GTE Omni SL, Harris/Digital D1200, Hitachi DX, IPC Technologies 160 DPX III, ITT 3100, Mitel SX-200, NEC NEAX 12A and 2400, Northern Telecom SL-1S, Siemens Saturn II, Solid State Systems D-TEL, TIE/Communications Data Star.

Environmental Specifications • temperature: 32 degrees to 104 degrees Fahrenheit • humidity: 10 to 90 percent • power: 117 VAC (+10 percent to 15 percent) at 60 Hz; separately fused outlet 20-amp service per cabinet • power usage: 150C—300 watts; 150S—300 watts; 150M—900 watts; 150E—1000 watts • heat dissipation: 150C—1040 BTU/hr; 150S—1040 BTU/hr; 150M—3300 BTU/hr; 150E—3400 BTU/hr • air conditioning: forced air plus convection required • dimensions: 150C—33x16x16 (WxDxH); 150S—27x26.5x35 (WxDxH); 150M—27x30x69 (WxDxH); 150E—27x30x69 (WxDxH) • weight: 150C—100 pounds; 150S—175 pounds; 150M—500 pounds; 150E—600 pounds • floor loading: 30 pounds per square foot (150C) to 100 pounds per square foot (150E) • minimum equipment room dimensions: 150E—8x10x8 (WxDxH) • FCC registration: AV5920-67676-PF-E; ringer equivalence 2.0B.

Vendor • Tele/Resources division of Acton Corporation; Northway 10, Executive Park, Ballston Lake, NY 12019 • 518-877-8571.

Canadian Headquarters • Alterquip; 2730 Halpern, Ville St. Laurent, PQ H4S 1N7.

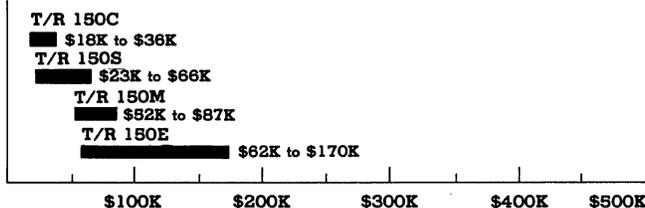
Distribution • nationwide and worldwide through Tele/Resources independent dealers and distributors • Canada through Alterquip; Ville St. Laurent, PQ.

Service/Support/Training • service, support, and training by Tele/Resources distributor • installation by Tele/Resources distributor; subcontractors • warranty 1-year parts and labor; maintenance contracts available • local and remote maintenance.

GSA Schedule • listed.

PURCHASE PRICE RANGE

hardware & software



TELE/RESOURCES T/R 150 PURCHASE PRICING bar graph covers price range between "small" and "large" configurations; installation and first year's maintenance included • T/R 150C small configuration consists of 4 trunks/16 stations; no console; large configuration consists of 14 trunks/38 stations, 1 console • T/R 150S small configuration consists of 10 trunks/34 stations, 1 console; large configuration consists of 24 trunks/86 stations; 1 console • T/R 150M small configuration consists of 16 trunks/78 stations; 1 console; large configuration consists of 36 trunks/110 stations, 1 console • T/R 150E small configuration consists of 20 trunks/90 stations, 1 console; large configuration consists of 50 trunks/230 stations; 2 consoles • system can be field upgraded.

Tele/Resources T/R 150 Series PBX Systems

Models T/R 150C, T/R 150S, T/R 150M & T/R 150E

■ ANALYSIS

The Tele/Resources T/R 150 Series is a family of analog PBX systems whose heritage dates back to the early days of the interconnect telephone industry. Tele/Resources dates back to 1969, a year after the landmark Carterfone decision that paved the way for interconnection of nontelco equipment to telephone company lines. Tele/Resources was one of the first interconnect firms to manufacture its own equipment, rather than buy systems on an OEM basis. The T/R System 32, introduced in 1972, was the first **all-electronic** PBX commercially available in the U.S. The current T/R 150 Series is an evolutionary product of the System 32.

In its current form, the T/R 150 is available in 4 models, the 150C, 150S, 150M, and 150E. Each uses analog switching based on time division multiplexing techniques. The entry-level 150C supports up to 16 trunks, 48 stations, and 1 console. The 150S provides 36 trunks, 96 stations, and 1 console. The 150M provides 64 trunks, 128 stations, and 1 console. The top end 150E, which was formerly called the T/R 300, supports up to 64 trunks, 256 stations, and 2 consoles.

The T/R 150 has a centralized architecture, with all activities controlled by a single CPU. Duplicate CPUs can be provided in all models except the 150C. System features are implemented in PROM, and the system has most desired features standard; few options are offered. The T/R 150 supports standard 500 and 2500 station equipment, both single-line and key telephones, plus Tele/Resources' own Twin-Line proprietary phones.

Although Tele/Resources has well over 3,000 telephone systems installed nationwide, only about 200 are T/R 150 models. This is an unusually low number of installations for a product that has been available for 5 years. There are several reasons for this. First, the under-300-station PBX market is extremely crowded. AT&T clearly dominates it with Dimensions and Horizons. Others with large claims are Mitel, with its popular SX-100 and SX-200, the Siemens SD family, and the NEC NEAX 12A. Interestingly, each of these machines is analog, using either space or time division switching, the same as the T/R 150, so there is no real edge on technology. How about marketing? Another strong area for the competition. Tele/Resources simply doesn't market its products like the competition. Name recognition, however, isn't really a problem for T/R, since the company has been in the business over 15 years. How about distribution? With only 40 distributors nationwide, Tele/Resources probably doesn't cover its market as thoroughly as it could. Another factor that enters this equation is the tendency of most interconnect companies to carry multiple manufacturers of PBX and key equipment. This probably also hurts T/R, since an interconnect will push the manufacturers that it feels offers them the best deals and the best overall product. Perhaps T/R is second choice at enough of these companies that its track record reflects accordingly.

The future? One thing Tele/Resources needs is a digital switch, and indeed one is in the works. It will use time division multiplexing and pulse code modulation (TDM/PCM), and have the same configurations as the T/R 150. It will be introduced during 1985, probably before mid-year. In fact, the 1985 International Communications Association Conference in Dallas is the perfect time for its introduction, not to mention a great opportunity for a major marketing blitz. To fully realize the opportunities in the under-300-station marketplace, T/R needs to completely revamp its product line. Users are more sophisticated, and although analog telephone equipment still provides excellent voice service, the future is definitely digital. The company should introduce some electronic feature telephones, messaging capabilities, and enhanced data communications support if they want to turn any heads. Tele/Resources competes in probably the toughest PBX market of all. It's time for the company to make a bold move, otherwise it might become another casualty in the coming PBX market shakeup.

□ Strengths

The T/R 150 packs a lot of communications capability in a single cabinet. A fully loaded system takes up only about 6 square feet of floor space. The selection of standard features is comparable to the competition, and user interaction with the switch is easy. The

system's prices are very competitive for analog voice-only products. Circuit board density is higher than many of the competition; 8 station circuits per board is one reason the system fits a lot within a small space. The SMDR capability conforms to the AT&T standard, which means the raw data can be manipulated into reports by virtually any call accounting software on the market. The system even prices out calls by itself; frequently this must be done by an external processor in competitive systems. The automatic route selection (ARS) feature is powerful; it supports up to 60 different trunk routes with time-of-day and day-of-week routing. Outgoing trunk queuing further supports ARS by packing more traffic into low-cost facilities. Multiple T/R 150 locations can be tied together via T/R net, which affords sharing of facilities and a simplified numbering plan at each system. The console, while having a rather busy appearance, is essentially the same design the company has been using for over 10 years. Once familiar with the unit, though, its operation is quite fast and easy. The Tele/Resources PBX product line is also one of the few made **entirely in the U.S.**

□ Limitations

The T/R 150 is an analog system, and in a largely digital world, this is felt to be a limitation. Ironically, most PBX equipment in place today is still analog, so is it really a limitation after all? The company's market image needs refreshing, because people won't buy a product if they don't know about it. Station equipment is rather dated, with standard 500/2500 and the proprietary Twin-Line sets as the only choices available. While in reality this selection is probably sufficient for most prospective users, there's simply no glamor here, and, after all, that's what sells. Data communications support is limited to the attachment of modems onto voice lines. There is no support for T1 lines, local area networks, IBM communication protocols, integrated voice and text messaging, gateways to X.25, etc. Most users typically start out with voice-only applications, but it's increasingly important for the system to move in the direction of digital networks, office automation, and terminal emulation.

■ SOFTWARE

□ Terms & Support

Terms • all software is bundled into the T/R 150 system price with the exception of optional features.

Support • T/R 150 system software is supported by Tele/Resources and its associated dealers and distributors • field-developed software is supported by the individual dealer or distributor that authors the programs.

□ Software Overview

T/R 150 software is used to control operations, conduct self-test functions, and provide features. It should be noted that all features of the T/R 150 family are software driven and targeted at 3 areas: (1) System Features; (2) Attendant's Features; and (3) Station Features. System software consists of the Operating System, Self-Test, and Configuration Tables.

The operating system defines major parameters and functions. The distribution of calls and methods of route selection and optimization is also controlled by the operating system.

The self-test provides online testing of the T/R 150 system performance. Error table printouts are available upon request. System fault error codes are stored in the T/R 150 memory and made available to local or remote access.

The configuration tables contain information unique to each T/R 150 installation. These tables may be changed or moved. The tables are used to define station characteristics and control assignments.

Diagnostic software is used to diagnose problems not found by the self-test programs.

□ Features Overview

All features are a function of various software releases • **all standard features are bundled into the system price** • optional features are **extra-cost** items.

Tele/Resources T/R 150 Series PBX Systems

Models T/R 150C, T/R 150S, T/R 150M & T/R 150E

General System Features

Standard Features • attendant console: incoming calls all processed by attendant console • distinctive ringing: station ringing cycles signal type of call • flexible numbering of stations: stations can be numbered with either 3 or 4 digits • foreign exchange (FX) service: access to FX trunks • intercept treatment: calls to vacant or unassigned stations receive distinctive signal • line lockout with warning: stations left off-hook after predetermined length of time are first sent a howler tone, followed by release from the PBX • listed directory number (LDN) service: access to local C.O. trunks • multiple LDN: access to more than one local trunk group with indication at console • night service: after-hours calls handled either by connecting trunks directly to stations or by dialing a special code to answer an incoming call • off-premises stations: connection for stations not located in same building as PBX • power failure transfer: prearranged stations are connected to trunks for service in a power outage • remote maintenance service: system to provide real-time diagnostics of system for both user and system supplier • rotary dial calling: dial telephones supported • tie trunk service: access to tie trunks • touch-tone calling: tone dial telephones supported • touch-tone to dial pulse conversion: converts tone signals to rotary dial pulses for connection to rotary dial central offices • trunk answer from any station: night service feature, users answer incoming calls by dialing special code • WATS service: access to WATS trunks, both oncoming and outgoing.

Automatic Call Distribution (ACD) Option • routes incoming calls to agent positions based on agent available for a call:

_____ NC prch

Code Calling Access Option • interface to customer-provided coded signaling system:

_____ NC

Direct Inward Dialing (DID) Option • permits incoming trunk calls to bypass attendant and terminate directly on designated stations:

_____ NC

Direct Inward System Access Option • provides direct access into T/R 150 via trunk user dials authorization code to access system features:

_____ NC

Facilities Administration & Control Option • provides detailed information on system facilities activities:

_____ NC

Loudspeaker Paging Option • interface to customer-provided paging system:

_____ NC

Music-On-Hold Access Option • interface to customer-provided music source:

_____ NC

Radio Paging Access Option • interface to customer-provided radio paging system:

_____ NC

Recorded Telephone Dictation Access Option • interface to customer-provided telephone dictation system:

_____ NC

Reserve Power Option • independent power source for temporary power during a short-term outage:

_____ NC

Speed Calling Option • provides directory of frequently called numbers accessed by special dial code:

_____ NC

Station Rearrangement & Change Option • permits user-controlled station moves and feature changes:

_____ NC

Restriction Features

Standard Features • class of service: group of features and

restrictions assigned to a station • code restriction: denies selected station lines completion of dialed outgoing exchange network calls to selected offices and area codes • data privacy: station user will deny other potential users the ability to override or gain access to the used line; restrictions released when station placed on-hook • fully restricted station: denies the ability to place or receive anything but station-to-station calls • inward restriction: stations prevented from receiving incoming tie trunk, and exchange network calls; either direct dialed or attendant completed • originating restriction: prohibits station line from originating calls • outward restriction: call attempts are routed to the intercept tone; station can not use CO, FX, CCSA trunks • station-to-station restriction: internal calls only are restricted • termination restriction: stations cannot receive calls at any time • toll restriction: prohibits users of particular trunks from dialing any number except specified office codes and area codes • miscellaneous trunk restriction: denies dial access from preselected station lines to preselected trunk groups.

Account Code for SMDR Option • requires dialing code for chargeback to specific business activities:

_____ NC prch

Area Code Restriction Option • permits or denies station user outside trunk based on 3-digit area code:

_____ NC

Forced Authorization Code Option • requires dialing special code (password) before system will process call:

_____ NC

Toll Restriction Option • permits or denies station user outside trunk access based on area code and local exchange (NXX) code:

_____ NC

Call Routing Features

Standard Feature • Route Advance routes outgoing calls to alternate facilities when the first-choice trunk group is busy.

Automatic Route Selection Option • provides automatic routing of outgoing calls over alternate customer facilities based on the Direct Distance Dialing (DDD) number; incorporates the functions of and replaces the code restriction and route advance features:

_____ NA prch

Automatic Trunk Queuing (OTQ) Option • outgoing trunk calls to busy trunk group are placed in queue, then called back by system when trunk available:

_____ NC

Call Accounting Features

Standard Features • feature usage statistics: stores system usage data into T/R 150 memory.

Station Message Detail Recording (SMDR) Option • provides station or attendant identify, starting time, duration, and trunk group used for outgoing and/or incoming calls:

_____ NC prch

Data Features

Standard Features • Data Privacy: denies other stations ability to override or gain access to data line while in use • Data Restriction: denies access to station or trunk group while data is being transmitted.

Data Communications Option • permits connection of customer-provided data equipment to PBX stations/trunks via standard modems:

_____ NC prch

Network Features

Tandem Tie Trunk Switching Option • allows tie trunk-to-tie trunk and tie trunk-to-exchange network connections through the

NA: not available; price not disclosed by vendor. NC: no charge; feature activated by programming.

