KAYPRO II

Dealer Reference Manual

KAYPRO II REFERENCE MANUAL

CONTENTS

FIGURE LISTING

TABLE LISTING

1-1 PRODUCT SUPPORT.

1-2 This is basically a quick reference manual that will aid both the dealer and the user who have general questions regarding the KAYPRO II personal computer. It is not meant to be used as a detailed technical manual or an operator's manual.

1-3 CRT. (Refer to Figures 1-3 (A) through (D) and Table 1-3).

a. When working on the CRT and associated circuitry, take care not to touch the two metal deflection rings at the end of the neck of the CRT as this will severely distort the display. Also, there is high voltage present, so keep this in mind when making adjustments. Align the CRT by reaching in and grasping the white taped coil on the neck of the CRT and turning the coil in the direction required to square its display. Turn the coil a little past alignment, as it will turn back a bit when you release it. Remember, avoid touching the metal deflection rings at the rear of the neck of the CRT.

b. The controls for adjustments on the video board shown in Figures 1-3 (A) and (B) should normally need no adjustment, as they are aligned at the factory. However, should it be required, they can be adjusted. The names of the adjustments make their uses apparent. Note that the horizontal size adjustment is a coil and requires a special non-metallic tool. This is a delicate component, so use extreme care. If the BRIGHTNESS control on the video board is turned up too high, then the raster will be apparent when the front panel BRIGHTNESS control is turned all the way down.

c. Figures 1-3 (C) and (D) show the geometric distortions possible on the CRT display and their acceptable tolerances. Figure 1-3 (D) shows an example of perfect video alignment with the capital letter E positioned on the borders. If CRT adjustments are required, alignment should be made as close to perfect as possible.

d. Table 1-3 lists the video signals on connector J1 of the main board and the voltages on the video boards. Take care when removing and reinserting the connector on the video board, as repeated removal and reinsertion could loosen the connection. The video signals coming from the main board are separate, not composite as in a TV signal. Also, one easy way to see if you have the 12V on the video board is to turn up the BRIGHTNESS control on the board and see if you have a raster by turning the front panel BRIGHTNESS control all the way down.

e. The display will jiggle on the CRT if the video drive lines are too near the flyback or the power supply. If this is the case, physically move them away, and the problem should disappear.

FIGURE 1-3(A)

ELSTON CRT

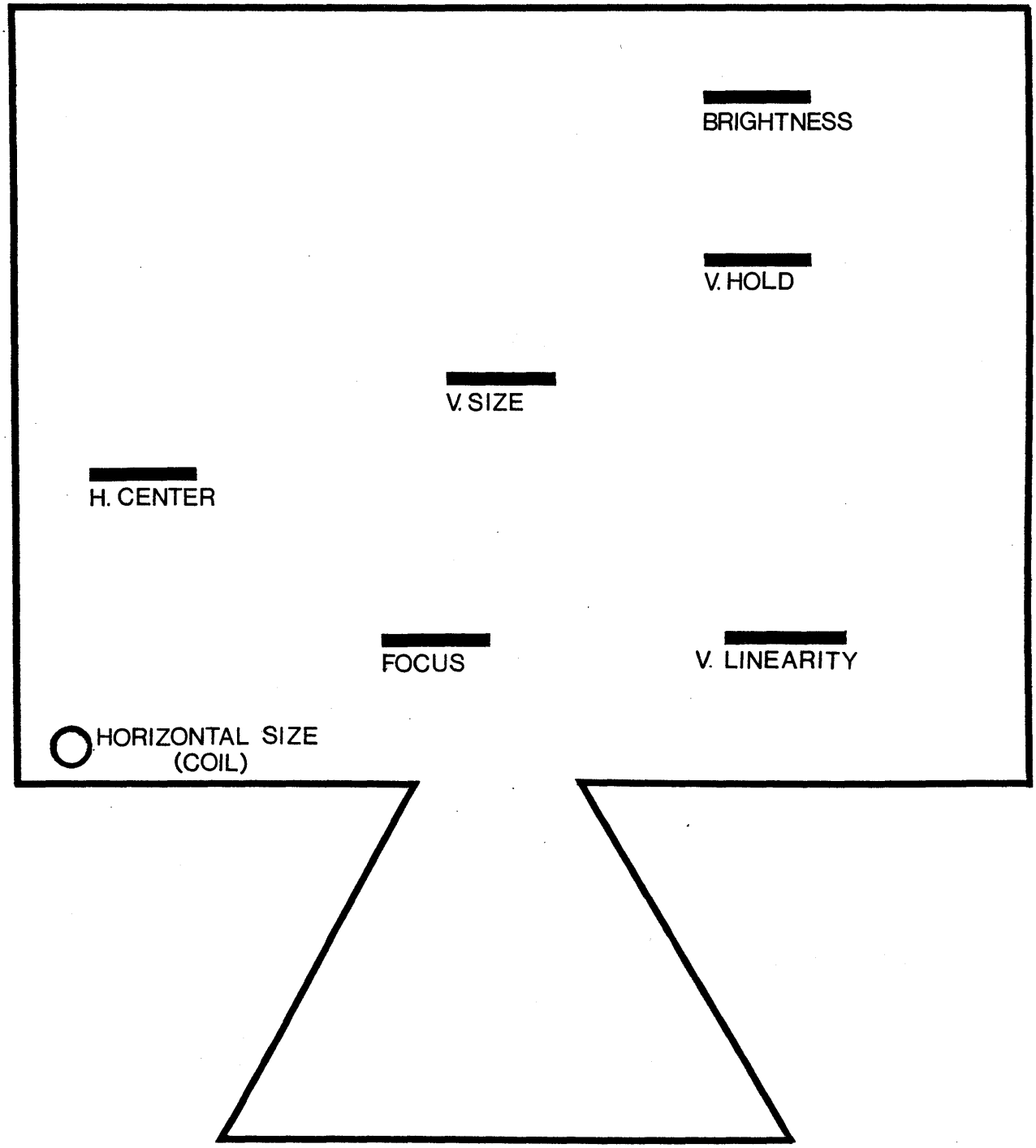


FIGURE 1-3(B)