Tele/Resources T/R 150 Series PBX Systems

Models T/R 150C, T/R 150S, T/R 150M & T/R 150E

switching system dialed directly by the remote PBX station user:

NC prch

T/R Net Option • permits multiple T/R 150 locations in regional area to develop uniform numbering plan; includes automatic dialing, attendant consolidation, trunk consolidation, centralized SMDR:

NC

Attendant Console Features

Standard Features • alphanumeric display for console: LED displays provide call information and status • attendant control of trunk group access: restriction of station access to specific trunk groups • attendant busy lamp field (BLF): visual display of busy condition of station • attendant lockout: prevents attendant from reentering connected station call • attendant transfer: calls can be transferred by attendant • attendant call waiting: extending call to a busy station sends special tone to user alerting of a waiting call • attendant verification of busy stations: attendant can check on status of a station line • calling number display to attendant: displays either station number calling or type of incoming trunk call • class of service display to attendant: displays station class of service to attendant • direct trunk group selection: attendant can directly access trunk group by depressing specific button on console • interposition calling and transfer: calls between attendants can be arranged, as well as call transfer • night console position: console arranged to handle night service • privacy: automatic splitting of attendant from incoming call while talking with called station • serial call: attendant can establish a series of station calls from a single incoming call, with the original call always returning to the attendant after completing each call • splitting: incoming call on hold while attendant talks with station • straightforward outward completion: attendant dials call for station user, then releases • switched loop operation: calls coming into console handled on one of several loops, which can be reused for next call • through dialing: attendant passes dial tone through to station user, who then dials a call • timed reminder: unanswered calls extended from console return to console for further handling after predetermined time • trunk group busy/warning indicators: LED indicator that tells when all trunks in a group are in use (busy) or when a predetermined number of trunks in a group are busy (warning) • trunk identification by attendant: trunk type in use on a call identified by display • trunk-to-trunk connections: attendant can connect incoming or outgoing trunk call with outgoing trunk call • 2-party hold: attendant can put call on hold that uses 2 facilities for call.

Attendant Conference Option • attendant can establish a connection between a maximum of 8 stations and the attendant

NC prch

Message Waiting Service Option • remotely lights a lamp on a station to indicated message waiting:

NC

Station Features

Standard Features • add-on conference: permits an internal extension to add one inside or outside call to an existing conversation • call hold: places call on hold • call park: places call on hold within IOX for retrieval at another station • call pick-up: stations can answer another phone either by dialing a code and the ringing extension, or by dialing the pick-up code and answering a ringing station in the same pick-up group • call transfer: station can transfer a call to another station • call waiting: station on a call can answer a second call after being alerted to the incoming call by a special tone • direct outward dialing: permits station to originate outside call without operator • automatic camp-on: station user trying to reach busy extension dials code and stays on line until busy station frees up • camp-on callback: station user trying to reach busy extension dials code and hangs up; system calls back once busy extension frees up • do not disturb: prevents incoming calls to a station • executive override: designated stations can break into existing conversations or can override the do-not-disturb feature • forwarding: calls can be diverted to another extension • privacy: prevents call from interruptions such as camp-on or barge-in tones • queuing: permits station to access busy trunk facility by

dialing a code and either staying on the line (standby) or hanging up (callback) • last number redial: permits user to redial last number dialed • system speed calling: users can access additional numbers stored in T/R 150 memory.

■ HARDWARE

□ Terms & Support

Terms • T/R 150 models are available for purchase or on a 1-, 2-, 3-, or 5-year lease • lease rates include maintenance • purchase prices include installation.

Support • equipment installed by Tele/Resources distributors and Telcos • service and maintenance is based on the policies established by individual dealers and distributors • prices vary among distributors based on overhead, discounts, and costs for installation, maintenance, training, and spare parts.

□ Overview

The T/R 150 product line includes 4 analog PBX models, the 150C, 150S, 150M, and 150E. All models are based on a centralized switching architecture with time division multiplexing and pulse amplitude modulation switching. Each system fits completely within a single cabinet. Circuit boards for specific functions can be interchanged among models. Field upgrades can be easily accomplished.

A Z80 microprocessor located on the central processing unit (CPU-B) board controls T/R 150 switching. Software for the stored program resides in PROM on the Memory board and the CPU-B board. The CPU-B board contains 64K bytes of PROM memory and 16K bytes of RAM memory. All system clocks are derived from a 4.096 MHz crystal oscillator located on the CPU-B board. Eight LEDs on the edge of the board display the status of the processor. Switches are located on the edge of the board to provide manual restart and backup configuration load of the T/R 150. Two CPU-B boards can be installed in all models of the T/R 150 Series, except the T/R 150C, to provide common control redundancy.

The Memory board contains 100K bytes of memory in PROM and 36K bytes of memory in RAM. The PROM is used to store the software program and the backup configuration. The RAM is used for the active configuration as well as for software tables. The RAM is backed up by 3 standard AA size nickel/cadmium batteries. The batteries can be tested by a test lamp/switch on the edge of the Memory board. Fully charged batteries can be expected to maintain power for the RAM memory for approximately 7 days.

There are 2 complete sets of configuration data stored in a T/R 150; one in RAM and one in PROM. RAM is used by the system for call processing and the system configuration. The RAM configuration is battery backed-up and write protected. The contents of the PROM configuration will be copied into the RAM configuration if the system is restarted with the backup load switch on the CPU-B board enabled.

There are 63 time slots or talk paths in each member of the T/R 150 Series. A time slot can hold up to 3 stations or trunks. A station-to-station call or a station-to-trunk call requires 1 time slot. A 3-party conference also uses only 1 time slot.

There are 3 types of single-line telephones available for use with a T/R 150. The T/R 4-wire Twin-Line phone has a 12-button tone pad and a T/R hold button. This phone supports all station features. The secretarial phone is a special 4-wire T/R phone equipped to provide visual and audible indications of selected ringing and busy extensions. Calls for these extensions can be accessed from the secretarial phone using the various station features. Tone 2-wire phones may use a switch hook flash hold if not equipped with a hold button. All station features are available from phones equipped with 12-button tone pads. Phones with 10-button tone pads can access any of the features not requiring the use of the "*" or "#" buttons. Rotary 2-wire phones can be attached to a T/R 150, and can place and receive calls, but are unable to access any of the features requiring hold or the "*" or "#" keys. Multiple line tone and rotary KSU (Key Service Units) and industry standard keysets can be connected as 2-wire

Tele/Resources T/R 150 Series PBX Systems

Models T/R 150C, T/R 150S, T/R 150M & T/R 150E

instruments. All standard 2-wire features are available to multiline keysets.

□ Representative System Configurations

T/R 150 Configurations • single-cabinet systems • redundant CPUs on models S, M, and L • T/R 150C—16 trunks; 48 stations; 1 console • T/R 150S—36 trunks; 96 stations; 2 consoles • T/R 150M—64 trunks; 128 stations; 2 consoles • T/R 150E—64 trunks; 256 stations; 2 consoles • field upgrade from 150C to 150E.

T/R 150C Small System • 6 trunks/30 stations; 1 console; 20 single-line 2500 telephones; 10 Twin-Line telephones:
\$20,700 to \$23,200 prch

T/R 150C Large System • 12 trunks/36 stations; 1 console; 10 single-line 2500 telephones; 26 Twin-Line telephones:
27,600 to 30,900

T/R 150S Small System • 10 trunks/34 stations; 1 console; 20 single-line 2500 telephones; 14 Twin-Line telephones:
25,300 to 28,400

T/R 150S Large System • 18 trunks/80 stations; 1 console; 50 single-line 2500 telephones; 30 Twin-Line telephones:
56,400 to 63,200

T/R 150M Small System • 16 trunks/78 stations; 1 console; 50 single-line 2500 telephones; 28 Twin-Line telephones:
54,100 to 60,600

T/R 150M Large System • 28 trunks/100 stations; 1 console; 40 single-line 2500 telephones; 60 Twin-Line telephones:
73,600 to 82,500

T/R 150E Small System • 20 trunks/90 stations; 1 console; 60 single-line 2500 telephones; 30 Twin-Line telephones:
63,300 to 70,900

T/R 150E Large System • 42 trunks/220 stations; 2 consoles; 140 single-line 2500 telephones; 80 Twin-Line telephones:
150,600 to 168,900

System Control Processor Circuit Board • provides overall system control functions • includes Z80, 64K bytes of PROM, 16K bytes of RAM • redundant CPUs can be installed on models 150S, 150M, and 150E:
2,500 to 4,000

System Memory Circuit Board • includes 100K bytes of PROM, 36K bytes of RAM • battery backup provided with 3 NiCad AA-size batteries:
2,000 to 2,800

Call Accounting Processor Circuit Board • provides internal SMDR function • includes Z80, 24K bytes of PROM, 14K bytes of RAM, RS-232C output port • produces call records in standard AT&T SMDR format; prices calls:
3,000 to 4,000

Two-Wire Station Circuit Board • supports standard 2-wire telephone equipment • 8 circuits per board:
1,600 to 2,000

Four-Wire Station Circuit Board • supports T/R Twin-Line telephones • 8 circuits per board:
1,800 to 2,200

Trunk Circuit Board • supports standard C.O. trunks, WATS, FX, etc • 4 circuits per board • loop or ground start • impedance is 600 ohms:
1,300 to 1,500

PRCH: purchase price; price ranges are approximate and include installation and first year's maintenance. Prices current as of March 1985.

DID Trunk Circuit Board • supports DID trunks • 4 circuits per board • accepts immediate start, wink start, or delay dial supervision • impedance 600 or 900 ohms.

Two-Wire Tie Trunk Circuit Board • supports 2-wire tie trunks • 6 circuits per board • E & M signaling • impedance is 600 ohms:
2,000 to 2,500

Four-Wire Tie Trunk Circuit Board • supports 4-wire tie trunks • 6 circuits per board • E & M signaling • accepts blind start, immediate answer, delay dial, and wink start supervision • impedance is 600 ohms:
2,400 to 2,800

Conference Circuit Board • provides up to two 8-party conference calls • maximum of 8 conference boards can be connected in T/R 150:
1,800 to 2,200

Paging Adapter Circuit Board • connects to customer-provided paging system • similar to 4-wire station circuit board • 1 address used for paging/music-on-hold/radio paging connection; other 7 addresses used for stations:
1,800 to 2,200

□ Station Equipment—Voice/Data

Attendant Console • primary function to service incoming calls, connect to desired station • places outgoing calls • 4-pair cabling • LED displays for date, time, station number display and class of service display • 26 loop buttons for trunk access • Busy Lamp Field with 60 trunk lamps, 100 station lamps • 8 system status display LEDs:
\$2,500 to \$3,000 prch

Twin-Line Telephone • proprietary single-line telephone • separate hold button:
175 to 200

Twin-Line Secretarial Station • similar to standard Twin-Line telephone but with addition of 4 or 8 LEDs for monitoring of other stations:
250 to 400

□ Data Communications Equipment

The T/R 150 systems can connect data terminals via industry-standard modems • systems are analog and should not handle data speed beyond 9600 bps • system has data privacy feature to ensure uninterrupted data calls.

□ Peripherals

Service Teleprinter • instructs system computer when moves and changes are performed • connects to equipment cabinet via RS-232C • handles maintenance routines, system diagnostics:
\$1,300 to \$1,500 prch

■ SYSTEM MAINTENANCE & DIAGNOSTICS

System Reliability • redundant CPUs • redundant critical electronics • reserve memory power • backup battery.

System Diagnostics • system continuously diagnoses operation • major/minor alarm indications at attendant console • audit trail generated on system service teleprinter • remote diagnostics by T/R distributor service centers.

System Maintenance • normally performed by T/R authorized distributor • larger systems typically include inventory of line cards, trunk cards, phones, cable, test equipment, etc for customer or vendor maintenance.

System Management • users can change such functions as pick-up groups and call routing, perform station relocations • system teleprinter used.

• END

TIE/communications, Inc Electronic Key Systems

Models EK-612, EK-616, EK-1648, EK-2260, TC-8, TC-12, TC-22

■ PROFILE

Function • TIE/communications TC and EK Series are electronic key telephone systems for switching voice.

Applications Supported • the above systems are targeted at small- to medium-sized business and residential users with as few as 6 trunks and 12 stations and as many as 22 trunks and 60 stations • general business; accounting services; financial firms; legal offices; health care; travel agencies; real estate; insurance offices.

System Parameters • space division switching • centralized architecture with stored program, microprocessor control • wiring: 1-, 2-, 3-, and 25-pair, requiring modular and hardware connections.

Traffic Capacity • TC-8: maximum 14 unblocked connections; TC-12: maximum 16 unblocked connections; TC-22: maximum 20 unblocked connections; EK-612: maximum 8 unblocked connections; EK-616: maximum 12 unblocked connections; EK-1648: maximum 32 unblocked connections; EK-2260: maximum 32 unblocked connections.

Trunks/Stations/Consoles • TC-8: 9 trunks, 20 stations, 2 consoles; TC-12: 14 trunks, 36 stations, 2 consoles; TC-22: 26 trunks, 60 stations, 2 consoles; EK-612: 6 trunks, 12 stations; EK-616: 6 trunks, 16 stations; EK-1648: 16 trunks, 48 stations, 2 consoles; EK-2260: 22 trunks, 60 stations, 2 consoles • refer to Table 1 for station equipment trade-offs.

Voice Equipment • vendor supplied: proprietary single-line and multibutton electronic telephone sets; direct station selection DSS/BLF positions • nonvendor equipment supported: TC-8, -12, -22, and EK-1648 can be equipped with industry-standard 500/2500 telephones.

First Delivery • 1971.

Systems Delivered • over 5000 (all models).

Installation Interval • 3 to 5 weeks (ARO).



Comparable Systems • NEC Electra 6/16 and 16/48; AT&T-IS Com Key, Merlin; Northern Telecom Vantage 12 and 48; Iwatsu Omega III; ITT EKS-701, EKS-801.

Environmental Specifications • refer to Table 2.

Vendor • TIE/communications, Inc; 5 Research Drive, Shelton, CT 06484 • 203-926-2000.

Canadian Headquarters • TIE/Canada; 351 Steelcase Road West, Unit 1, Markham, ON L3R 4H9 • 416-475-5577.

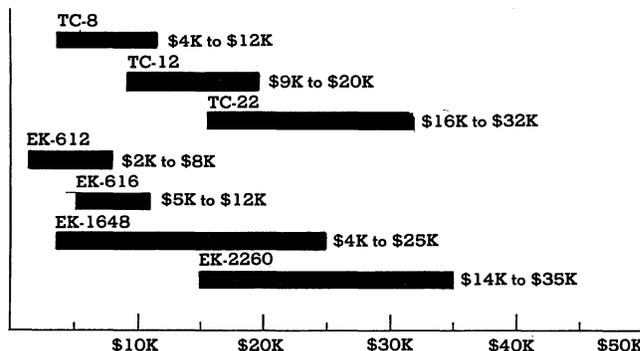
Distribution • worldwide through approved distributors.

Service/Support/Training • provided by TIE and authorized distributors, TIE distributors perform installations with the support of TIE/communications engineering staff.

GSA Schedule • listed.

PURCHASE PRICE RANGE

hardware & software



TIE/COMMUNICATIONS KEY SYSTEMS PURCHASE PRICING bar graphs cover price ranges between small and large configurations; installation and first year's maintenance included • TC-8 supports up to 9 trunks/20 stations • TC-12 supports 14 trunks/36 stations • TC-22 supports 26 trunks/60 stations • EK-612 supports 6 trunks/12 stations • EK-616 supports 6 trunks/16 stations • EK-1648 supports 16 trunks/48 stations • EK-2260 supports 22 trunks/60 stations.

■ ANALYSIS

One of the first companies to build a formidable business as a result of the landmark Carterfone Decision of 1968 was TIE, known at the time as Telephone Interconnect Equipment Corporation. Today TIE is one of the leading companies in telecom equipment manufacturing, with an extensive R&D facility and a manufacturing capability few companies in the market can match.

Systems are targeted at general businesses and residences of varying sizes and needs. Equipment cabinets can fit in a standard closet. Small- to medium-sized businesses and residences can utilize sophisticated electronic telephone features previously available only to large business users, at a competitive price.

Modular design reduces downtime from hours to minutes. Optional features and equipment can be added on an as-needed basis, reducing a customer's initial capital investment. The systems are relatively easy to operate and provide the end user with a reliable, affordable, and flexible telephone system.

TIE/communications, Inc Electronic Key Systems

Models EK-612, EK-616, EK-1648, EK-2260, TC-8, TC-12, TC-22

TABLE 1

	TC-8	TC-8 with TC-12 Telephones	TC-12	TC-22
Accessible CO lines	9*	12*	14*	26*
Private CO lines	2**	2**	4**	6**
Hotlines	2***	2***	4***	6***
Attendant DSS Consoles	2	2	2	2
Stations	20!	20!	36!	60!

*The last 2 lines may be converted to Private CO lines or Hotlines.

**Includes 2 lines converted from Common CO lines.

***The total number of Private and/or Hotline(s) cannot exceed 2 in the TC-8, 4 in the TC-12, or 6 in the TC-22 system.

!A DSS console reduces the maximum number of possible stations by one.

Strengths

TIE telephone systems offer the user an impressive list of features. The systems are completely modular, require minimal office space, and will operate in most office environments. Electronic components in the system's control cabinet can be replaced and/or reprogrammed in minutes, limiting the end user's inconvenience from a nonoperational or partially operational telephone system. TIE systems can be field upgraded with minimal disruption to service.

Limitations

TIE key systems are satisfactory for voice, but are not designed for data communications. Systems can be field upgraded within each model, but growth to the next larger product requires a complete system changeout.

TIE offers key systems in several model groups, built around 7 major product lines. Depending on the geographical region of the country, the local TIE interconnect distributor will sell virtually the same product—only the names are changed. For example, the TC-8/TC-12/TC-22 products are the same as the EK-820/1236/2260 systems, except that the buttons are arranged differently on each system's faceplate. Systems are sold under the Ultrakey, Ultracom, and Businesscom names. The EK-612 is sold as Ultrakey. The EK-616 is sold as Paragon. The EK-1648 is sold as Ultracom CK, Meritor, and Delphi. If this seems very confusing, it is, but the most important issue is determining the system's present and future requirements. System selection is then a matter of picking a product with the right configuration, and forgetting about the product name.

SOFTWARE

Terms & Support

Terms • software bundled in with system price; optional features available for purchase or for 2-, 3-, 4-, 5-, 7-, or 10-year leases depending on distributor.

Support • software is supported by TIE and authorized distributors.

Software Overview

Software controls all system operations, provides features, and performs system diagnostics. Features are either built into the system or user-programmable. Operating features are implemented in PROM and EPROM while user-programmable features are implemented in RAM, which has battery backup in case of power failure.

Features Overview

TIE systems have standard feature packages that are software controlled and programmable either by the user, attendant, or maintenance personnel. Feature access is restricted only by the type of phone used; some features are intended for electronic phones and are not supported on standard 500/2500 sets. For detailed descriptions of features refer to the glossary in section 1100 of this volume.

General System Features

System Features • alarm clock, alternate point answer, automatic callback, automatic hold release; automatic timeout on intercom; battery backup; automatic dialer, auto callback, busy lamp field (BLF), conference calling, limited data access; DTMF/dial pulse signaling; exclusive hold; external tone signals; flash, flexible ringing, handsfree answerback, hold, auto hold, hot line, intercom, microphone mute, monitor, music-on-hold, multiline access; night service, paging access; off-premises extensions, outgoing call restriction-0/1; outgoing call restriction-toll; privacy; power fail transfer; privacy with release; recall/flash button for feature access; single-line telephone access; system speed dialing; station message detail recording; trunk queuing; zone paging; diagnostic routines; release of abandoned call on hold.

Station Features • alarm; add-on conference; call forwarding—all calls; call forwarding—busy; call pickup; call transfer; call waiting; do not disturb; I-hold indication; key set display; last number redial; nonlocking buttons; handsfree operation; multiline conference; prime line selection—originating/receiving; programming features from key set; push button dialing; speed dialing—station; volume control.

Attendant Features • attendant automatic answer; attendant recall with station identification on display; busy lamp field/direct station selection (BLF/DSS) unit; programming from attendant position.

HARDWARE

Terms & Support

Terms • TIE systems are available for direct purchase or for variable monthly lease/purchase plans, depending on the specific distributor • lease rates may or may not include maintenance • installation rates are separate from equipment cost • TIE or an authorized distributor will provide total installation • end-user pricing will vary based on the costs such as distributor markups, discounts, and overhead, as well as installation, maintenance, and training costs.

Support • equipment supported by TIE and/or authorized distributors • training is provided by either TIE, an authorized distributor, or both.

Overview

TIE Systems use a central processor with analog space division switching. They are housed in compact equipment units. Expansion occurs by adding plug-in modules to the primary equipment cabinet. Wiring consists of 1-, 2-, 3-, and 25-pair, requiring modular and hardwired connections. The following sections describe the main product lines.

TC-8/12/22 • electronic key telephone systems with distributed processing that use Z80 microprocessors as the main processor and additional processors for task sharing between the main processing unit (A-MPU) and the station printed circuit boards (PCBs) • the systems also use a space division matrix.

TIE/communications, Inc Electronic Key Systems

Models EK-612, EK-616, EK-1648, EK-2260, TC-8, TC-12, TC-22

TABLE 2

System FCC Registration Number/Ringer Eq.	Operating Temp "F"	Humidity Range %	Requires Air. con.	Dimensions WxDxH	Weight Lbs.
TC-8 BJ286G-68581-KF-E/0.4B	40-100	05-95	No	15.5x11x19	32
TC-12 BJ286G-68581-KF-E/0.4B	40-100	05-95	No	23x11x19	611
TC-22 BJ286G-68581-KF-E/0.4B	40-100	05-95	No	23x11x26	871
EK-612 BJ286G-11827-KF-E/0.4B	32-104	05-95	No	14x2.5x18	131
EK-616 C9C719-12298-KN-E/0/68	32-113	10-95	No	11x10.8x14.2	111
EK-1648 BJ286G-64139-KF-E/2.2B	40-100	05-95	No	27.25x13x17	55
EK-2260 BJ286G-67247-KF-E/0.4B	32-104	00-90	No	23x11.5x26.8	871

EK-612/-616 • electronic digital key telephone systems with distributed processing; designed to replace older electromechanical 1A2 telephone systems • uses Z80 microprocessors in addition to erasable programmable read only memory (EPROM); complementary metal oxide semiconductor (CMOS) components for random access memory (RAM) used in the main operating program • the systems operate as standalone, or behind a PBX.

EK-1648/-2260 • electronic key telephone systems using Z80 microprocessors for the main control program • systems employ space division switching with stored program control to provide a full range of features • in addition, 6502 and 6504 microprocessors are used for traffic control and status reporting; this permits task sharing between the CPU and the station printed circuit boards (PCBs).

Representative System Configurations

TC-8 • single cabinet; nonredundant; up to 10 trunks, 20 stations, 4 ICMs.

3 Trunks/10 Stations: \$4,100 to \$4,875 approx prch

10 Trunks/20 Stations: 9,450 to 11,250

TC-12 • basic system; single cabinet; up to 14 trunks, 20 stations, 6 ICMs.

11 Trunks/21 Stations: 10,100 to 12,000

14 Trunks/36 Stations: 15,750 to 18,750

TC-22 • basic system; single cabinet; up to 20 trunks, 60 stations, 6 ICMs.

15 Trunks/37 Stations: 16,400 to 19,500

20 Trunks/60 Stations: 25,200 to 30,000

EK-612 • basic system; single cabinet; up to 6 trunks, 12 stations.

3 Trunks/4 Stations: 2,400 to 2,750

6 Trunks/12 Stations: 5,700 to 6,800

EK-616 • basic system; single cabinet; up to 6 trunks, 16 stations.

3 Trunks/13 Stations: 5,100 to 6,200

6 Trunks/16 Stations: 6,930 to 8,500

EK-1648 • basic system; single cabinet; up to 16 trunks, 48 stations.

4 Trunks/8 Stations: 4,020 to 4,740

13 Trunks/40 Stations: 17,800 to 21,000

EK-2260 • basic system; single cabinet; up to 22 trunks, 60 stations.

16 Trunks/36 Stations: 17,400 to 21,600

22 Trunks/58 Stations/2 DSS Consoles: 28,300 to 34,100

System Components

TIE-612 • basic Key Service Unit (KSU) • with built-in power supply, telephone sets, installation cabling and hardware, Telco PBX lines:

\$1,600 to \$1,900 approx prch

TIE-616 • basic KSU with built-in power supply and (RMSU-A) relay matrix shorting PCB:

1,700 to 2,000

Main Common Control PCB • contains circuitry for matrix control, internal tone generators, alarm connections, background music, music-on-hold (MOH), and system memory:

750 to 900

CO Line/Key Station Interface PCB • provides circuitry to connect 3 common CO lines and 8 key stations, matrix switches for 3 CO lines and 4 ICM links, and a voice switch circuit for handsfree reply on ICM calls:

800 to 900

Matrix Expansion PCB • required when system has greater than 3 CO lines; requires ICM 5 and 6 and/or if 2 stations are required for each line during power fail operation:

650 to 700

EK-1648 • basic KSU; houses PCBs that control system:

2,800 to 3,100

Power supplies: 300 to 400

APPROX PRCH: purchase price; price ranges are approximate and include installation. Prices effective as of May 1985.

TIE/communications, Inc Electronic Key Systems

Models EK-612, EK-616, EK-1648, EK-2260, TC-8, TC-12, TC-22

Central Processor (B-CPU-B) • provides system clock and operating programs:

1,500 to 1,600

Station Line Circuit Board (B-8SCU-C) • provides up to 8 Key Station circuits:

500 to 575

Single-Line Instrument Circuit Board (B-8SLU-B) • provides up to 8 single-button stations:

540 to 600

CO Line Circuit Board (B-4COU-A) • provides up to 4 CO lines:

520 to 560

EK-2260 • basic KSU; houses all PCBs that are required to operate system:

3,200 to 3,600

Power Supply:

300 to 400

4-Link Intercom PCB:

300 to 350

4-Circuit CO Line Card:

550 to 600

2-Circuit CO Line Card:

350 to 375

Power Fail Transfer:

195 to 225

External Paging Circuit:

250 to 275

Toll Restriction:

400 to 450

4-Station Circuit Board:

550 to 600

2-Station Circuit Board:

300 to 350

TC-8/12/22

TC-8 KSU:

1,700 to 1,850

TC-12 KSU:

1,800 to 1,900

TC-22 KSU:

2,600 to 3,000

(A-MPU-A) Main Processor:

1,500 to 1,650

(A-DMU-A) Data Transmission:

1,100 to 1,250

(A-ILU-A) Intercom Link:

600 to 700

Station Equipment/Voice Data

EK-612 Telephones

Ultra Key:

\$295 to \$315 approx prch

Meritor 1E:

295 to 315

Econ-o-Key:

295 to 315

Delphi 6:

295 to 315

EK-616 Telephones

Executive Display Key Telephone:

395 to 450

Industry-Standard 500/2500 Single-Line Sets:

120 to 150

EK-1648/2260 Attendant Console • primary function to answer incoming calls and connect to stations • place outgoing calls • provides information concerning call status • desk to unit • busy status.

Meritor/Delphi Dual-Port DSS Console:

595 to 615

Meritor/Delphi Single-Port DSS Console:

575 to 695

UltraCom Dual-Port DSS Console:

595 to 615

UltraCom Single-Port DSS Console:

575 to 695

Meritor/Delphi Display Multi-Button Key Phone:

295 to 325

Meritor/Delphi Multi-Key Phone With Speaker:

395 to 425

Meritor/Delphi Handsfree Multi-Button Key Phone:

315 to 340

Meritor/Delphi 4-Button Key Phone:

275 to 290

Ultracom Multi-Button Key Phone With Display:

350 to 375

Ultracom Multi-Button Key Phone:

290 to 315

Ultracom Multi-Button Key Phone With Speaker:

395 to 425

Ultracom Multi-Button Handsfree Key Phone:

315 to 340

Ultracom Multi-Button Key Phone With Monitor:

350 to 395

Ultracom 4-Button Key Phone:

280 to 300

Ultracom 1-Button Set:

195 to 225

EK-2260 Attendant Console • functions same as EK-1648/-2260:

615 to 640

I-2260 Key Telephone Set • includes keypad and faceplate:

330 to 360

TC-8 Telephone Set:

275 to 300

TC-8/-12 DSS Console:

350 to 375

TC-12 Telephone Set:

285 to 315

TC-8/-12/-22 TC-22 Power Fail Telephone (DTMF):

315 to 340

TC-22 Display Phone:

450 to 475

TC-22 DSS Console:

575 to 600

TIE/communications, Inc Electronic Key Systems

Models EK-612, EK-616, EK-1648, EK-2260, TC-8, TC-12, TC-22

■ SYSTEM MAINTENANCE & DIAGNOSTICS

System Reliability • back-up battery for memory and other logic circuits.

System Diagnostics • major/minor alarm indications • automatic and on-site diagnostics.

System Maintenance • performed by either TIE or authorized

distributor • maintenance by replacement of defective or faulty equipment • inventory of spare parts normally maintained by the distributor.

System Management • users can change various system and station parameters.

• END

United Technologies Com Dev Call Accounting Systems

Models Accountant, STU, 8200 Series, NP 9000, Ratepro

■ PROFILE

Function • systems range in capability from providing SMDR for nonintelligent PBXs up to a polling system for multiple telephone systems that generate detailed management reports.

Configuration • accountant-line scanner for nonintelligent PBXs; CPM-9 processor, 115 VAC/60 Hz power supply, up to 2,048 line/trunk interfaces, I/O option; RS-232C interfaces with processor, network poller, translator unit, CRT, or printer; transfer rates: switch selectable up to 9600 bps; maximum call records 480,000 with tape drive • Ratepro: on-site SMDR system; Motorola 68008 processor, 256K to 1.5M bytes of solid-state memory; 115 VAC/60 Hz power supply; RS-232C interface; serial or parallel printer; 32,000 call records • STU-3B: data storage device; Z80A processor 4 MHz clock; 64K to 512K bytes of dynamic memory; 115 VAC/60 Hz power supply; handles larger PBXs; I/O option; interfaces up to 6 PBXs, 40,000 call records; up to 480,000 call records with tape drive • STU-5: data storage device; Z80A processor 4 MHz clock; power supply; 1M-byte dynamic memory; smaller PBXs; 25,000 call records • 8200 Series: Z80A processor with 256K bytes RAM; I/O option; up to 15M bytes hard disk drive; remote system diagnostics; RS-232C interface; peripheral equipment includes printer, CRT, Hotel/Motel Cashier Terminals; 400,000 call records • 8200 Scan: processor with line scanner capability for nonintelligent PBXs; repackaged Accountant model; handles up to 159 tone dial/255 rotary lines • NP 9000: network poller; central processor with 256K-byte dual magnetic tape drive; 8.2M-byte storage capacity; I/O option; up to 20 polling ports; 117 VAC/60 Hz power supply; RS-232C interface; peripheral equipment includes printer, CRT, plus storage units interface; 870,000 call records with attached STU or Accountant.

Associated System • all PBX and Key systems with or without SMDR capabilities • interface required: RS-232C, ASCII, or comparable interface • cable may be required depending on system configuration.