DOTRONICS CRT

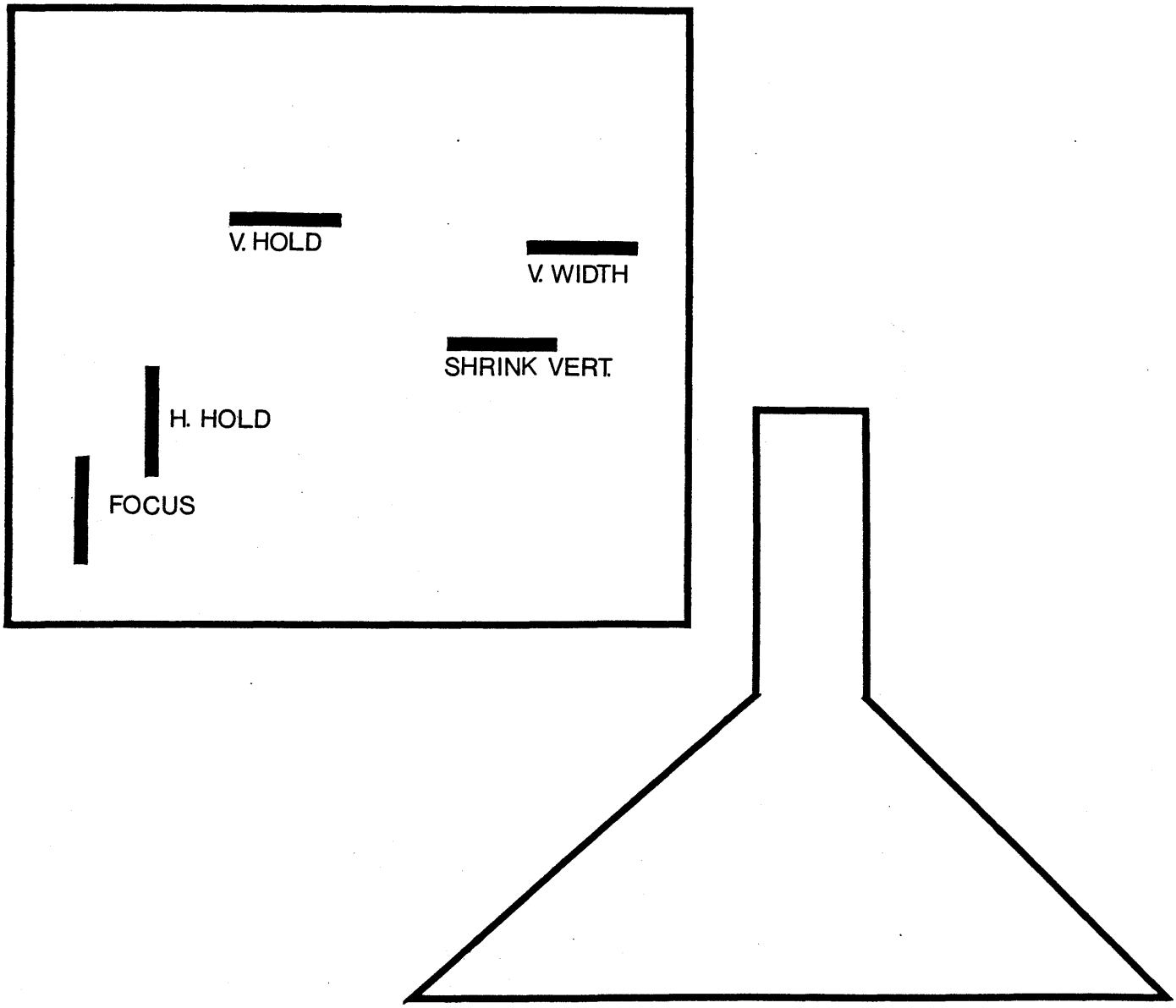
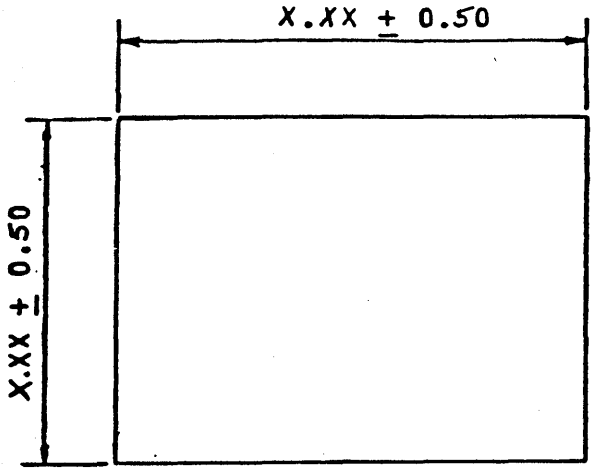


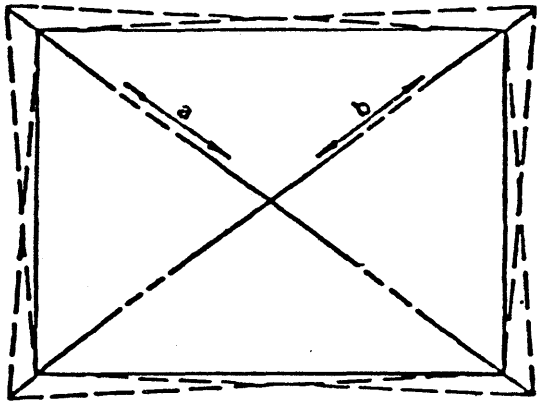
FIGURE 1-3(C)

MONITOR SPECIFICATIONS

GEOMETRIC DISTORTION

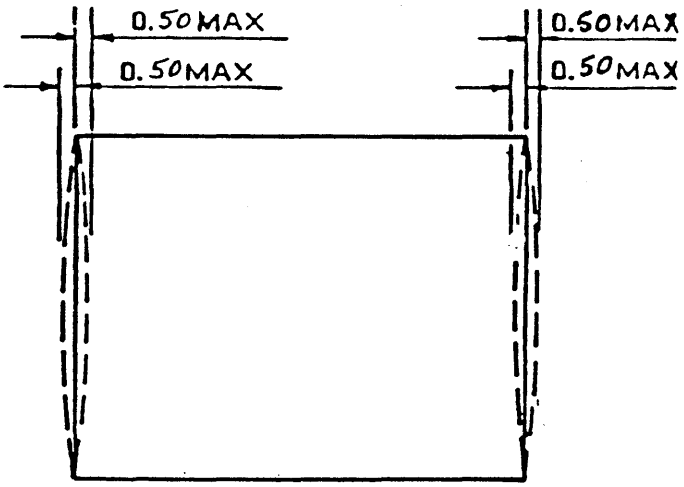


a. Ideal Geometry

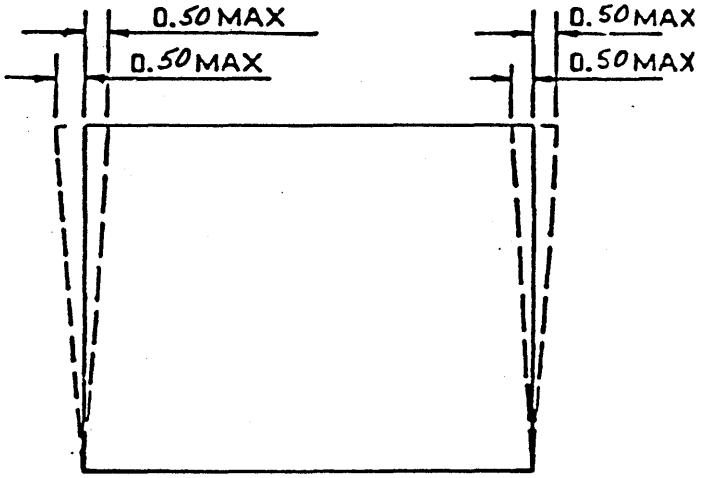


b. Un-equal Diagonals

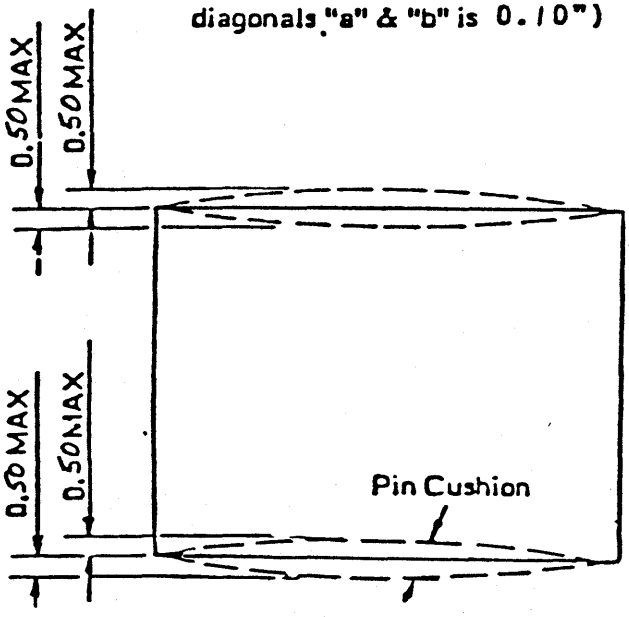
(Max difference between diagonals "a" & "b" is 0.10")