System Parameters • Accountant: 1,024 line/trunk interfaces in standard system; 2,048 line/trunk interface configuration upon request • Ratepro: 250 line/trunk interfaces • STU-3B: up to 6 PBXs supported, data transmission speeds at selectable rates up to 9600 bps; management reports produced dependent on



United Technologies Com Dev NP 9000

software and processor capability • STU-5: up to 2 PBXs supported, data transmission speeds at selectable rates up to 9600 bps; management reports dependent on software and processor capability • 8200 Series: up to 2,000 line/trunk interfaces; 8 user terminal ports; 64K hardware spooler allows PBX data rates up to 9600 bps—will spool 500 to 1000 call records depending on their length; management reports produced depends on software application—CallQuest software generates 11 types of summary and 6 types of detail reports, Hotel/Motel 1 provides 2 types of summary and 6 types of detail reports, Hotel/Motel 2 provides 13 summary and 6 detail reports, optional software provides additional reports • 8200 Scan: refer to 8200 Series for system parameters; 8200 Telecommunication Processor Software Application may have a lower maximum capacity; 255 stations rotary only; 159 stations tone dial; management reports—see 8200 Series • NP 9000: up to 20 simultaneous dial-up or dedicated polling ports; 1200-bps modem for dedicated-line operation terminates in RJ45S; data transmission bit-oriented with data compression packed; 64K bytes—EBCDIC; 128 bytes—ASCII; 128 bytes; redundant tape drives; management reports dependent on software in processing unit (see 8200 Series) as well as 7 summary and 3 detail reports available.

First Delivery • Accountant: 1976 • Ratepro: April 1985 • STU-3B: 1978 • STU-5: April 1985 • 8200 Series: 1983 • 8200 Scan: 1983 • NP 9000: 1982.

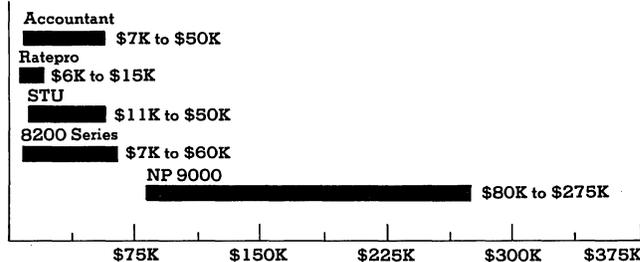
Systems Delivered • Accountant: 1250 worldwide • Ratepro: over 50 • STU-3B: 275 • STU-5: over 50 • 8200 Series: 570 • 8200 Scan: over 75 • NP 9000: over 10.

Installation Interval • 4 to 8 weeks ARO.

Comparable Systems • (large scale) Action/Honeywell Roadrunner Digital Edition, Communications Group TMS-2, Conrac/Alston Call Account System, CP National Reel Recorder, National Applied Computer Technologies LCX 120, National Tel Data InfoTrac, NEC Information Systems Astra-Phacs, Rolm Insite, TDX Systems Telemax 3000, Teknekron Infoswitch LDCS/SMDR, TeleSciences SRS-3000 Series, (smaller scale) Bitek International Systems, Control Key FM 5000, CP National Systems, DND Teletronics Systems, NEC Information System Mini-Phacs,

PURCHASE PRICE RANGE

hardware & software



UNITED TECHNOLOGIES COM DEV PURCHASE PRICING bar graphs cover price ranges between small and large configurations of the company's 5 different product lines • the Accountant is a freestanding line scanner that can monitor up to 1,024 lines • Ratepro is a standalone SMDR monitoring and report generating system • STU is a polling device that collects data gathered by Accountants • 8200 Series processes call data gathered by Accountants and STUs and processes it into reports • NP 9000 is a centralized call accounting system for multiple locations • prices include installation, training, database setup, and first year's maintenance.

United Technologies Com Dev Call Accounting Systems

Models Accountant, STU, 8200 Series, NP 9000, Ratepro

Optimum Communications Systems, Summa Four Systems, Sykes Datatronics Systems, Xiox Corporation Systems.

Environmental Specifications • all systems ambient operating temperature: 50 to 90 degrees Fahrenheit • storage temperature: 32 to 120 degrees Fahrenheit • humidity: 20 to 65 percent noncondensing • air conditioning: required • mounting requirements: Accountant—7x23 shelf (or in cabinet) • STU-3B dimensions: 24x29x24 (HxWxD), weight 130 pounds; STU-5: 3.75x25x11.5 (HxWxD), weight 30 pounds • 8200 Series: 11x22x15 (HxWxD), one disk drive weight 46 pounds, 2 disk drives 50 pounds • 8200 Scan: 18x22x15 (HxWxD), weight 37 pounds • NP 9000: 65x23x31 (HxWxD) • electrical requirements: 115-117 VAC/60 Hz all systems • FCC registration: NP 9000 Telco Interface-AJ496M68189DME; ringer equivalence 1.08.

Vendor • United Technologies Com Dev; 2006 Whitfield Industrial Way, Sarasota, FL 33580 • 813-753-6411.

Canadian Headquarters • none.

Distribution • nationwide through authorized distributors • major distributors include GTE-CSC, Continental Telecom, Sonacor Systems, Nynex, and UTCC.

Service/Support/Training • service is provided through distributor or Com Dev • support is supplied through distributor • training provided by Com Dev • warranty: 1-year for parts and labor on purchased system • maintenance contracts available.

GSA Schedule • listed.

■ ANALYSIS

United Technologies Com Dev's SMDR equipment product line handles a vast spectrum of user applications. They range from creating a SMDR capability in a nonintelligent PBX with the Accountant model line scanner, up to the multitask, multiprocessor centralized SMDR data collection and recording system, the NP 9000. Com Dev has 2 storage translator units, the STU-3B and STU-5, which take data from various smart PBX SMDR modules and store the information until requested from the processing unit. The 8200 Series is the processing unit which generates reports, collects data, and monitors the phone system. Its various software applications allow the 8200 Series to accommodate most business applications. Ratepro is a new on-site SMDR system which became available for shipment April 1985. This product processes and prices SMDR data, stores the information, and provides reports on demand. For small line applications where the PBX is electromechanical and does not provide built-in SMDR capability, the 8200 Scan is available. The system provides a line scanner plus a processing unit to generate reports. Versatility within the product line makes United Technologies a complete source for call accounting equipment. No other single vendor supports as complete a range of call accounting products as Com Dev. The company was a pioneer in the call accounting industry, and continues its position of leadership.

□ Strengths

Com Dev's modular product line affords the user a high degree of flexibility when choosing a call accounting product. Their extensive array of SMDR devices, especially when compared to other manufacturers, makes them qualified to handle all levels of call accounting. Users can also expand their systems without having to change vendors for the upgrade. Com Dev's products are competitively priced with other SMDR vendors.

□ Limitations

The only limitation when looking at a product line as extensive as Com Dev's is the vendor's ability to support it. In this instance it isn't a limitation. Com Dev provides extensive support on all products through its home office as well as by providing training and parts support for distributors.

■ SOFTWARE

□ Terms & Support

Terms • software prices are bundled into system cost • optional features and peripheral equipment available for purchase.

Support • software is supported by Com Dev and authorized distributors.

□ Software Overview

Accountant software is built into the system. User-selectable call logging parameters can be set. Reports are run continuously as information regarding calls is received. Ratepro handles its call record information with solid-state memory. A cartridge containing both the application program and rate database is used depending on the application required. Major software applications include a Commercial software package, Billback, Resale I or Resale II. Software for the STU-3B and 5 controls all system operations, provides memory features, and handles system diagnostics. Features are contained in cartridges Software applications for the 8200 Series processors consist of CallQuest for business applications and Hotel/Motel 1 and 2 for the lodging industry. NP 9000 software controls all systems operations. Operating features are implemented in RAM.

□ Features Overview

Features are provided through various options chosen by user before purchase of equipment. For detailed description of specific features, refer to the Glossary in Section 1100 of this volume.

□ System Features

Accountant: line scanner, data, and report generator. Ratepro: processes and rates SMDR data, built-in keyboard, receive-only printer, battery backup. STU-3B and 5: translates PBX data format into Com Dev Universal Format, AC/DC power supply, I/O port option, polling modem. 8200 Series: multitasking computer designed for single or multiterminal port operation. NP 9000: polling ports operate up to 20 simultaneous dial-up or dedicated lines; the system has full tape drive redundancy, packed binary ASCII or EBCDIC tape format, user selectable standard IBM tape labels, real-time alarm reporting including historical and summary reports, comprehensive statistical reports full remote diagnostics, built-in 1200-bps, full-duplex dial-up or dedicated modems, built-in dialer, single call record format for all PBXs including #1 ESS Centrex.

■ HARDWARE

□ Terms & Support

Terms • end-user pricing will vary, unless otherwise specified, based on costs such as distributor markups, discounts, overhead; installation, maintenance, and training costs will also have an impact on the systems price.

Support • Com Dev and authorized distributors provide support of equipment by replacement and repair.

□ Overview

The Accountant consists of 2 basic models: Act 1 and 2. Act 1 has a capacity of 1,024 ports. Act 2 has a capacity of 160 ports and is not expandable. Both models contain a CPM-9 processor, Event Buffer Module (EBM-1), Signal/Supervisor Processor (SSP-4), and Power Alarm Module (PAM-6) Control Panel. Cabinet handles 16 ports per line module. There are 16 Line Modules per shelf (256 ports total). System provides SMDR capabilities to nonintelligent PBXs.

Ratepro has a solid-state memory with internal battery backup, built-in keyboard with liquid crystal display. RPPRT is the receive only (RO) printer with a parallel interface. RPCART is the cartridge containing both the application program and the rate database. Supports up to 32,000 call records. has an internal alarm to notify user when machine has reached 90 percent capacity.

STU-3B and 5 consist of the basic assembly, power supply, I/O port options, memory, dial-up/dedicated modem, software upgrades, and mounting options. Maximum configuration interconnects 6 PBXs, has 512K memory, IBM-compatible dual density (800/1600 BPI) 10-inch, 9-track tape drive generating 480,000 call records with parallel printer. Traffic data is stored in the STE until reports are generated, at which time the information is retrieved by the processor for printing. The basic assembly consists of a 19-inch rackmounting, input/output

United Technologies Com Dev Call Accounting Systems

Models Accountant, STU, 8200 Series, NP 9000, Ratepro

modules, memory control module, program load module, 64K standard memory module, and dial-up/dedicated modem.

8200 Series consists of a multitasking computer, cable interface to PBX, software applications, and peripheral attachments. The maximum configuration includes 8 terminal ports, support for up to 2,000 stations, up to 400,000 call records, 256K bytes of memory, 731K bytes of floppy disk storage, and 15M bytes of fixed disk storage. A 300-bps, full-duplex data set supports complete remote system diagnostics.

NP 9000 hardware components include a tape drive, modem shelf up to 2 tape drives and 3 modem shelves, dial-up polling modems, dedicated polling modems, and system terminals. The maximum configuration consists of the central processor with 256K-byte, dual magnetic tape drives, 3 modem shelves, 20 polling ports, application software, real-time alarm reporting, power supply, dialer interface, printer cable, CRT cable, master CRT and printer, and slave CRT and printer.

Representative System Configurations

Accountant • Act 1 basic model, 1,024 port capacity, power supply (heavy-duty) Tone Dial Line/Trunk Interface, I/O option:
\$7,587 to \$44,560 prch

Ratepro • basic processor, up to 250 lines, application program, software feature, cables, expansion memory:
6,082 to 11,370

STU-3B • basic assembly, power supply, software, I/O option, memory, modem dial-up/dedicated options, mounting:
11,852 to 49,374

8200 Series • basic assembly, PBX cable, software application, processor:
7,612 to 55,921

NP 9000 • basic model, 10-inch tape drive, logic card cage, power supply, diagnostic modem, printer cable, CRT cable, software, I/O option:
83,681 to 264,605

System Components & Peripherals

Accountant

Basic Assembly:

Act 1 • up to 1,024 ports:
\$8,310 prch

Act 2 • 160 ports nonexpandable:
3,915

Power Options:

Act 1 • 115 VAC/60 Hz:
2,475

Act 2 • 115 VAC/60 Hz:
NC

Shelf Capacity:

Act 1 • 256 to 1,024 ports (tone):
2,295 to 13,210

Act 2 • 160 ports:
NC

Act 1 • 256 to 1,204 ports (rotary):
NC to 5,347

Line/Trunk Interface:

Act 1 • 176 to 1,024 line/trunk:
2,557 to 14,880

Act 1 & 2 • 16 to 160 line/trunk:
232 to 2,325

Ratepro

Basic Processor:
\$3,450 prch

Lines • 15 - 250 lines:
232 to 3,720

Tone Dial Option:
1,800

Printer Receive Only:
450

Application Program:
1,050

Software:
 Commercial:
NA

Billback:
375

Resale I:
NA

Resale II:
375

Memory Expansion:
1,800

Cables:
62 to 308

STU-3B

Basic System:
\$4,743 prch

Basic System Plus IBM-Compatible Tape Drive:
32,784

Basic System Plus Cabinet:
6,396

Power Supply • 19-inch rackmount; 115 VAC/60 Hz:
2,825

Software:
 Serial Output Format:
712

#1ESS Software Centrex:
750

NP 9000 Serial Output Format:
570

Parallel Output Format:
952

Software Upgrades:
570

Memory Control Module:
1,170

8200 Series

Basic System • plus Callquest or Hotel/Motel software:
\$3,675 to \$34,500 prch

Cable:
79

PRCH: purchase price. Price ranges include installation and first year's maintenance. Prices effective as of May 1985.

United Technologies Com Dev Call Accounting Systems

Models Accountant, STU, 8200 Series, NP 9000, Ratepro

Lines Rotary • 15 to 255: 5,452 to 8,913

Lines Tone • 15 to 159: 6,594 to 8,671

Software:
 CallQuest • 1 user terminal up to 8 user terminals: 1,500 to 6,750

Hotel/Motel • 1-2 user terminal ports: 1,500 to 3,000

Hotel/Motel • 2-8 user terminal ports: 8,250 to 9,000

NP 9000

Basic Models:

1 Tape Drive, 1 Modem Shelf: \$69,052 prch

1 Tape Drive, 2 Modem Shelves: 79,725

1 Tape Drive, 3 Modem Shelves: 85,342

2 Tape Drives, 1 Modem Shelf: 101,615

2 Tape Drives, 2 Modem Shelves: 107,235

2 Tape Drives, 3 Modem Shelves: 112,852

Dial-Up Polling Ports • up to 20 ports: 5,955 to 72,255

Dedicated Ports • up to 20 ports: 4,111 to 66,121

System Terminals:
 NP 9000 Master CRT: 4,563

Master CRT & Printer; Slave CRT & Printer: 16,314

■ SYSTEM MAINTENANCE & DIAGNOSTICS

System Reliability • depending on system solid-state memory, dual tape drive backup, backup battery supply.

System Diagnostics • major/minor alarm indications, remote diagnostics, on-site diagnostics.

System Maintenance • performed by United Technologies Com Dev or authorized distributors • maintenance by replacement or repair • inventory of spare parts provided by distributor.

System Management • 8200 Series and NP 9000 users can specify system parameters • V & H and any other rate tables updated by vendor • CRT/keyboard used • reports printed on system printer.

• END

United Technologies Lexar UTX

Digital Voice/Data PBX

■ PROFILE

Function • stored program computerized branch exchange systems for switching voice and data.

Applications Supported • office automation • healthcare • retailers • hotel/motel • banking • military • education • service sector • general business.

System Parameters • switching technology: digital switching using time-division multiplexing/adaptive delta modulation • architecture: centralized processing tied to high-speed bus; nonblocking configuration • common control: stored program • transmission: 4-wire internal switching • wiring plan: stations—uniform 2-pair • data switching capability: 19.2K-bps full-duplex at station.

Traffic Capacity • 36 CCS per line (voice), 36 CCS per line (data) • grade of service: P.01 • nonblocking architecture: yes • see Table 1 for configuration limits.

Trunks/Stations/Consoles • 1024 ports; any combination • trunks supported: central office—1-way (in/out), 2-way; DID; FX; tie lines; OCC; AUTOVON; CCSA • attended and unattended operation • see Table 1 for configuration limits.

Voice Equipment • vendor supplied: digital telephones • nonvendor equipment supported: all rotary (500 type) and Touch-Tone (2500 type) telephones • electronic feature telephones: Lexar proprietary digital sets • digital telephones: Lexar LX-2, LX-5, LX-5D, LX-15, LX-15D.

Data Equipment • vendor supplied: Computer Access Device (CAD), Modem Access Device (MAD) • nonvendor equipment supported: ASCII terminals • data rates: synchronous 1.2K to 19.2K bps; asynchronous 110K to 19.2K bps; full duplex • modems: all types; modem pooling • multiplexers: all types • protocol converters: none supported • data modules: CAD, MAD • interfaces supported: RS-232C, RS-449 • printers: service printer • data storage: digital cassette unit, diskette subsystem • data terminals: ASCII, TTY • computers: minicomputers, personal computers.

Subsystem Support • call detail recording • voice message systems: none • message center systems: none • centralized attendant service • energy management systems: Lexar Energy Management System • hotel/motel management systems: none.

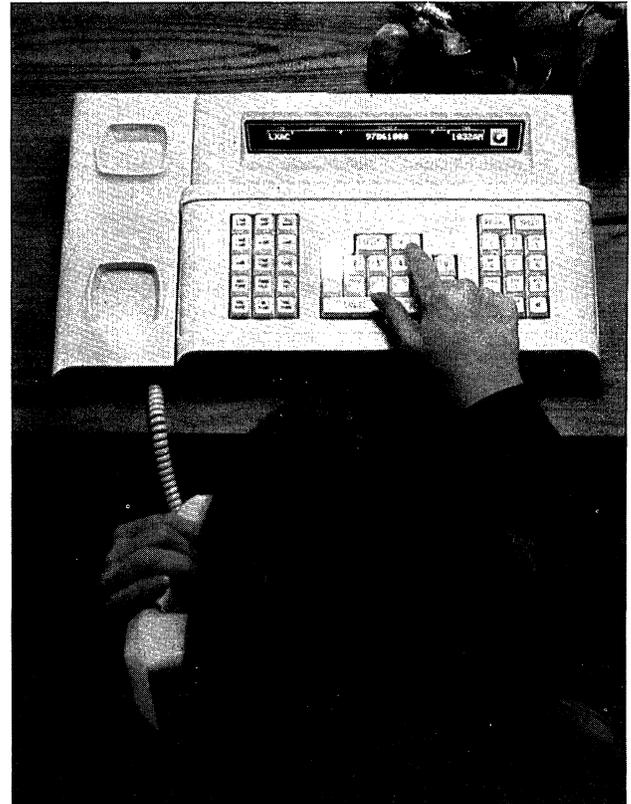
Communications/Networking • route optimization • tandem switching • satellite operation • asynchronous to 19.2K bps • synchronous to 19.2K bps.

First Delivery • 1982.

Systems Delivered • over 500.

Installation Interval • 12 to 16 weeks ARO.

Comparable Systems • American Telecom Focus, Anderson



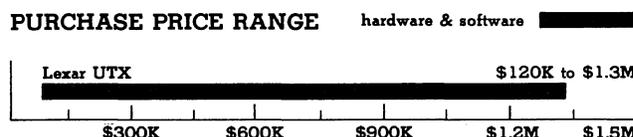
Jacobson IOX, AT&T Systems 75 and 85, CXC Rose; DTI 580 DSS, Ericsson MD110, Executone Summit, GTE Omni III, Harris/Digital D1200, InteCom IBX, Mitel SX-2000, NEC NEAX 2400, Northern Telecom SL-1/SL-100, Siemens Saturn III, TIE/Communications Mercury, Zitel PBX.

Environmental Specifications • temperature: 50 degrees to 100 degrees Fahrenheit (normal), 70 degrees Fahrenheit (recommended) • humidity: 8 to 80 percent (normal), 50 percent (recommended) • power: 120 VAC (+10% to 15%) at 60 Hz; 240 VAC (+10% to 15%) at 60 Hz; all systems -48 VDC (+17% to 8%); separately fused outlet 30-amp service per cabinet • air conditioning: 4270 BTU/hour • dimensions: 29" W x 26" D x 77" H • weight: 550 pounds • floor loading: 100 pounds per square foot • minimum equipment room dimensions: 8'W x 10'D x 8'H.

Vendor • United Technologies/Lexar; 31829 La Tienda Drive, Westlake Village, CA 91362 • 213-706-1000.

Distribution • nationwide and worldwide through United Technologies direct sales offices and independent dealers and distributors.

Service/Support/Training • service, support, and training by United Technologies or distributor • installation by United Technologies or distributor; subcontractors • warranty one-year parts and labor; maintenance contracts available • local and remote maintenance.



UNITED TECHNOLOGIES LEXAR UTX PURCHASE PRICING • bar graph covers price range between "small" and "large" installations; installation and first year's maintenance included • small configuration consists of 20 trunks/100 stations; single console; all digital phones • large configuration consists of 120 trunks/700 stations; 4 consoles; all digital phones; 30 percent data communications over switch.

United Technologies Lexar UTX Digital Voice/Data PBX

TABLE 1: UTX CONFIGURATION LIMITS - SINGLE PORT MODULE SYSTEM

MAIN CABINET	AUXILIARY CABINETS	MAXIMUM PORT CAPABILITY	USING MAXIMUM TRUNK CAPABILITY	REMAINING STATION CAPABILITY
1	0	512	minus 48	equals 464
1	1	512	minus 168	equals 344
1	2	512	minus 288	equals 214
1	3	512	minus 408	equals 104

■ ANALYSIS

The United Technologies Lexar UTX is a powerful digital PBX system that provides fully integrated voice and data switching. It uses time-division multiplexed switching and adaptive delta modulation (ADM) techniques to handle voice and data in a nonblocking matrix. The system supports data speeds up to 19.2K bps synchronous and asynchronous at a digital telephone, and interfaces to computers and outside databases are provided via Computer Access Devices (CADs) and Modem Access Devices (MADs), respectively.

Each UTX supports up to 1,024 ports, which can be configured for trunks, stations, or attendant consoles. Depending on the configuration, 1 to 8 cabinets are required to build a system. A single central processor, based on a 16-bit 8086 microprocessor, handles all system control functions. Redundant components, including the CPU, can be configured for greater reliability. A full range of features is provided, including least cost routing and station message detail recording.

The primary method of communicating with the UTX is via digital LX telephones. Voice is digitized in the set using ADM techniques and is multiplexed along with data in a 72K-bps bit stream to the switch over 2 pairs of wires. Each digital phone has feature activation buttons and either 2-, 5-, or 15-line appearances. Data versions of the 5-line and 15-line sets include either an RS-232C or RS-449 interface in the back of the set. Data sessions are established by a dedicated button. The attendant console also requires just 2 pairs to the switch, and features a 40-character display, up to 12 switched loop keys, and 21 call processing buttons.

The UTX is one of the more sophisticated digital PBXs on the market today, although its integrated data/voice capabilities fall short of the major players in the market. Its price is comparable with other PBXs, but its small line size limits its applications.

The system was developed in 1981 by a team of engineers working for Lexar when it was a subsidiary of Citicorp. Lexar became a subsidiary of United Technologies in 1982. United Technologies also acquired the PBX product line of the Stromberg Carlson Division of General Dynamics in 1983 to obtain a large-scale digital PBX. The 2 models, ultimately known as the UTX 1200 and UTX 5000, are no longer manufactured by United Technologies, although the existing user base is still supported.

□ Strengths

The Lexar UTX is able to switch voice and data simultaneously over only 2 pairs of wires. A single port is used for integrated voice and data, unlike many other switches that require at least 2 ports. A wide range of system configurations is possible, which makes the UTX suitable for traditional business environments as well as operations where heavy trunking is required, such as companies that are heavily into telemarketing and data communications using the switch. Both RS-232C and RS-449 interfaces are supported. Modem pooling (outgoing) is available, as is auto-calling from the LX digital phone. Users can interact with the UTX via the system teleprinter or standard ASCII CRT terminal; the system has a comprehensive set of diagnostic and maintenance routines.

□ Limitations

The UTX is limited to small/medium business applications. There currently is no system larger than the 1,024-port version, which could limit its sales. Data transport speeds available are lower than many of the competition's switches. There is no protocol conversion, X.25 interface, T1 interface, LAN interface, or integrated voice/data workstation available.

■ SOFTWARE

□ Terms & Support

Terms • all software is bundled into system price with the exception of optional features • end-user prices will vary based on distributor markups, overhead, installation, maintenance, and training costs.

Support • system software is supported by United Technologies and its associated dealers and distributors • field-developed software is supported by the individual dealer or distributor that authors the programs.

□ Software Overview

Software is used to control operations, conduct self-test functions, and provide features. It should be noted that all features of the Lexar UTX family are software driven and targeted at 3 areas: (1) System Features; (2) Attendant's Features; and (3) Station Features. System software consists of the Operating System, Self-Test, and Configuration Tables.

The operating system defines major parameters and functions. The distribution of calls and methods of route selection and optimization is also controlled by the operating system.

The self-test provides online testing of system performance. Error table printouts are available upon request. System fault error codes are stored in memory and made available to local or remote access.

The configuration tables contain information unique to each installation. These tables may be changed or moved. The tables are used to define station characteristics and control assignments.

Diagnostic software is used to diagnose problems not found by the self-test programs. They are recorded serially on cassette tape. When diagnostics are run, nonredundant systems will not be able to function. Redundant systems will not experience any interruption in service while the diagnostic routines are being executed.

□ Features Overview

All features are a function of various software releases. All releases will run partially or totally in all models. **All standard features are bundled into the system price.** Optional features are extra-cost items.

□ LBX System Features

General System Features

Standard Features • automatic error-correcting memory; appends error-correcting bits to each word stored in memory •

United Technologies Lexar UTX Digital Voice/Data PBX

TABLE 2: UTX CONFIGURATION LIMITS - DUAL PORT MODULE SYSTEM

MAIN CABINET	AUXILIARY CABINETS	MAXIMUM PORT CAPABILITY	USING MAXIMUM TRUNK CAPABILITY	REMAINING STATION CAPABILITY
1	1	1024	minus 120	equals 904
1	2	1024	minus 240	equals 784
1	3	1024	minus 360	equals 664
1	4	1024	minus 480	equals 544
1	5	1024	minus 600	equals 424
1	6	1024	minus 720	equals 304
1	7	1024	minus 840	equals 184

auxiliary equipment access: connect various devices such as tape and disk drives • bad line reporting: reports stations out of service • distinctive ringing: indicates specific feature is active on incoming call • electronic telephone set: proprietary Lexar feature phones • feature usage statistics: system tracks feature utilization • flexible station numbering: stations can be numbered to correspond with specific requirement • intercom blocking: prevents station-to-station calls • key telephone features using 2-pair wiring: modules simulate key features but eliminate 25- and 50-pair cables • multiple console operation: up to 12 • multiple trunk groups: supports C.O., WATS, tie, etc • music-on-hold/camp-on: access to customer-provided music source when call is on hold or camped-on • night service fixed: calls directly routed to designated stations after hours • night service universal (also trunk answer from any station): incoming calls can be answered by any station • off-premises extensions: stations located remote to UTX • paging: access to customer-provided paging system via attendant and/or users • power failure transfer: predesignated trunks and extensions automatically connected during power outage • recorded announcements/intercepts: alerts caller that station or facility is not available • remote administration: system can be monitored or exercised remotely via dial-up telephone line • self-test and fault isolation: UTX detects and isolates malfunctions • station release with howler: stations left off-hook receive burst of tone notifying of condition followed by release from system control • system forwarding: calls routed to designated station on busy or don't answer condition • tie lines: facilities connecting other PBXs with UTX • TTY/CRT interface: connects display terminal and hard-copy output unit.

Automatic Program Load Option • provides floppy disk as alternate system loading device if system goes down; requires floppy disk hardware interface and drive; can be ordered after system installation as field upgrade:
NA prch

Direct Inward Dialing Option • designated group of trunks that can complete incoming call directly to station without attendant assistance:
NA

Direct Inward System Access Option • provides direct access into UTX via trunk; user dials authorization code to access system features:
NA

DTMF to Dial Pulse Conversion Option • converts tones generated by UTX into rotary dial pulses:
NA

Redundant Critical Electronics Option • provides duplicate electronic components as backup:
NA

Restriction Features

Standard Features • class of service: programmed codes that

determine station access to specific features and facilities • fully restricted station: station permitted to make and receive calls from within UTX only • inward restriction: DID calls blocked from completion to station; routed to alternate point • manual line service: attendant intervention required for all calls • toll restriction 0/1: outside calls requiring 0 or 1 prefix denied.

Account Code for SMDR Option • requires dialing code for chargeback to specific business activities:
NA prch

Area Code Restriction Option • permits or denies station user outside trunk based on 3-digit area code:
NA

Call Routing Features

Standard Features • automatic route selection: system completes outgoing trunk calls over preselected group of trunks.

Call Queuing Option • prioritizes all outgoing long-distance calls; when trunk is busy, call is held and connected to most economical trunk available; 2 types—callback and standby:
NA prch

Least Cost Rating • selects most economical outgoing trunk facility:
NA

Call Accounting Features

Standard Features • feature usage statistics: stores system usage data into UTX memory • remote polling for analysis: UTX queried online for data used in distributor analysis center.

Station Message Detail Recording Option • outputs data on outside calls to printer, mag tape, diskette:
NA prch

Data Features

Standard Features • provides interface support for both asynchronous and synchronous data terminals • data privacy: prevents other stations or attendant from interfering with data call in progress • modem pooling: provides for sharing of modems for both incoming and outgoing data calls • data speeds: up to 19.2K-bps asynchronous, and synchronous; full duplex • auto-call: UTX automatically dials specific number when Request for Service activated.

Attendant Console Features

Standard Features • alphanumeric display: allows attendant to process calls; identification of the source of an incoming or

NA PRCH: purchase price not available; price not disclosed by vendor.

United Technologies Lexar UTX

Digital Voice/Data PBX

recalled call; calling extension class of service or trunk traffic group; called number or calling extension/trunk number • automatic recall: places call to busy extension after operator release • busy verification: check of off-hook condition on dialed line • camp-on busy: wait until off-hook condition ceases; place call when station idle • conference call: more than 2 parties speak together • digital clock • emergency trunk override: accesses busy trunk or station • hold: calling party or conference is placed in a position waiting for an internal party • intercept: automatically forwards call to attendant if the call station is vacant, down, or in use • paging access: attendant connected to paging system when PAGE button depressed and lights • serial calls: initiates a series of calls for the same party • speed dialing: assigns abbreviated codes to selected stations • system alarm indication: indicates the existence of a system malfunction; steady for minor alarm, flashes for major alarm; audible alarm also sounds • tone silence: silence ringing at attendant's console due to arrival of incoming or recalled calls or system alarm • trunk connection: reinstate station user access to all trunk groups • 2-way splitting: alternates between calling and called party on a selected loop • universal cancellation of call forwarding and do-not-disturb; cancels call forwarding and/or do-not-disturb arrangements on a system-wide basis.