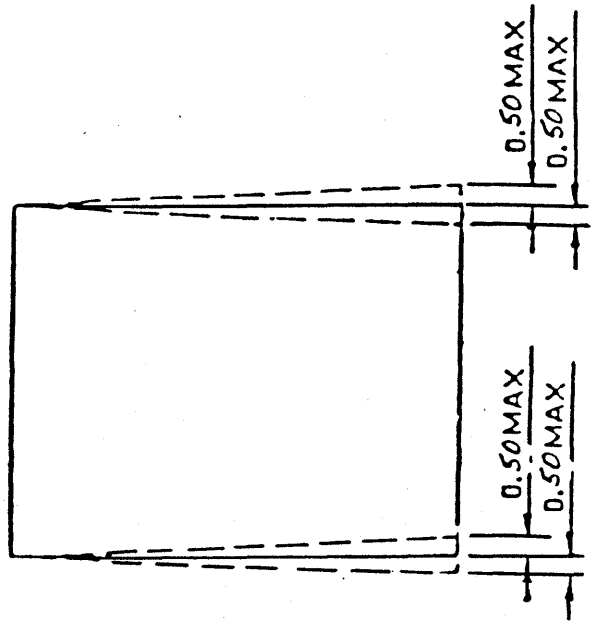


d. Pin or Barrel-Left and Right



e. Trapezoid-Sides





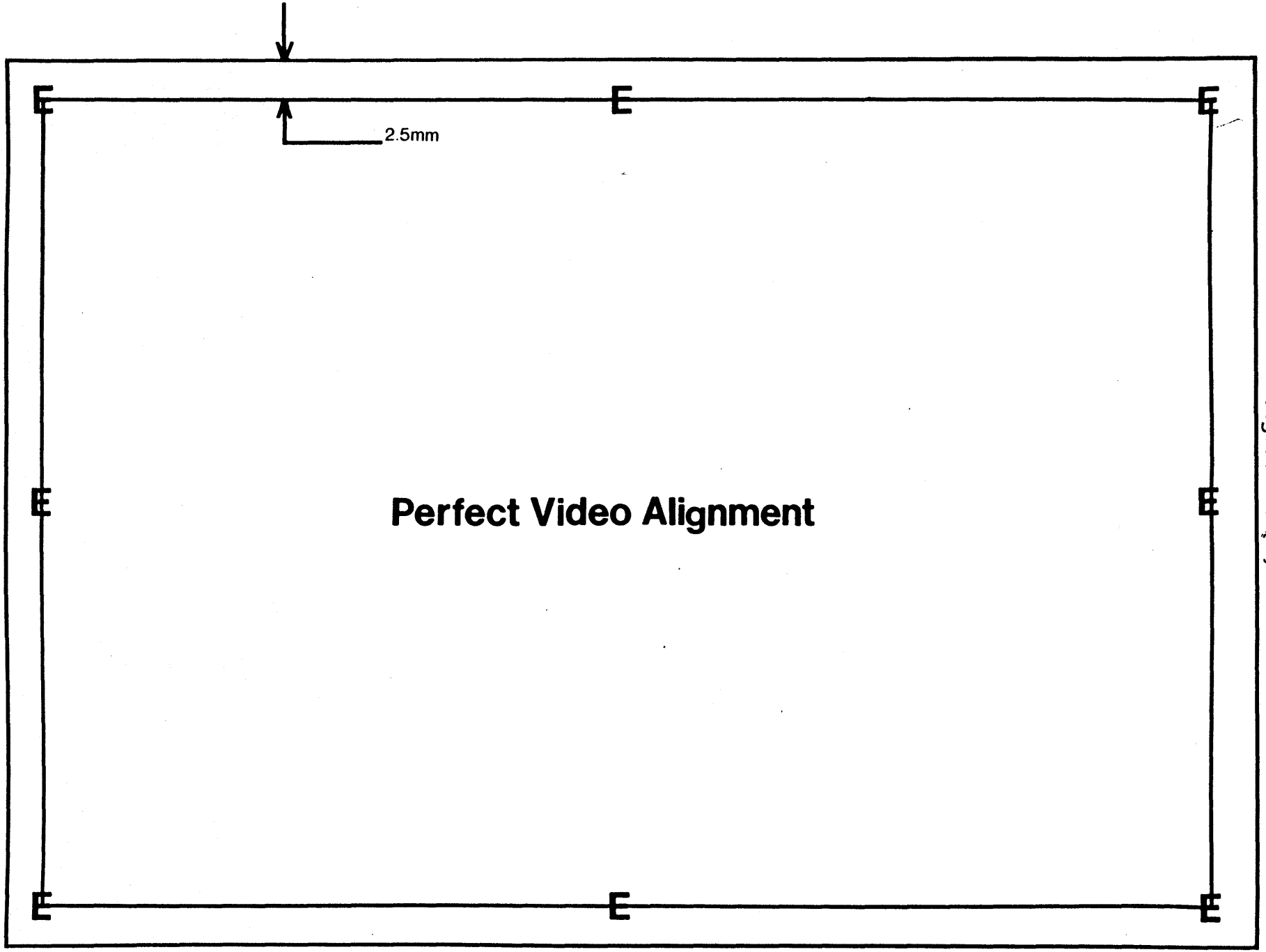


Figure 1-3 (D)

Table 1-3

VIDEO SIGNALS ON MAIN BOARD (J1)
(separated, not composite)

Pin 1 - Horizontal Sync

Pin 2 - Key

Pin 3 - Video

Pin 4 - Vertical Sync

VIDEO BOARD VOLTAGES

Pin 1 - 0V
Pin 6 - 0V
Pin 7 - 12V
Pin 8 - 0V
Pin 9 - approximately 4V (brightness)
Pin 10 - 0V

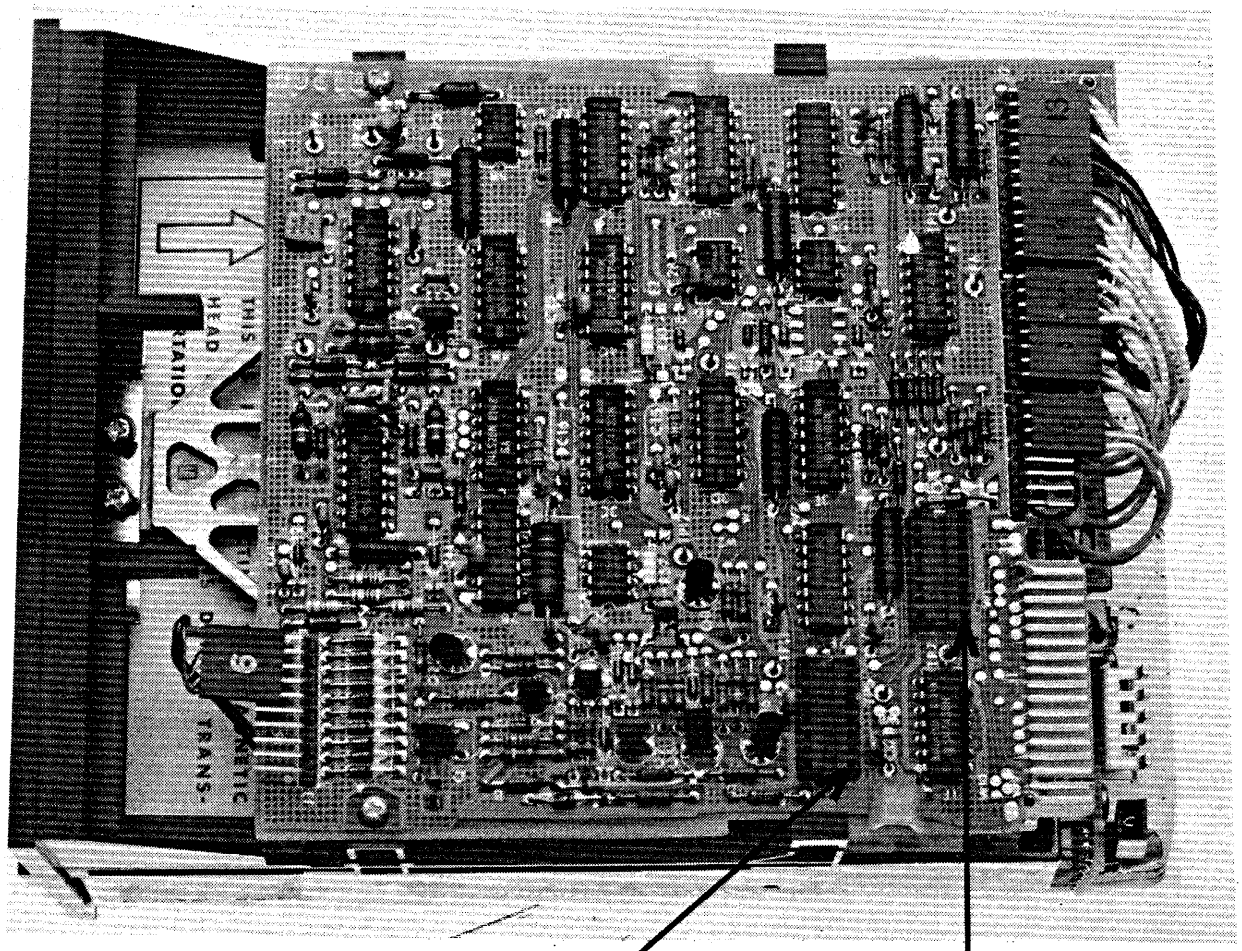
1-4 DISK DRIVES. The disk drives should require no maintenance other than occasional cleaning, using disk cleaning systems available from your local computer supply store. However, if you should work on the disk drives, take care when handling their connectors, as the pins are easily damages. Figure 1-4(A) shows how the disk drives are jumpered. Drive A has pins 1 and 14, and pins 2 and 13 jumpered in location 1E, while Drive B has pins 1 and 14, and pins 3 and 12 jumpered in location 1E. A terminating 150 ohm resistor pack is in location 2F in the drive attached to the last connector at the end of the drive ribbon cable. There is no resistor pack in location 2F in the other drive. The disk drives are shipped with white disk head protectors, and these should be in place in the drives upon receipt of the computer. When returning faulty drives to the factory, the disk drive head protectors must be in place, or else the warranty is void.