Station Features

Standard Features • add-on conference: permits an internal extension to add one inside or outside call to an existing conversation • call hold: places call on hold • call park: places call on hold within UTX for retrieval at another station • call pick-up: stations can answer another phone either by dialing a code and the ringing extension, or by dialing the pick-up code and answering a ringing station in the same pick-up group • call transfer: station can transfer a call to another station • direct outward dialing: permits station to originate outside call without operator.

Lexar Digital Station Features • automatic camp-on: station user trying to reach busy extension dials code and stays on line until busy station frees up • camp-on callback: station user trying to reach busy extension dials code and hangs up; system calls back once busy extension frees up • data calls: connects data terminal through UTX • do not disturb: prevents incoming calls to a station • executive override: designated stations can break into existing conversations or can override the do-not-disturb feature • forwarding: calls can be diverted to another extension • message reminder: station user can leave a callback message on a Lexar telephone • on-hook dialing: station can originate call without lifting handset • privacy: prevents call from interruptions such as camp-on or barge-in tones • queuing: permits station to access busy trunk facility by dialing a code and either staying on the line (standby) or hanging up (callback) • save/repeat: permits user to store an outside number for ease of redialing at a future time • station speed calling: users can program their extensions with frequently dialed numbers • system speed calling: users can access additional numbers stored in UTX memory • voice calling: modified intercom capability between 2 stations.

Application Software

The UTX has been installed in numerous application environments. To date, United Technologies can support the following industries: health care; retailers; office automation; and general business.

HARDWARE

Terms & Support

Terms • the UTX models are available for purchase or on a 1-, 2-, 3-, or 5-year lease • lease rates include maintenance • purchase prices include installation • end-user prices will vary based on distributor markups, overhead, installation, maintenance, and training costs.

Support • equipment can be installed by United Technologies/Lexar or distributors • service and maintenance is based on the policies established by individual dealers and distributors.

Overview

The UTX is composed of the Main Equipment Cabinet and various types of station equipment. The main equipment consists of a central processor, switching matrix, program load and Station Message Detail Record (SMDR) tape drives, port interface and trunk interface cards. Station equipment includes LX telephones, attendant consoles, Computer Access Devices (CAD), and Modem Access Devices (MAD).

The central equipment communicates with the station equipment through standard system access ports. Each port provides a standard 2-pair interface that multiplexes a digitized voice, data, and control channel onto a 2-wire communications pair. All ports have access to the digital switching matrix and the processor's supervision channels.

Any port in the LBX switch can support simultaneous voice and data communications through the use of proprietary integrated circuits. Integrated voice and data communications requires a Lexar digital telephone. This permits an RS-232C/RS-449-compatible terminal to plug directly into the telephone. The serial data information is then combined with the digitized voice and control signals into a single, serial bitstream. Each digital telephone has an analog-to-digital/digital-to-analog converter that uses adaptive delta modulation (ADM) to transform the digital format to voice for telephone transmission and reception. The system supports asynchronous and synchronous full-duplex data communications at up to 19.2K bps through a CAD or MAD. These devices perform the necessary conversion between UTX digital and RS-232C and RS-449 signaling.

A port on the UTX can support either a station or a trunk. A single-port module system supports a combination of up to 512 stations and trunks. Trunk circuits require trunk cards and additional cabinet space to house them. A trunk module can be mounted in the main equipment cabinet below the port module, as configured for single-port module systems. Depending on the requirements of the system, an additional trunk module can be installed below the first trunk module, and in adjacent auxiliary cabinets, to accommodate the quantity of Trunk or Conference Cards required to meet customer needs. Single-port module systems are equipped with 1 power module, mounted at the bottom of the Main Equipment Cabinet, distributing power for that cabinet. A single-port module system can be expanded to 3 auxiliary cabinets and 408 trunks.

When a customer's station or trunk requirements require more than 512 ports, an additional port module can be added to the main equipment cabinet to provide another 512 Ports. The addition of a second port module also requires an additional power module with both mounted at the bottom of the main equipment cabinet. Auxiliary cabinet(s) can be installed to provide mounting space for additional trunk modules and associated trunk circuits in the same manner as a single-port module system with requirements for more than 48 trunks. Each auxiliary cabinet provides equipment mounting space for a power module and up to 5 trunk modules for 120 trunks. The maximum system includes up to 7 auxiliary cabinets for 840 trunks.

Each central processor is an 8086-based 16-bit processor, utilizing between 128K and 512K bytes of error-detecting memory. Error detection consists of single-bit errors that are detected and corrected; double-bit errors are detected only. The processor is comprised of at least 3 cards: the 86/12 Processor Card; the 128K Memory Card; and the Channel Control Card. The 86/12 Processor Card includes a completely self-contained 16-bit processor which provides control and computational functions for the System and communicates with the Load Tape to receive data. Up to 4 128K Memory Cards provide 512K bytes of memory for processor reference. The Channel Control Card serves as the input/output interface between the processor and the system and communicates with all the other facilities within the switch and the Maintenance Console.

The Tape Module consists of a mounting shelf with Tape Control Card, Tape Drives 1 and 2, and power supply. Tape Drive 1 provides initial program loading and automatic reloading for processor memories in case of power failure. Tape Drive 2 is identical to Tape Drive 1 and can be programmed to record

United Technologies Lexar UTX Digital Voice/Data PBX

Station Message Detail Record (SMDR) information.

The port module provides mounting space for port cards and matrix cards. Port cards provide the voice and/or data interface function and matrix cards provide the switching to system ports. Three Matrix Cards are the heart of the system; the total 3-card set is always provided regardless of the number of ports. A second set of Matrix Cards can be provided for redundancy. Matrix Card 1 communicates with the processor, controls Matrix Cards 2 and 3, transmits control characters to ports, and generates port module clock pulses. Matrix Card 2 receives control characters from all port devices, telephones, and trunks; activates station equipment and port devices; and also contains circuitry to establish and verify port synchronization with Matrix timing. Matrix Card 3 controls all switching in the system. It provides voice and data switching, within a 512-line system, and contains an input channel to receive voice and data information from another 512-line system to provide full capability of switching 1024 lines. The remaining slots in the port module are reserved for port cards that provide the interface for 32 ports on each card. A fully equipped port module contains 16 port cards (512 ports). Each Port Card provides the electrical line protocol interface to the port devices, trunks, and the electrical protocol of the matrix.

Trunk modules can be mounted in the main equipment cabinet or an auxiliary cabinet, depending on the number of Port Modules and trunks equipped. The trunk module provides mounting space for 2 trunk control cards, a maximum of 8 trunk cards (24 trunk circuits), or conference cards. Each trunk card provides 3 trunk interface circuits for 1 type of trunk, e.g., loop start, ground start, DID, 2-wire tie line, or 4-wire tie line. Conference cards provide 3-way conferencing. If more than 1 3-way conference circuit is required, additional Conference Cards can be installed (to a maximum of 6-way conferencing) under control of the same trunk control card.

The Maintenance Console, typically a system teleprinter, functions interactively to conduct diagnostic tests and control-selected system components. It is also used to receive certain reports concerning system assignments, traffic activity, and alarm conditions. It can also be used for administrative activities within the system. The UTX will support up to 4 on-site or remote maintenance consoles.

Representative System Configurations

Lexar UTX Configuration • up to 8 cabinets; redundant system • up to 512 ports in single cabinet; second cabinet adds 512 ports • additional cabinets required for trunk configurations • up to 12 attendant consoles • only 1 port required for simultaneous voice and data communications • up to 512K bytes of memory in 128K-byte increments • field upgrade from small to large configuration.

Small System • single-port module single-cabinet system; nonredundant • 256K-byte memory • 15 trunks/80 stations; single console • 70 digital telephones; 10 single-line 2500 sets;
\$128,500 to \$136,500 approx prch

Medium System • dual-port module, 2-cabinet system; redundant components • 512K-byte memory • 46 trunks/550 stations; 2 consoles • 500 digital telephones; 50 single-line 2500 sets • 10 percent data/voice switching;
772,600 to 819,400

Large System • dual-port module, 2-cabinet system; redundant components • 512K-byte memory • 80 trunks/770 stations; 3 consoles • 730 digital telephones; 40 single-line 2500 sets • 20 percent data/voice switching;
1,105,200 to 1,173,900

Large System/Heavy Trunking • dual-port module, 4-cabinet system; redundant components • 512K-byte memory • 200 trunks/450 stations; 3 consoles • 420 digital telephones; 30 single-line 2500 sets • 50 percent data/voice switching;
989,400 to 1,051,200

Station Equipment—Voice/Data

Attendant Console • services incoming calls and connects to

desired station • places outgoing calls • 6 or 12 incoming switched loops • 40-character display • provides information about system status and calls being placed • desktop unit • 2-pair wiring required:
\$3,000 to \$3,300 approx prch

Lexar Digital Telephones • proprietary digital telephones • voice digitized at set • 2-pair station wiring • programmed feature buttons • 16-character LCD display • RS-232C/RS-449 data port integrated with set • 2-, 5-, or 15-line models.

LX-2 (2 lines):
450 to 475

LX-5 (5 lines):
495 to 530

LX-5D (5 lines with RS-232C/RS-449):
795 to 830

LX-15 (15 lines):
650 to 725

LX-15D (15 lines with RS-232C/RS-449):
950 to 1,050

Data Communication Equipment

Simultaneous voice and data communication support at data speeds up to 19.2K bps between on-premise terminals or terminal and transmission facility • eliminates modems for internal communication; reduces long-distance modems by pooling data lines • adds data without compromising voice communication.

Computer Access Device (CAD) • provides connection for asynchronous data device to UTX port • supports RS-232C, RS-449, and RS-366 • permits data device to place and receive data calls at variable rates automatically:
NA approx prch

Modem Access Device (MAD) • provides interface to customer-provided modems and UTX port • supports RS-232C, RS-449 • can be used in modem pooling configuration:
NA

Peripherals

Maintenance Console • teleprinter which instructs system when moves and changes are performed • handles maintenance operations • signals alarm conditions • connects to equipment cabinet in local mode • can be used for remote communications • lists Self-Test Error Table; Audit Table; Traffic Table; extension and trunk attributes; establishes security key:
\$1,800 to \$2,000 approx prch

Subsystems

Station Message Detail Recording (SMDR) • system captures data on outgoing trunk call activity, records on tape cassette drive:
\$8,000 to \$8,500 approx prch

Energy Management System • controls operation of various energy-consuming devices • monitors usage levels:
NA

SYSTEM MAINTENANCE & DIAGNOSTICS

System Reliability • redundant CPUs • error-correcting memory • redundant critical electronics • reserve memory power • backup battery • automatic program load.

System Diagnostics • system continuously diagnoses operation • major/minor alarm indications at attendant console • audit trail generated on system service teleprinter • remote diagnostics by Lexar/distributor service centers.

APPROX PRCH: purchase price; price ranges are approximate and include installation. NA: not available. Prices effective as of December 1984.

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System Maintenance • normally performed by Lexar or authorized distributor • larger systems typically include inventory of line cards, trunk cards, phones, cable, test equipment, etc, for customer or vendor maintenance.

System Management • users can change such functions as

pick-up groups and call routing, perform station relocations • system Maintenance Console used.

• END

Ztel, Inc PNX

Digital Voice/Data PBX System

■ PROFILE

Function • stored program private network exchange (PBX) system for switching voice and data.

Applications Supported • office automation: word processing dictation, facsimile • general business • banking • military • education • service sector.

System Parameters • switching technology: digital packet switching using PCM; packet switching for data architecture: distributed processing tied to network communication rings; nonblocking configuration • common control: stored program • transmission: internal IEEE 802.5 circuit ring maximum ring speed 9.216M bps; maximum bus speed is 400M bps • wiring plan: stations—uniform 2-pair; internode—coaxial, fiber optic, or T1 • data switching capability: 56K bps full-duplex at station; voice switched at 64K bps through system • dynamic bandwidth allocation; submultiplexing, supermultiplexing; shared access.

Traffic Capacity • 36 CCS per line (voice), 36 CCS per line (data) • grade of service: P.01 • simultaneous conversations: 113 per ring • nonblocking architecture: yes.

Trunks/Stations/Consoles • 150 to 20,000 users; any combination • trunks supported: central office—1-way (in/out), 2-way; DID; FX; tie lines; OCC; AUTOVON; CCSA • attended and unattended operation.

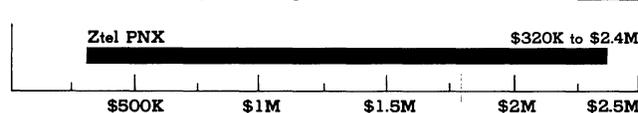
Voice Equipment • vendor supplied: analog and digital telephones • nonvendor equipment supported: all touch-tone (2500-type) telephones • electronic feature phones; attendant console; supervisor console • digital telephones: Z-28 full feature telset; Z-12 enhanced feature telset; Z-4 basic telset.

Data Equipment • vendor supplied: Datadapter; DataServer • nonvendor equipment supported: terminals that support IBM 3270, BSC, ASCII, VT-100 • data rates: synchronous 1.2K to 64K bps; asynchronous 110 to 19.2K bps; full-duplex • modems: all types; modem pooling • multiplexers: all types • protocol converters: 3270, X.25 • data modules: Datadapter for Ztel digital telsets • Data Server; Enhanced Data Server; interfaces supported: RS-232C, RS-449 • data storage: diskette subsystem • data terminals: ASCII, TTY, 3270, VT-100 • computers: minicomputers, personal computers.

Subsystem Support • message center systems.

Communications/Networking • abbreviated dialing • off-network dialing • on-network dialing • dialed digit translation • route optimization • tandem switching • satellite operation • transmission rates: maximum bandwidth per node 400M bps (40 rings maximum 10M bps each) • protocols: X.25, SNA, BSC, ASCII, IEEE 802.5 baseband • asynchronous to 19.2K bps • synchronous to 64K bps • T1 interface • gateways: X.25.

PURCHASE PRICE RANGE



ZTEL PNX PURCHASE PRICING bar graph covers price ranges between "small" and "large" configurations; installation and first year's maintenance included • small configuration consists of 35 trunks/300 stations; single console; 50 percent data/voice communications • large configuration consists of 170 trunks/2,000 stations; 3 consoles; 70 percent data/voice communications • configurations up to 20,000 ports possible but will not be available in initial system release.



First Delivery • 300-line system; August 1984.

System Delivered • under 10.

Installation Interval • 16 to 24 weeks ARO.

Comparable Systems • American Telecom Focus, Anderson Jacobson IOX, AT&T Systems 75 and 85, CXC Rose, DTI 580 DSS, Ericsson MD110, Executone Summit, GTE Omni SIII, Harris/Digital D1200, InteCom IBX, Mitel SX-2000, NEC NEAX 2400, Northern Telecom SL-1/SL-100, Siemens Saturn III, TIE/Communications Mercury, United Technologies/Lexar UTX.

Environmental Specifications • temperature: 70 degrees Fahrenheit (normal), 40 degrees to 104 degrees Fahrenheit (maximum) • humidity: 45 percent (normal), 20 to 80 percent (maximum) • power: 48 VDC (+15% to 8%); separately fused outlet 100-amp service per cabinet • dimensions: PNX cabinet—37.5x28x73.5 inches (WxDxH) • weight: 828 pounds • floor loading: 120 pounds per square foot • minimum equipment room dimensions: 8X10X8 feet (WxDxH).

Vendor • Ztel Incorporated; 181 Ballardvale Street, Wilmington, MA 01887 • 617-657-8730.

Distribution • nationwide through Ztel direct sales offices, regional bell operating companies (RBOCs), independent dealers and distributors • RBOC—US West • distributors—Jackson Communications, Tel-Matic Systems, Consolidated Data Systems, ASI Telesystems.

Ztel, Inc PNX

Digital Voice/Data PBX System

Service/Support/Training • service, support, and training by Ztel or distributor • installation by Ztel or distributor; subcontractors • warranty 1-year parts and labor; maintenance contracts available • local and remote maintenance.

■ ANALYSIS

The Ztel Private Network Exchange is a sophisticated voice/data PBX system built around distributed processing and local area network (LAN) technologies.

Both circuit switching and packet switching are used to switch voice and data through the system. It represents what some industry observers (including Ztel) call a "Fourth Generation" PBX. Aside from the marketing value of that description, the PNX is an interesting application of technologies. The system was formally announced April 12, 1983, and its first installations were completed in 1984. There are about 10 systems installed, to date.

The PNX is built around the IEEE 802.5 token-ring LAN standard, and its software conforms with the Open Systems Integration model of the International Standards Organization. Ztel claims the PNX is directly compatible with the IBM Cabling System, and will be compatible with its forthcoming local area network. Each node of a PNX occupies one or more cabinets, and can support up to 512 voice/data ports. Numerous nodes can be connected via packet-switched rings into systems with port capacities approaching 20,000. Current systems are single-node, with capacities up to around 500 stations. Multiple-node systems have been demonstrated; in particular, a 4-node model at the 1984 International Communications Association Conference.

Two main types of function processors make up the PNX: application and ring processors. Application processors act as shared resources to the ring processors, which provide access to the overall switched network, among other responsibilities. An application processor supports such functions as least cost networking, messaging, station message detail recording, network management, maintenance control, and X.25 packet assembly/disassembly. Each AP uses the Motorola 32-bit 68000 microprocessor with up to 8M bytes of error-correcting memory implemented in dynamic RAM. APs can be added one at a time and are physically housed in PNX cabinets in groups of 6. Ring processors provide the interface for various devices such as Ztel proprietary telsets, standard 2500-type telephones, attendant consoles, personal computers, facsimile systems, and compressed video. Each ring processor supports 512 general-purpose ports that can be either lines or trunks, contains its own redundant 32-bit processors and memory, and can be subdivided into voice/data rings and packet rings for data only. Each voice/data ring handles 64K bps of digitized voice and 56K bps of data. The data packet ring provides a 10M-bps bandwidth for sending packetized data. Up to 40 rings can be configured for backup support.

Three types of rings are provided in the PNX. Circuit rings carry digitized voice signals between processing elements. Digitized voice travels at 64K bps. Data can also be switched over circuit rings. Packet rings are based on the IEEE 802.5 token ring standard. Data from terminals is condensed into packets, and these discrete blocks of information are routed to their destination within the PNX. Backup rings can be configured as either circuit or packet rings, and are brought into service upon the outage of an in-service ring. All rings communicate at 10M bps.

The PNX architecture is modular in design and available in 2- or 3-shelf configurations. A 2-cabinet PNX can support up to 1,024 ports; expansion is accomplished by adding more cabinets. The PNX provides interfaces to various types of protocols without relying on specific gateway modules, such as with the Rolm CBX II. Programming is in the C language, and the company plans to accommodate most user applications. The main design thrust of the PNX was to merge voice functions into a data switching system, as opposed to other manufacturers who add data to a voice system.

As is the case with most of the current data/voice switch manufacturers, Ztel has a family of digital telephones. The Z-4, Z-12, and Z-28 all digitize voice at the telset, and communicate with the PNX at up to 192K bps. This large bandwidth is used via RS-232C or RS-449 connector for the terminal, while providing a link to the

PNX. Full data/voice lines require 2 ports on the PNX, which will have an impact on the ultimate capacity of a system. Analog stations and trunks normally have a one-to-one relation with PNX ports. All connections with the PNX require only 2 pairs of wires. Attendant consoles are essentially modified CRT/keyboard units with a separate module for voice-related activities.

Throughout the PNX, system diagnostics and performance monitoring are handled by a unique hardware/software element called the Maintenance Thread. It tracks system activities, reports on malfunctions, and determines when backup facilities and systems should be brought in.

The voice/data PBX industry is getting quite crowded these days. Although the major competitors, AT&T, Rolm, and Northern Telecom are pushing products that could be called dated designs by some observers, they are nonetheless tough competitors. Ztel has already asserted its presence with some significant distributorship agreements, particularly with FirsTel Information Systems, unregulated equipment subsidiary of US West, the Regional Bell Holding Company in the far west. The company has also inked deals with Jackson Communications, Tel-Matic Systems, Consolidated Data Systems, and ASI Telesystems, all powerful interconnect companies with experience and large installed bases. Other manufacturers, such as InteCom, NEC, and Mitel, are busy building their respective market share, and will represent serious competition to Ztel.

Ztel was formed in 1981, announced the PNX in April, 1983, shipped its first beta test system June 1984, and cut over its first customer system in October 1984. The beta site was Compugraphic, Inc in Massachusetts, and the first official customer was the State of Utah, sold by FirsTel Information Systems.

The company's financial backers include 2 prominent names in industry, General Electric and NCR Corporation. Several venture capital firms have also invested sizeable amounts in the company. Recently, a major shakeup occurred with the resignations of company president Peter Anderson and chief financial officer, Gerald Birr, in what was probably a disagreement until the two senior positions can be filled. The company has trimmed its operating staff by one fourth in an attempt to hold off continuing cost overruns. Investor management noted that the company is anywhere from 2 to 12 months behind in its business plan.

Ztel has raised over \$45 million from its various investors, and has been quietly trying to raise more cash. Meanwhile, NCR has been injecting capital to maintain its 19 percent stake in Ztel. The company's latest round of venture funding could trigger a move by NCR to buy Ztel, and this is likely to happen if (1) NCR is serious about competing in the telecommunications market, and (2) Ztel has difficulty obtaining capital.

NCR has formed a telecommunications subsidiary to resell "space" on its corporate tie line network, an increasingly popular practice of very large corporations looking for additional ways to obtain revenues with minimal capital investment. GE, similarly, is now in the interconnect business, and its Information Systems Company unit (GEISCO), has announced several new agreements with major telecom vendors to get into the booming tenant services industry. Both firms have substantial investments in Ztel, and the direction is quite clear: Ztel will most likely become a part of one of its major investors within 1 year. Another possible alternative is for Ztel to become part of a Regional Bell Holding Company, specifically US West. This company has signed on to distribute the PNX through its FirsTel subsidiary, and the acquisition of a company like Ztel will give US West a technologically advanced partner when competing for voice/data PBX dollars. Based on the acceptance of the PNX, the first signs should appear by the 3rd or 4th Quarter of 1985. The IBM acquisition of Rolm has made it acceptable for big companies to buy into the telephone business, and Ztel is an excellent prospect.

□ Strengths

In terms of sophistication, the PNX gets plenty of attention. Based on early installations, the system has received mixed reviews. As a voice system, it works satisfactorily, but its data capabilities, specifically the 10M-bps LAN, are unproven. The first couple of

Ztel, Inc PNX

Digital Voice/Data PBX System

systems will have the undivided attention of manufacturer, distributor, etc. The true test occurs when the 20th or 50th system is installed. Ztel has developed a system that (on paper) has all the right features, nonblocking architecture, end-to-end digital communications, programming flexibility, and a high level of reliability, availability, and serviceability. It has several large distributors signed on, which doesn't guarantee success, but sure goes a long way toward making it possible. Its distributed architecture is the current trend, and its use of a local area network provides a high level of data support and connectivity. Ztel is promoting a direct connect capability with the IBM Cabling System, and, ultimately, its local area network. Its conformance to the ISO Open Systems Integration model and the IEEE 802.5 token-passing network standard will increase its attraction. The company has made extensive use of CAD/CAM (computer-aided design/computer-aided manufacturing) systems in the design and development of the PNX. Continued use of these techniques will mean quicker turnaround times for new products, and should help the company maintain its technical edge on the competition.

□ Limitations

A product of the PNXs sophistication will not appeal to everybody. It is very high-tech, expensive, and represents a higher risk than the more established voice/data PBX manufacturers. Its 10M-bps LAN will not be available until July 1985, and it has virtually no user base.

Integrated voice/data communications normally require 2 ports in the system. Analog stations and trunks need 1 port. This means a user will need to order approximately 30 percent more ports than the total number of stations/trunks if a fully integrated system is desired.

The system currently does not have options for automatic call distribution (ACD), centralized attendant service (CAS), or an integrated voice/data workstation.

■ SOFTWARE

□ Terms & Support

Terms • all software is bundled into the PNX system price with the exception of optional features • end-user prices will vary based on distributor markups, overhead, installation, maintenance, and training costs.

Support • Ztel system software is supported by Ztel and its associated dealers and distributors • field-developed software is supported by the individual dealer or distributor that authors the programs.

□ Software Overview

Ztel PNX software is modular, layered, written in C language, and then compiled for MC 68000 processing. The layered structure consists of the Distributed Network Operating Systems (DNOS) or kernel, user interface utilities and system management, application software modules, and a relational database management system. Application software includes voice and data call processing, online directory, message handling, and provision for other applications.

Data applications provide circuit-switched and packet-switched connections between system components and communications devices. All data call processing software is structured according to the 7-layer International Standards Organization (ISO) Open Systems Interconnection (OSI) model. The PNX provides the network routing, data link, physical link, and transport layers of the local area network (LAN). The PNX's voice call processing emulates all features found in traditional PBX and key systems.

Software revisions are distributed in 2 ways: disk or remote downloading. By design, software processes can be assigned to any processing element (PE) in the system on an as-needed and as-available basis. This distribution process offers a high level of flexibility, peak-load processing power, and reliability.

□ Features Overview

All features are a function of various software releases or application packages.

□ PNX System Features

General System Features

Standard Features • attendant console: incoming calls all processed by attendant console • distinctive ringing: station ringing cycles signal type of call • flexible numbering of stations: stations can be numbered with either 3 or 4 digits • foreign exchange (FX) service: access to FX trunks • intercept treatment: calls to vacant or unassigned stations receive distinctive signal • line lockout with warning: stations left off-hook after predetermined length of time are first sent a howler tone, followed by release from the PNX • listed directory number (LDN) service: access to local C.O. trunks • multiple LDN: access to more than 1 local trunk group with indication at console • night service: after hours calls handled either by connecting trunks directly to stations or by dialing a special code to answer an incoming call • off-premises stations: connection for stations not located in same building as PNX • power failure transfer: prearranged stations are connected to trunks for service in a power outage • remote access to PNX services: outside callers can dial special trunk, enter authorization code, and transact calls like an internal station • remote maintenance and testing service (RMATS): system to provide real-time diagnostics of system for both user and system supplier; part of Maintenance Thread • tie trunk service: access to tie trunks • touch-tone calling: tone dial telephones supported • touch-tone to dial-pulse conversion: converts tone signals to rotary-dial pulses for connection to rotary-dial central offices • trunk answer from any station: night service feature, users answer incoming calls by dialing special code • WATS service: access to WATS trunks, both oncoming and outgoing.

Direct Department Calling (DDC) Option • permits incoming trunk calls to bypass attendant and terminate directly at preselected group of stations:

NC prch

Direct Inward Dialing (DID) Option • permits incoming trunk calls to bypass attendant and terminate directly on designated stations:

NA

Enhanced Statistics Option • detailed reporting capability to report on numerous system parameters:

NA

Facilities Administration & Control Option • provides detailed information on system facilities:

NC

Loudspeaker Paging Option • interface to customer-provided paging system:

NA

Messaging Option • PNX can create, file, and send messages throughout system:

NA

Music-On-Hold Access Option • interface to customer-provided music source:

NA

Recorded Telephone Dictation Access Option • interface to customer-provided telephone dictation system:

NA

Reserve Power Option • independent power source for temporary power during a short-term outage:

NA

Speed Calling Option • provides directory of frequently called numbers accessed by special dial code:

NC

PRCH: purchase price. NA: not available; price not disclosed by vendor. NC: no charge. Prices effective as of December 1984.

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Station Rearrangement & Change Option • permits user-controlled station moves and feature changes:

NC

Uniform Call Distribution (UCD) Option • routes incoming calls to designated stations according to preset pattern:

NC

Restriction Features

Standard Features • class of service; group of features and restrictions assigned to a station • code restriction; denies selected station lines completion of dialed outgoing exchange network calls to selected offices and area codes • data privacy; station user will deny other potential users the ability to override or gain access to the used line; restrictions released when station placed on-hook • data restriction; station or group denies other users ability to gain access to the station or group; attempted bridge-on is routed to a tone • fully restricted station; denies the ability to place or receive anything but station-to-station calls • inward restriction; stations prevented from receiving incoming Common Control Switching Arrangement (CCSA), tie trunk, and exchange network calls; either direct dialed or attendant completed • originating restriction; prohibits station line from originating calls • outward restriction; call attempts are routed to the intercept tone; station cannot use CO, FX, CCSA trunks • station-to-station restriction: internal calls only are restricted • termination restriction; stations cannot receive calls at any time • toll restriction; prohibits users of particular trunks from dialing any number except specified office codes and area codes.

Account Code for CDR Option • requires dialing code for chargeback to specific business activities:

NC prch

Area Code Restriction Option • permits or denies station user outside trunk based on 3-digit area code:

NC

Authorization Code Option • requires station user to dial special access code prior to dialing desired facility; FP 8 only:

NC

Controlled Outgoing Restriction Option • permits attendant control of outgoing call restriction for stations:

NC

Call Routing Features

Standard Feature • Route Advance routes outgoing calls to alternate facilities when the first-choice trunk group is busy.