1-5 KEYBOARD. The 76-key alphanumeric detachable keyboard is connected to the computer by a four-wire cable (refer to Table 1-5 for pinouts) and is powered by +5 VDC through the cable. An easy way to tell if your keyboard has power or not is to depress the CAPS LOCK key and see if the red LED indicator lights. Use the cable that is supplied with the computer, as different cable lengths cause a mismatch of impedance which can result in problems. Especially do not use phone cords as they are typically not low enough impedance. Incorporated in the keyboard is an audible device which beeps or clicks as indicated (on how to defeat the clicking see The KAYPRO II User's Guide: Sample S-BASIC program in the appendix). The keyboard uses the standard 7-bit ASCII characters, with special functions available by use of the 14-key pad to the right of the standard keys and the four arrow keys.

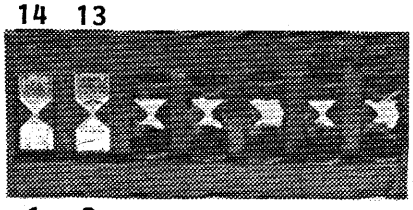
1-6 POWER SUPPLY. The power supply used in the KAYPRO II computer is either a California DC power supply or a Boschert power supply. Both supply plus and minus regulated 12 VDC and +5 VDC and dissipate approximately 60 watts. One important difference between them is that the Cal DC power supply has two five-watt power-dissipating resistors located in the upper corner (these are the 1K & 10K Ohm rectangular ceramic resistors) that normally get quite hot. Therefore, the power supply cables nearby should be tied down behind the power supply circuit board, or damage could result. There are two fuses associated with the power supply: one (2 Amp) accessible on the back panel of the KAYPRO II, and the other (3 Amp) on the power supply board. If work is done on the power supply, make sure that the plug is oriented correctly when reconnected, with the black wire on top and the white and green wires underneath. To change the power supply from 110 VAC to 220 VAC, refer to Figures 1-6 (A) & (B).

FIGURE 1-4 (A)

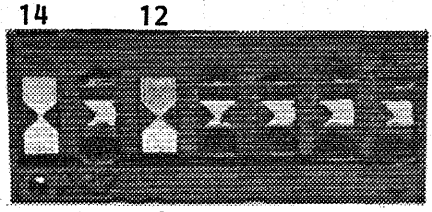
DISK DRIVE JUMPERING



1E For Drive A:
Pins 1-14 + 2-13 jumpered



For Drive B:
Pins 1-14 + 3-12 jumpered



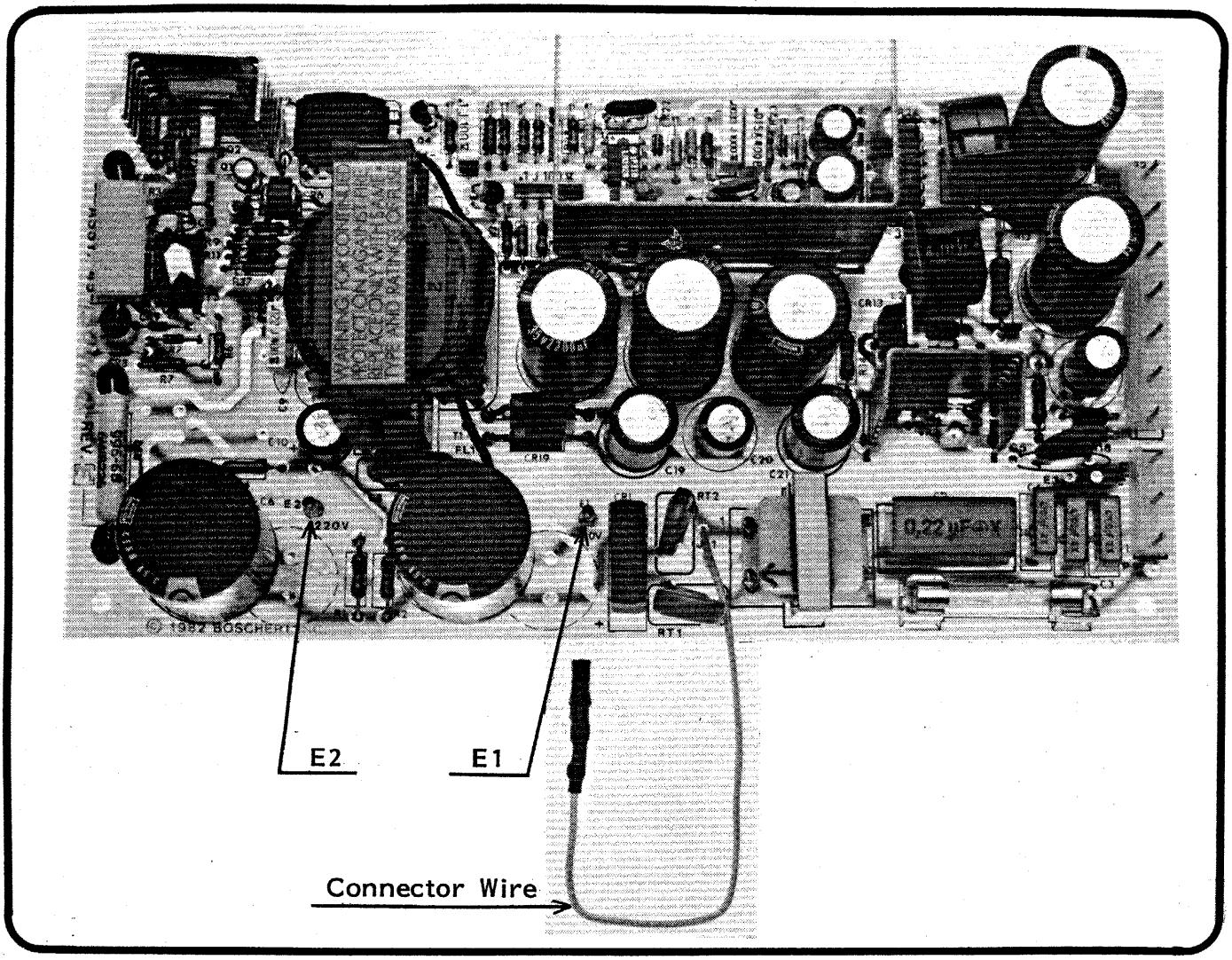
(arrow designates pin #1)

2F For the drive attached to the last connector of the ribbon cable:
Insert 150 ohm resistor pack

For other drive:
No resistor pack

FIGURE 1-6(A)

BOSCHERT POWER SUPPLY

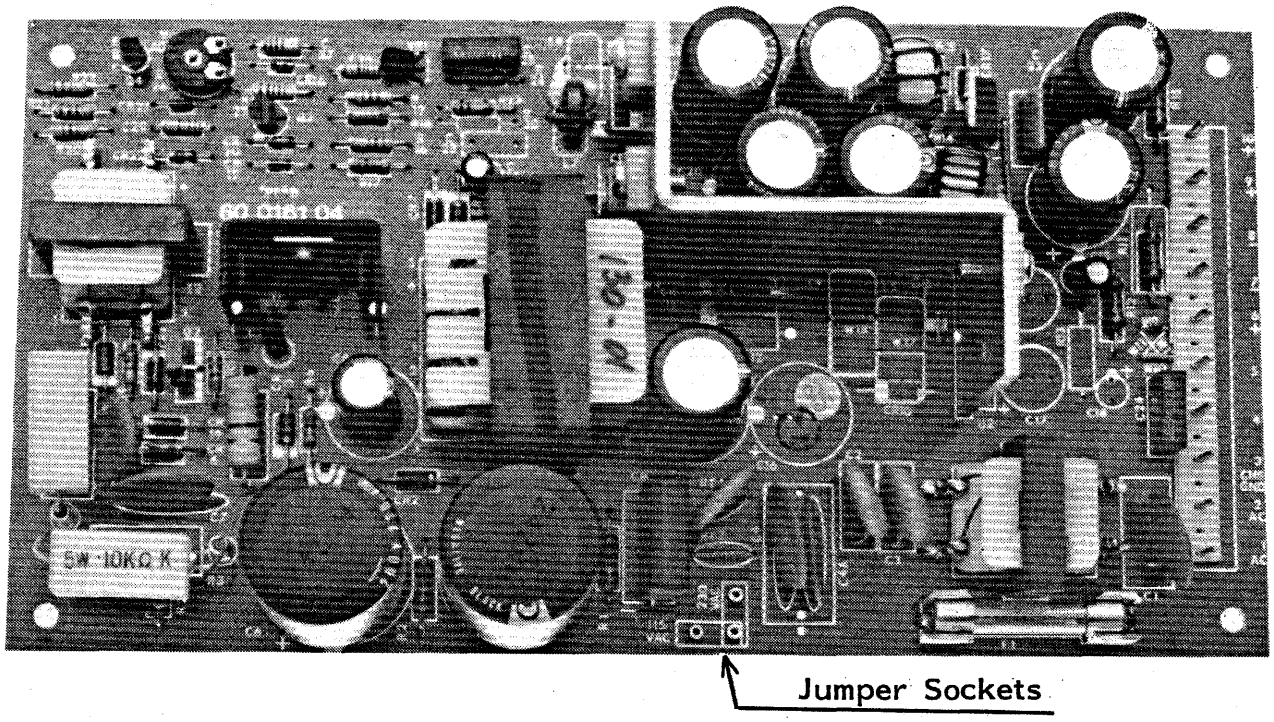


Boschert (identified by "Boschert" printed on the component side of the power supply board at the bottom right above capacitor C2 and the fuse).

To the left of the fuse, past transformer L1, is a six-inch wire with one end soldered to the board at a point labelled "JP1" and the other end attached by a heat shrink covered connector to pin E1 (labelled "110 V"). Remove the connector from E1 and move it about 2-1/2 inches to the left of pin E2 (labelled "220 V").

FIGURE 1-6 (B)

CALIFORNIA DC POWER SUPPLY



CALIFORNIA DC (identified by being a bright blue power supply board with a white sticker printed with "California DC" and model and serial number on the side of the board opposite the components).

With the board oriented so the power supply connector is on the right and the fuse at the bottom right, find the jumper sockets to the left of the fuse and capacitor C4 (there are two versions of California DC power supplies that have been used in the KAYPRO II, and the jumper sockets being described are somewhat different). Remove the jumper from the horizontal pair of jumper sockets (labelled "115 VAC") and insert it into the vertical sockets immediately above (labelled "230 VAC").

Table 1-5. **KEYBOARD CABLE PINOUTS**

J3 Pin 4 (Black) - Keyboard Serial Data Out (to Keyboard) TTL Levels.

J3 Pin 3 (Red) - Ground

J3 Pin 2 (Yellow) - Keyboard Serial Data In (from Keyboard) TTL Levels.

J3 Pin 1 (Green) - +5 VDC

Table 2-2. **CHANGING BAUD RATES**

Hex	Baud rate	Uses
0	50	Not used very often.
1	75	Not used very often.
2	110	Used with some slower printers
3	134.5	Used with some IBM printers
4	150	Not used very often
5	300	Very common (default on reset on KPII)
6	600	Not used very often
7	1200	Used with many printers
8	1800	Not used very often
9	2000	Not used very often
A	2400	Not used very often
B	3600	Not used very often
C	4800	Higher rate for faster printers
D	7200	Not used very often
E	9600	Highest rate normally used.
F	19200	Very high rate (for special purposes)

(Note: The baud rate will be 300 baud on power up or when the reset switch is pressed.)

2-1 REFERENCE INFORMATION. Several figures and tables are included as reference information. They contain a variety of useful information concerning the KAYPRO II, including control key sequences, main board component locations, and video control codes.

2-2 Changing Baud Rate. The KAYPRO II has a RS-232C serial port (J4) to interface with external devices. Both the computer and the external device must be set at the same baud rate (tne speed at which data travels). To get the baud rates listed in Table 2-2, output the HEX value listed to port 0.

2-3 I/O Pin Connections. Table 2-3 lists the pin numbers and designations for the RS-232C connector labeled "J4 SERIAL I/O."

2-4 SERIAL PORT ASSIGNMENTS (refer to Table 2-4).

For modem (serial channel A):

PORT 4 is the Z-80 SIO data port.
PORT 6 is the Z-80 SIO control and status port.

Received character available is obtained by testing bit 0 of the status port; Transmit Buffer Empty is obtained by testing bit 2 of the status port. Other details can be found in the Z-80 documentation available from Zilog.

For defeating handshaking on the RS-232C connector:
Pins 5 and 8 are jumpered to pin 6.

To tell CP/M to reconfigure output from parallel to serial interface, enter on keyboard the following:

STAT LST:=TTY: (This process can be made permanent on a diskette by using CONFIG.)

The serial output is an 8-bit word with one start, one stop, and no parity.

Table 2-3

SERIAL I/O PINOUTS

Pin No.	Designation	Direction
1	Chassis Ground	N/A
2	Transmitted Data	FROM Computer
3	Received Data	TO Computer
4	Request to Send	FROM Computer
5	Clear to Send	TO Computer
6	Data Set Ready	Pulled Up To +5 VDC
7	Logic Ground	N/A
8	Data Carrier Detect	TO Computer
20	Data Terminal Ready	FROM Computer

Other pin assignments are not supported

Table 2-4

PORT ASSIGNMENTS

Hex

0 = channel A baud rate port
4 = Serial channel A data port
5 = Serial channel B data port
6 = Serial channel A control/status port
7 = Serial channel B control/status port
8 = Parallel printer data port
1C = System bit-control port

2-5 **PROBLEMS AND SOLUTIONS**

The following is a handy guide for solving problems encountered with the KAYPRO II. These are not absolute solutions, but rather suggestions.

SYMPTOM	CAUSES AND FIX
VIDEO	
1) Raster lines, "gassy tube" "brightness changes."	1) Bad video board or tube 2) Bad harness
2) No video	1) U15 bad 2) Bad CRT assembly 3) Other mainboard problems(U42,e.g.)
3) Multiple lines on video	1) Bad mainboard (problem in video ckt.) Replace mainboard
KEYBOARD	
1) No response at all	1) U78 Bad 2) Bad harness 3) Bad cable 4) Bad keyboard assembly
2) Multiple wrong CTRL characters on screen, either constant or intermittent or when warm	1) U78 bad
3) Keys with wrong caps	1) Swap them
4) Fuzzy, stretched-out video	1) U1 bad 2) U2 on mainboard bad
DISKS(possible need for head cleaning on all of these, also the KAYPRO II shouldn't be operated in an ambient temperature of more than 75 degrees F, or disk errors could result.	
1) Bad sector message - constant	1) Bad diskette
2) Won't format or do other utilities on "B"	1) Bad B drive 2) Bad mainboard (U82,U88)
3) Intermittent or multiple Read/Write errors on "A" when copying	1) Exchange power supply 2) Bad drive
4) Slow response to console input	1) U82 bad 2) U88 bad 3) Bad diskette

SYMPTOMS	CAUSES AND FIX
DISKS continued.	
5) Multiple errors on "B" during format and/or copy or, won't format when warm	1) Poor quality diskette 2) Bad diskette 3) Replace board or U71 bad 4) U82 bad 5) U88 bad 6) Bad drive "B" 7) Bad power supply
6) Boots, "won't read diskette" message (sometimes only when warm)	1) Bad "A" drive 2) Bad U88 3) Bad U82 4) Bad monitor PROM(U47) 5) Bad mainboard
7) Won't prompt B> when control passed from A	1) Bad "B" drive
8) "Crunching noise on either drive	1) Bad drive (mis-aligned) 2) Inferior diskettes
OTHER	
1) Won't boot; garbage on screen	1) Bad mainboard
2) As above and drive lights flashing, on/off lights flashing	1) Power supply bad or shorted
3) Machine works short time-- then dies (no boot, no reset)	1) U88 bad

When suspecting bad video, put two computers back to back and swap video cables from one to the other. This will help determine where the problem exists.