Automatic Alternate Routing Option • automatic routing of tie trunks over up to 4 alternate trunk groups:

NA prch

Automatic Overflow to DDD Option • optional routing of private network calls via off-net facilities from a point on the network where all on-net routes are busy or none are provided:

NA

Least Cost Networking (LCN) • provides automatic routing of outgoing calls over alternate customer facilities based on the Direct Distance (DDD) number, incorporates the functions of and replaces the code restriction and route advance features:

NA

Queuing Option • allows all trunk calls to be placed in queue whenever all routes for completing a particular call are busy:

NA

Outgoing Trunk Queuing (OTQ) Option • outgoing trunk calls to busy trunk group are placed in queue, then called back by system when trunk available:

NA

Time of Day Routing Option • changes routing patterns based on time of day:

NC

Call Accounting Features

Station Message Detail Recording (SMDR) Option • provides station or attendant identity, starting time, duration, and trunk group used for outgoing and/or incoming calls:

NA prch

Data Features

Data Communications Option • provides interface support for both asynchronous and synchronous data terminals • data privacy; prevents other stations or attendant from interfering with data call in progress • modem pooling; provides for sharing of modems for both incoming and outgoing data calls • data speeds: up to 19.2K-bps asynchronous, 56K-bps synchronous; full duplex • auto-call: PNX automatically dials specific number when Request for Service activated:

NC prch

Network Features

Advanced Private Line Termination (APLT) Option • specialized trunk groups that provide access to and termination from private line networks:

NC prch

Automatic Network Dialing Option • provides automatic dialing of all network calls; uses 3-digit code for off-premises locations; requires Rolmnet:

NC

CCSA Access Option • access from the inward dialing from the CCSA network, outward dialing from the PBX without attendant assistance:

NC

Centralized Attendant Service Option • groups attendants for multiple PNX locations in centralized site; incoming calls to branch PNXs routed to central site for answering, then returned to desired station at originally called location:

NA

Enhanced Networking Option • groups tandem calling, least cost networking, uniform numbering, and main/satellite options:

4,000 to 18,000

Facilities Restriction Level (FRL) Option • class of service information for a station that determines which facilities it can access:

NC

Inter-PBX Call Transfer Option • calls transferred to and from a Main and Satellite PBX system:

NC

Main/Satellite Option • allows multilocation PBX users to concatenate their attendant positions at 2 locations:

NC

Tandem Tie Trunk Switching Option • allows tie trunk-to-tie trunk, tie trunk-to-CCSA, and tie trunk-to-exchange network connections through the switching system dialed directly by the remote PNX station user:

NC

Traveling Class Mark (TCM) Option • class of service (FRL) information about a station user attempting to complete a call over an ETN that determines the facilities the call can use at a distant switching node:

NC

Uniform Numbering Plan Option • permits users at a Satellite or Main PNX to place calls over tie trunks using a uniform dialing plan:

NC

Attendant Console Features

Standard Features • alphanumeric CRT display; allows attendant to process calls; identification of the source of an incoming or recalled call; calling extension class of service or trunk traffic group; called number or calling extension/trunk

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number • automatic recall: places call to busy extension after operator release • busy verification: check of off-hook condition on dialed line • camp-on busy: wait until off-hook condition ceases; place call when station idle • conference call: more than 2 parties speak together • digital clock • emergency trunk override: access busy trunk or station • hold: calling party or conference is placed in a position waiting for an internal party • intercept: automatically forwards call to attendant if the call station is vacant, down, or in use • paging access: attendant connected to paging system when PAGE button depressed and lights • serial calls: initiates a series of calls for the same party • speed dialing: assigns abbreviated codes to selected stations • system alarm indication: indicates the existence of a system malfunction; steady for minor alarm, flashes for major alarm; audible alarm also sounds • tone incoming or recalled calls or system alarm • trunk connection: reinstates station user access to all trunk groups • 2-way splitting: alternates between calling and called party on a selected loop • universal cancellation of call forwarding and do not disturb; cancels call forwarding and/or do-not-disturb arrangements on a system-wide basis.

Attendant Messaging Option • attendant can take message for caller, create message for called party's telset:

NA prch

Online Directory Option • lookup function at attendant position with features to speed the lookup process:

NA

Station Features

Standard Features • add-on conference: permits an internal extension to add one inside or outside call to an existing conversation • call hold: places call on hold • call park: places call on hold within CBX for retrieval at another station • call pick-up: stations can answer another phone either by dialing a code and the ringing extension, or by dialing the pick-up code and answering a ringing station in the same pick-up group • call transfer: station can transfer a call to another station • call waiting: station on a call can answer a second call after being alerted to the incoming call by a special tone • CDR/Account Coding: permits station to assign account code when placing call • direct outward dialing: permits station to originate outside call without operator.

Ztel Proprietary Telset Features • automatic camp-on: station user trying to reach busy extension dials code and stays on line until busy station frees up • camp-on callback: station user trying to reach busy extension dials code and hangs up; system calls back once busy extension frees up • do not disturb: prevents incoming calls to a station • executive override: designated stations can break into existing conversations or can override the do not disturb feature • forwarding: calls can be diverted to another extension • LCD display: 40-character visual display on Z-28 telset for various system features • messaging: station user can leave a callback message on a Ztel proprietary telset • privacy: prevents call from interruptions such as camp-on or barge-in tones • queuing: permits station to access busy trunk facility by dialing a code and either staying on the line (standby) or hanging up (callback) • save/repeat: permits user to store an outside number for ease of redialing at a future time • station speed calling: users can program their extensions with frequently dialed numbers • system speed calling: users can access additional numbers stored in PNX memory • trunk select: stations can access specific trunk lines.

Datadapter Option • module that mounts inside Ztel telset to connect data terminals:

NA prch

Speakerphone Option • provides handsfree calling:

NA

Application Software

The Ztel PNX is designed for ease of application development. Specialized applications will be developed by end users and distributors. Programming is in C language. Ztel has several software feature groupings for specialized communications requirements.

Networking Option • combines tandem switching, least cost networking (LCN), uniform dialing, and main/satellite operation:

\$4,000 to \$18,000 prch

Office Automation Option • combines PNX messaging capabilities with online directory, LCN, enhanced statistics, station message detail recording (SMDR), and enhanced data:

28,000 to 112,000

System Control Option • combines LCN with SMDR:

9,000 to 40,000

HARDWARE

Terms & Support

Terms • PNX models are available for purchase or on a 1-, 2-, 3-, or 5-year lease • lease rates include maintenance • purchase prices include installation • end-user prices will vary based on distributor markups, overhead, installation, maintenance, and training costs.

Support • equipment can be installed by Ztel, distributors, and Regional Bell Holding Companies • service and maintenance is based on the policies established by individual dealers and distributors.

Overview

The PNX is a fully integrated system for both voice and data switching. Systems from 200 lines to 8,000+ lines are packaged into a single- or multiple-cabinet group. The single cabinet can contain the primary electronics to support a 400-line system. Disk drive equipment can also be mounted in the same cabinet. Two cabinets can accommodate a typical 1,000-line system. Smaller systems easily upgrade to larger-capacity systems by the addition of more PNX cabinets.

Cabinets are equipped with cooling fans, locking front and rear doors, and a Line Distribution Frame (connector panel) for external cable connections to the Main Distribution Frame (MDF). Each cabinet can have 3 shelves of electronic module elements, containing Processing Elements (PEs), Switch Elements (SEs), and Line Elements (LEs).

PNX systems can be configured for high levels of reliability. Redundant processing modules and switch modules can be configured. Similarly, various redundancy levels are used to adjust the nonblocking ratio of a system. Extreme levels of reliability and nonblocking ratios are easily supported by the increase in the number of shelves or cabinets to accommodate additional redundant modules.

PNX system cabinets contain equipment interfaces that support the terminal equipment (telsets, data devices, and consoles connected by quad wire) up to 5,000 feet away. Packet and circuit rings may be required for distances beyond 5,000 feet. The rings link remote PNX systems, up to 5 miles away, into the network. The packet ring transfers data in the LAN at a 10M-bps rate. The ring transmission medium may be either coaxial cable or fiber optic cable.

Equipment shelves accommodate printed circuit card modules (PEs, SEs, and LEs). Typically, there are 2 or 3 shelves per cabinet. Each 18-inch shelf may support up to 30 circuit card modules. Backplanes at the rear of the shelf distribute the common voltages and signals (buses) to the card module connectors. There are 3 types of backplanes—1 for a 6-slot Processing Element, the second for a 12-slot Switching Element, and the third for a 6-slot Line Element.

A Processing Element (PE) is the computer portion of the PNX and consists of up to 5 different modules sharing a common 6-slot backplane. The modules include a Basic Processor Module, Memory Module (2 modules per PE), Shared Bus Controller, Packet Access Controller, and Small Computer System Interface. The Basic Processor Module (BPM) contains a 16-bit Motorola MC68000 microprocessor and associated control and bus interface circuitry that establishes the PE computer bus. This bus is Ztel's Local bus, a modified version of the Motorola VERSAbus. A Memory Management Unit (MMU) is provided for address translations that access up to 16M bytes of address space. The

Ztel, Inc PNX Digital Voice/Data PBX System

BPM also contains 32K of PROM (Programmable Read Only Memory) storage, a DMA (Direct Memory Access) controller, and a dedicated 8051 microprocessor for maintenance processing in the maintenance thread. A Local Memory Module (LMM) contains up to 1M byte of dynamic MOS RAM (Metal Oxide Semiconductor, Random Access Memory); it also contains parity-check/error-correction circuitry. The Shared Bus Controller (SBC) couples and translates the Local bus structure and protocol to double 15-line Shared buses (1 prime, 1 backup), which link other PEs and SEs in a system. The Packet Access Controller (PAC) interfaces the PE to the IEEE 802.5 packet ring. The Small Computer System Interface (SCSI) converts the Local bus structure and protocol to an industry standard bus structure. This bus structure is compatible with a variety of storage device interfaces (disk controllers) and with other user-specific peripherals.

Depending on the specific requirements, Processing Elements can contain 1 or 2 memory modules that store switch processing and packet data processing programs. In addition to switch and packet processing, at least 1 PE in the PNX system must be programmed with system management and optional applications software. This PE is defined as the Application Processor, which contains an SCSI module to provide access to a disk drive and to optional peripherals (line printers and other user devices).

A Switching Element (SE) makes the desired voice or data path connection between various stations in the PNX. The SE is controlled by a Processing Element through a shared bus. Four different modules on the SE sharing a common backplane include the: Shared Bus Adapter and Clock, Memory Module (up to 4), Time Slot Interchanger, and Time Space Matrix. The Shared Bus Adapter (SBA) converts the Shared bus structure and protocol to a Local bus and switch element architecture. System clock signals are also generated. The Memory Module contains up to 1M byte of dynamic MOS RAM. The Memory Module also contains parity-check/error-correction circuitry and plugs into the SE backplane interfacing to the Local bus. A Time Slot Interchanger (TSI) is the basic switch of the PNX. It is a time-division switch that multiplexes data under a PE-controlled processing subsystem. TSIs switch up to 512 ports. Larger switching systems use 2 TSIs linked by a common Time Division Multiple Access (TDMA) bus. A Time Space Matrix (TSM) is a space-division switch for larger switch capacity systems (beyond 2 TSIs). The number of TSI and TSM switching modules varies with the size and redundancy of the switch. Since 1 TSI supports up to 512 ports, a 400-line system would require only 1 TSI.

When converting PNX lines to ports, multiply 1.3 times the number of lines. When converting from ports to lines, multiply the number of ports by 0.8.

A Circuit Ring Interface Unit interfaces the switch element TDM voice and data link and converts TDMA bus structure and protocol to the time-slotted (113 slots) 9.216M-bps circuit ring. Each ring will provide 113 talk paths (voice or data) between PNX System Processing Units.

Line Elements (LE) are the PNX terminal equipment interfaces and consist of 3 basic types: line, trunk, and service cards. All lines from the TSI connect to Line Element module cards through a TDM link. The serial link contains both time-division multiplexed voice/data and control information. Line cards provide signal and power to the terminal equipment. Options are: Digital Line Card—16 voice and data lines, 32 TSI ports; Analog Line Card—16 voice lines, 16 TSI ports, DTMF phones only; Ground Start/Loop Start (GS/LS)—8 trunks, 8 TSI ports; Direct Inward Dial (DID)—6 trunks, 8 TSI ports; and E&M Tie Trunks—4 trunks, 4 TSI ports.

Service Cards in the Line Element shelf include: Tone Generator Card, Ringing Generator Card, DTMF Receiver Card, Speakerphone Card, Conference Card, and Modem Service Card. Station equipment manufactured by Ztel includes 3 digital telsets, 2 digital data servers, and an analog line card for standard 2500 telephones. Ztel telsets digitize voice using a pulse code modulation (PCM) technique. Data is input through data servers attached to the telsets or through a similar Datadapter option that is installed inside telsets.

Ztel system consoles are based on screen displays, keyboard layout, and multifunctional capabilities that permit consoles to serve as an Attendant, Supervisor, or System Manager Console.

System maintenance support is based on a Maintenance Thread that contains hardware and software. It serves as a dedicated maintenance subsystem to enhance reliability, availability, and serviceability. The subsystem monitors all circuit modules and selects fallback logic in place of any failed circuit module.

□ Representative System Configurations

PNX Configuration • single- or multicabinet systems; fully redundant • up to 2M bytes of memory per Processing Element • basic system can be field upgraded to larger system • over 8,000 stations can be configured in a single system before additional nodes are connected by LAN rings.

Small System • single cabinet; redundant • 30 trunks/160 stations; single console • 50 digital sets; 10 2500 sets • 50 percent data:

\$163,000 to \$231,000 prch

Medium System • 2 cabinets; redundant • 120 trunks/650 stations; 2 consoles • 630 digital sets; 20 2500 sets • 60 percent data:

815,000 to 1,155,000

Large System • 4 cabinets; redundant • 180 trunks/1,600 stations; 4 consoles • 1,500 digital sets; 100 2,500 sets • 60 percent data:

1,875,000 to 2,656,500

□ Station Equipment—Voice/Data

Attendant Console • primary function to answer incoming calls and connect to desired station • place outgoing calls • message center • online directory feature • CRT with keyboard and auxiliary dial pad • menu-oriented screen displays • can function as console, supervisory unit, or system manager console:

\$2,900 to \$3,500 prch

Z-28 Full Feature Telset • proprietary telephone • 40-character LCD display for messages, status information • 28 programmable function keys • digitizes voice in set:

750 to 900

Z-12 Enhanced Telset • proprietary telephone • 12 programmable function keys • digitizes voice in set:

450 to 600

Z-4 Basic Telset • proprietary telephone • single line • 4 programmable feature buttons; 4 associated LEDs • voice digitized in set:

195 to 230

Datadapter • module that plugs into bottom of Z-28 and Z-12 • provides RS-232C or RS-449 connectors for data terminals:

150 to 275

Speakerphone • converts Telset (Z-28 and Z-12) to handsfree operation:

200 to 300

Data Servers • modules that provide digital connections to PNX • support asynchronous or synchronous connections • RS-232C or RS-449 • available in Enhanced version that functions as a telephone with 12 programmable keys • available in Basic version that is designed to fit under standard 2500 telephone.

Enhanced Unit:

450 to 500

Basic Unit:

195 to 250

PRCH: purchase price; price ranges are approximate and include installation. NA: not available; price not disclosed by vendor. Prices effective as of December 1984.

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Digital Voice/Data PBX System

Data Communication Equipment

Simultaneous voice and data communication support at data speeds up to 56K-bps synchronous and 19.2K-bps asynchronous between on-premise terminals or terminal and transmission facility • eliminates modems for internal communication; reduces long-distance modems by pooling data lines • adds data without compromising voice communication • 56K-bps X.25 Data Network Interface • Data Servers • Datadapters.

Peripherals

Service Teleprinter • connected to equipment cabinet in local mode • can be used for remote PNX communications • lists Error Table; Audit Table; Traffic Table; extension and trunk attributes; establishes security key:

NA prch

SYSTEM MAINTENANCE & DIAGNOSTICS

System Reliability • redundant CPUs • error-correcting memory

• redundant critical electronics • reserve memory power • backup battery • automatic program load.

System Diagnostics • system continuously diagnoses operation • major/minor alarm indications at attendant console • audit trail generated on system service teleprinter • remote diagnostics by Ztel/distributor service centers • automatic facilities test system monitors trunks, tie lines, etc • Maintenance Thread monitors all system operations.

System Maintenance • normally performed by Ztel or authorized distributor • larger systems typically include inventory of line cards, trunk cards, phones, cable, test equipment, etc, for customer or vendor maintenance.

System Management • users can change such functions as pick-up groups and call routing, perform station relocations • system CRT used.

• END