When the problem is with the disk drives, keep in mind that it may look like a bad drive, but it may be due to something else. It is best to approach any problem in a logical manner. First, check to see if the Read/Write protect slot on your diskette is taped. If it is, then you won't be able to write onto the diskette. Second, your diskette may be bad, so try a known good one. Next, if you suspect a disk drive, then you can restrap them to narrow down the problem (i.e. change "B" to "A" and vice versa). See paragraph 1-4 for more information. Check to see if the drive is turning inside. Also, are the LED s on or not? All of this will help determine where the problem may be.

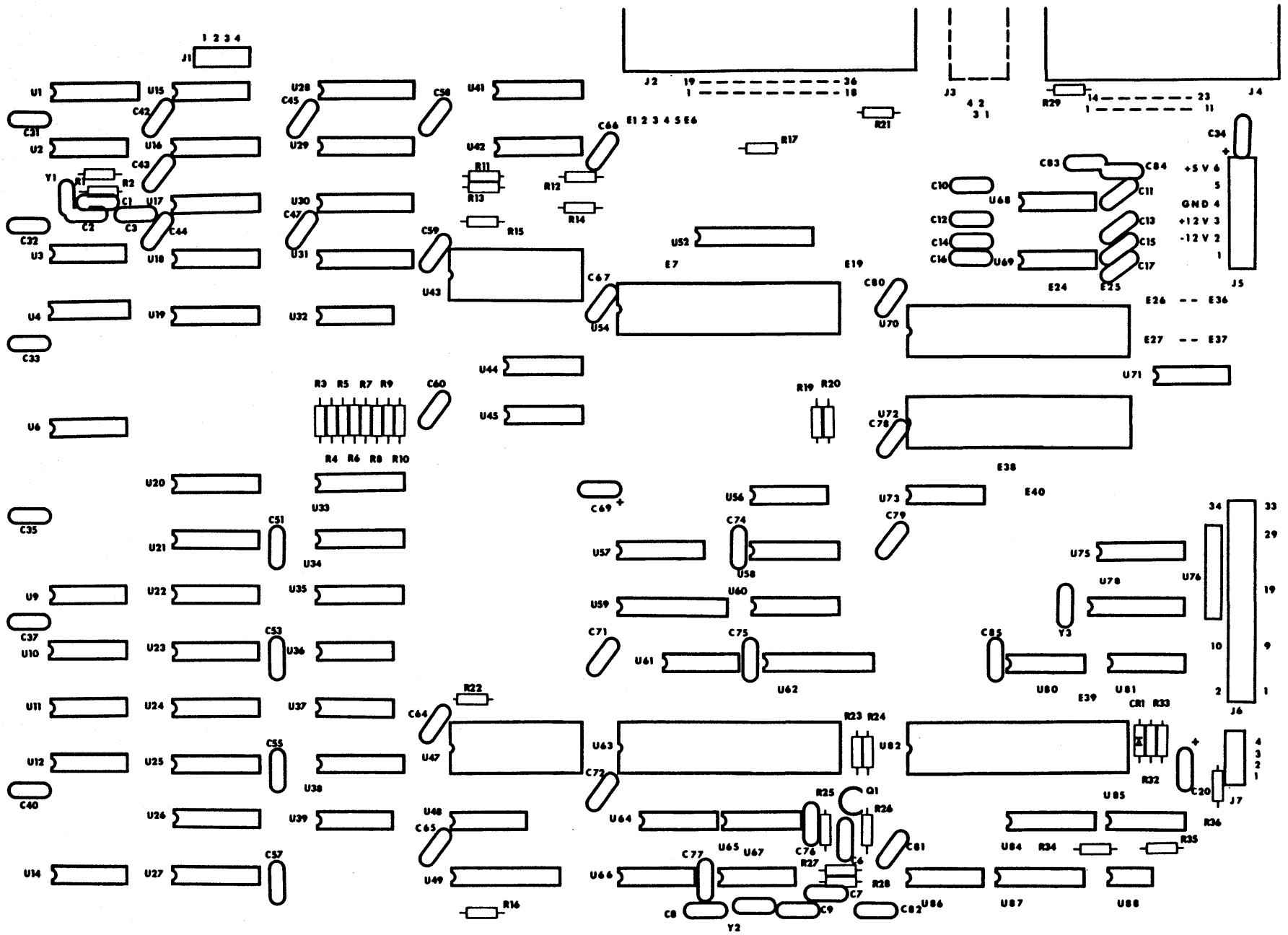

J1
J2
J3
J4
J5
J6
J7
U1
U2
U3
U4
U6
U9
U10
U11
U12
U14
U15
U16
U17
U18
U19
U20
U21
U22
U23
U24
U25
U26
U27
U28
U29
U30
U31
U32
U33
U34
U35
U36
U37
U38
U39
U41
U42
U43
U44
U45
U47
U48
U49
U52
U54
U56
U57
U58
U59
U60
U61
U62
U63
U64
U65
U66
U67
U68
U69
U70
U71
U72
U73
U75
U76
U78
U80
U81
U82
U84
U85
U86
U87
U88
Y1
Y2
Y3
Q1
CR1
R1
R2
R3
R4
R5
R6
R7
R8
R9
R10
R11
R12
R13
R14
R15
R16
R17
R19
R20
R21
R22
R23
R24
R25
R26
R27
R28
R29
R32
R33
R34
R35
R36
C1
C2
C3
C4
C5
C6
C7
C8
C9
C10
C11
C12
C13
C14
C15
C16
C17
C20
C31
C32
C33
C34
C35
C37
C40
C42
C43
C44
C45
C47
C51
C53
C55
C57
C58
C59
C60
C64
C65
C66
C67
C69
C71
C72
C74
C75
C76
C77
C78
C79
C80
C81
C82
C83
C84
C85
E1 2 3 4 5 E6
E7
E19
E24
E25
E26 -- E36
E27 -- E37
E38
E39
E40
1 2 3 4
19 36
1 18
14 23
1 11
4 2
3 1
+5 V 6
5
GND 4
+12 V 3
-12 V 2
1
34 33
29
19
10 9
2 1
4
3
2
1

Figure 2-1

Table 2-1 (A)

MAIN BOARD IC LISTING (81-110B1 Version)

Reference Designation	Description	
U1	74LS161	4-BIT COUNTER
U2, U67*	74HC04	HEX INVERTER C-MOS
U3	74LS290	DECADE COUNTER
U4	74LS10	TRI NAND GATES
U6, U11	74LS393	DUAL BINARY COUNTER
U9, U80	74LS08	QUAD AND GATES
U10, U61	74LS32	QUAD OR GATES
U12, U14, U32	74LS74	DUAL "D" FLIP-FLOP
U15, U39	74LS00	QUAD NAND GATES
U16-U19	74LS157	QUAD 2/1 MUX
U20-U27	MCM 6665	(or equivalent) 64K x 1 DYNAMIC RAM
U28-U31	2114	1K x 4 RAM
U33, U34	74157	QUAD 2/1 MUX
U35, U38	8216	QUAD BI-DIRECTIONAL MUX
U36	74LS20	DUAL NAND GATES
U37, U56, U85	74LS02	QUAD NOR GATES
U41	74S151	8/1 MUX
U42	74LS174	HEX "D" FLIP-FLOP
U43	81-146	CHARACTER GENERATOR EPROM
U44, U45, U64, U65	74LS243	QUAD BUS TRANS
U47	81-149	MONITOR EPROM
U48, U73	74LS04	HEX INVERTER
U49, U52, U62	74LS241	OCTAL BUFFER
U54, U72	Z-80 PIO	
U57, U58, U60	74LS138	3/8 MUX
U59	L4LS373	OCTAL "D" LATCH
U63	Z-80 CPU	
U66	74164	8-BIT SHIFT REGISTER
U68	MC1488	QUAD LINE DRIVER (OUT)
U69	MC1489	QUAD SCHMITT LINE RECEIVER (IN)
U70	Z-80 SIO	
U71	74S04	HEX INVERTER
U78	8116	DUAL PROGRAMMABLE BAUD-RATE GENERATOR
U81	7406	HEX INVERTER OPEN COLLECTOR
U82	FD1793	FLOPPY DISK CONTROLLER
U84	74LS195	4-BIT SHIFT REGISTER
U86	74LS293	4-BIT BINARY COUNTER
U87	74LS390	DUAL DECADE COUNTER
U88	FDC9216	DATA SEPARATOR

*Note: There are some versions of the "B1" main board out in which U2 and U67 are not CMOS ICs, but regular TTL ICs as in the "A" main board (see Table 2-1(B)). This is the way those particular "B1" boards were designed. So read the number on an IC to be certain of the correct replacement.

The following table lists only the differences between the two versions of the main board in regard to integrated circuits--that is, between main board (81-110A) and main board (81-110B1). The main board number can be found on the side of the main board opposite the component side in the corner where the connectors are. The IC s listed below are those which are found on the "A" main board that are different from those similarly designated on the "B1" main board (see Table 2-1 (A)). An asterisk "*" following an IC designation indicates that chip is present on "A" main board, but not on the "B1" main board.

Reference Designation		Description
U2	74S04	HEX INVERTER
U4	74LS174	HEX "D" FLIP-FLOP
U5*, U8*	74LS283	4-BIT BINARY ADDER
U13*	74LS10	TRI NAND GATES
U15	74LS393	DUAL BINARY COUNTER
U50*, U75*, U77*	74LS123	DUAL MONOSTABLE MULTIVIBRATOR
U51*	74LS00	QUAD NAND GATES
U52 , U53*	74LS243	QUAD BUS TRANSCEIVER
U67, U79*	74LS04	HEX INVERTER
U71, U85	74LS14	SCHMITT TRIGGER
U74*	74LS74	DUAL "D" FLIP-FLOP
U82	FD1791	FLOPPY DISK CONTROLLER
U83*, U84	74LS242	QUAD INVERTING TRANSCEIVER

Table 2-1 (B)

CHIP DIFFERENCES BETWEEN MAIN BOARD VERSIONS "A" AND "B1"

FIGURE 2-3(A)

SYSTEM PORT & I/O SELECT

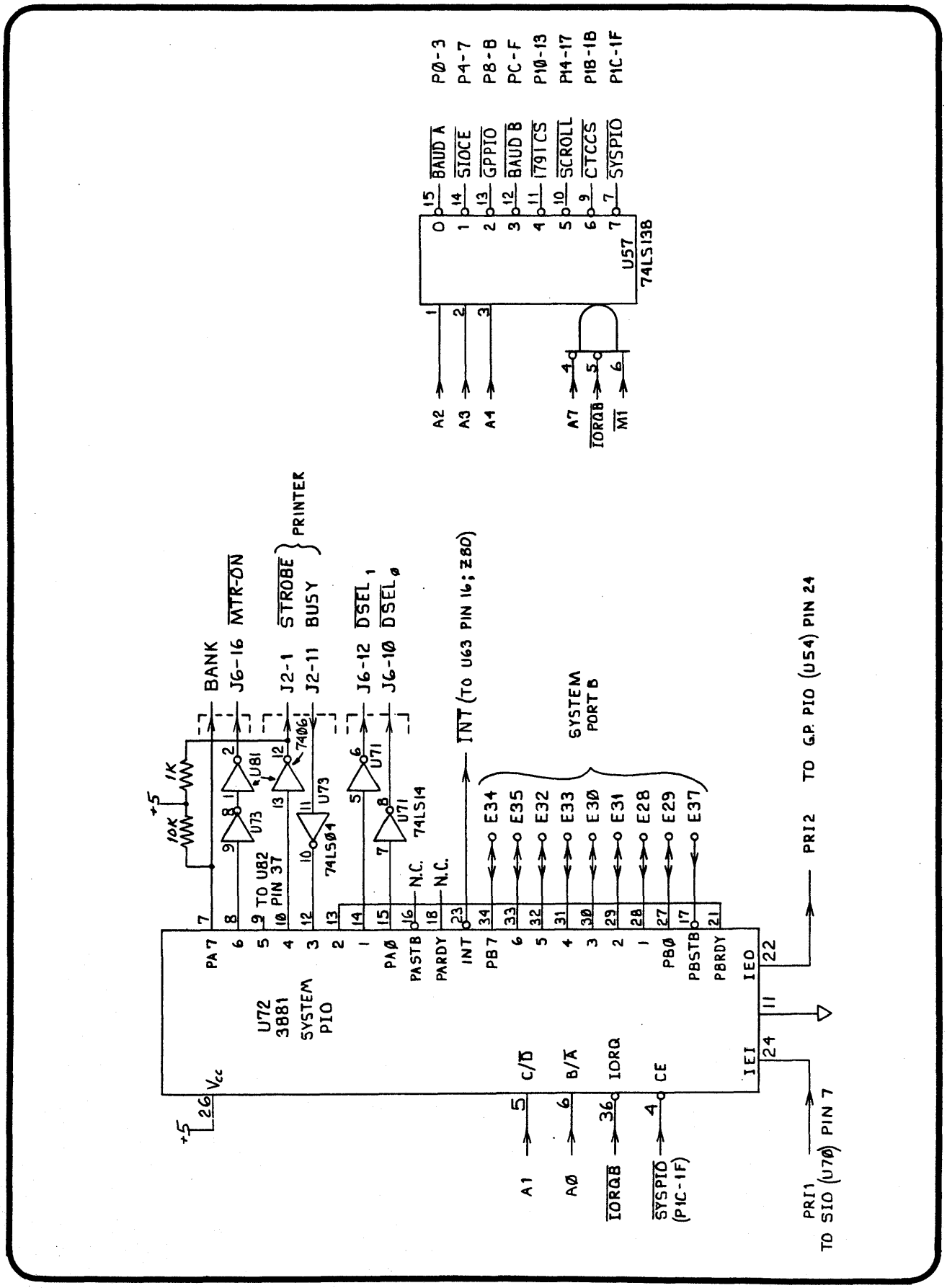


FIGURE 2-3(B)

SERIAL PORT

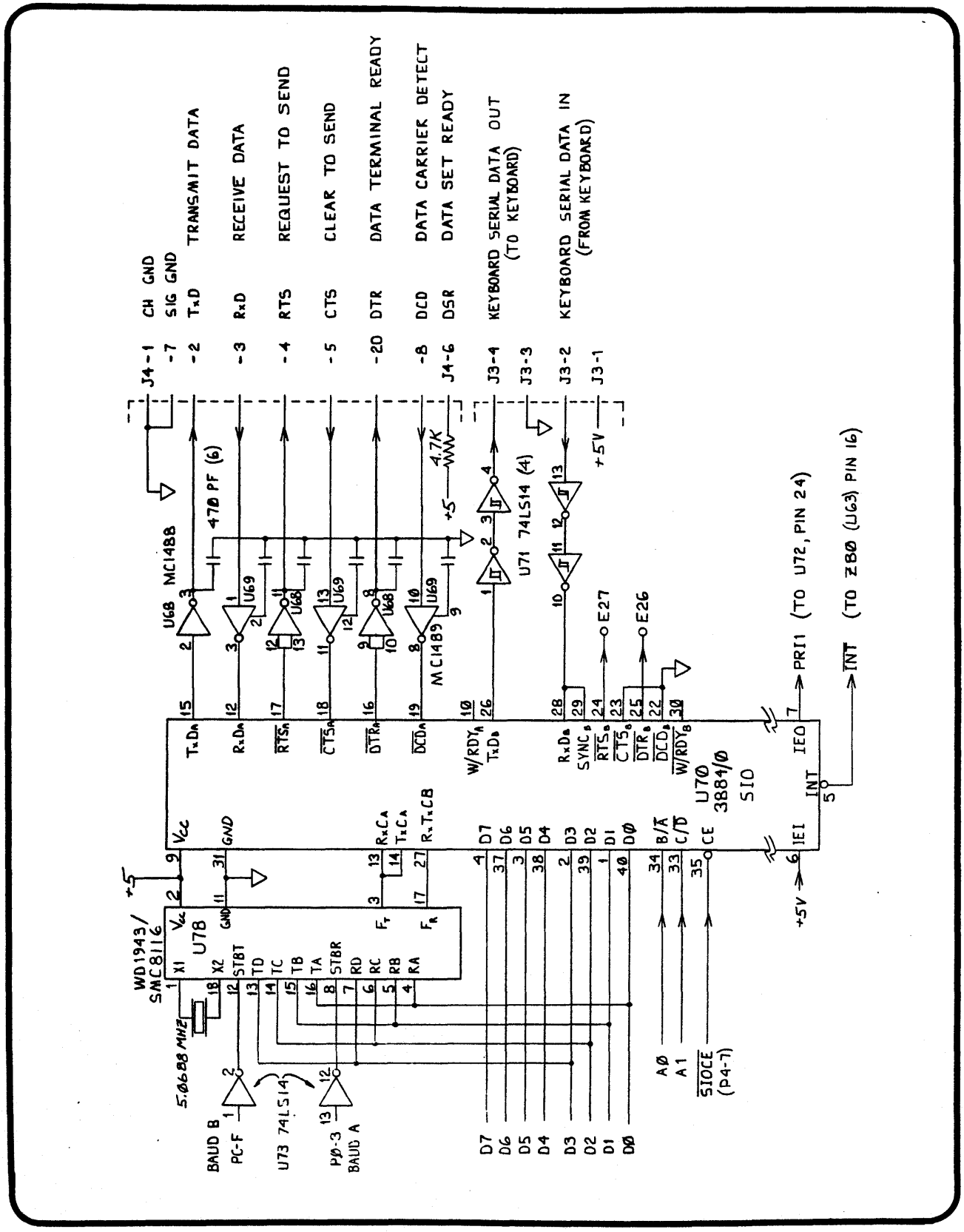


FIGURE 2-3(C)

PRINTER PORT

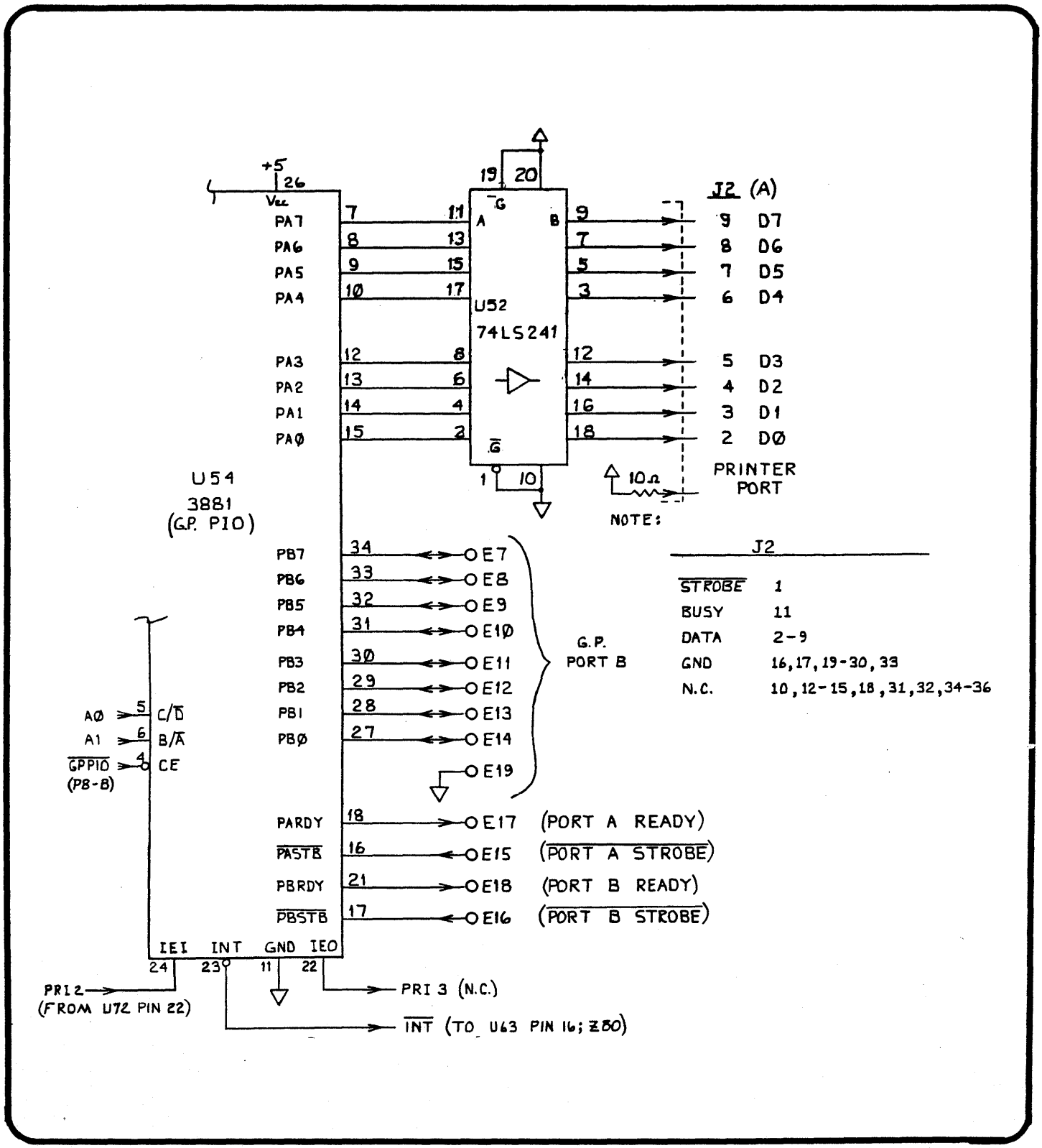
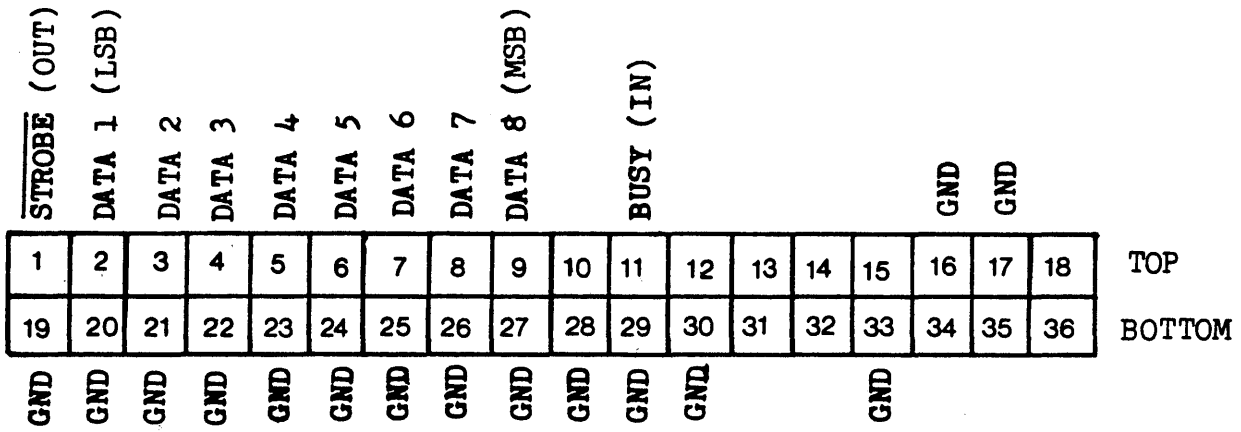


FIGURE 2-3(D)

CONNECTOR J-2
CENTRONICS PRINTER INTERFACE



CONNECTOR J-4
RS-232C INTERFACE

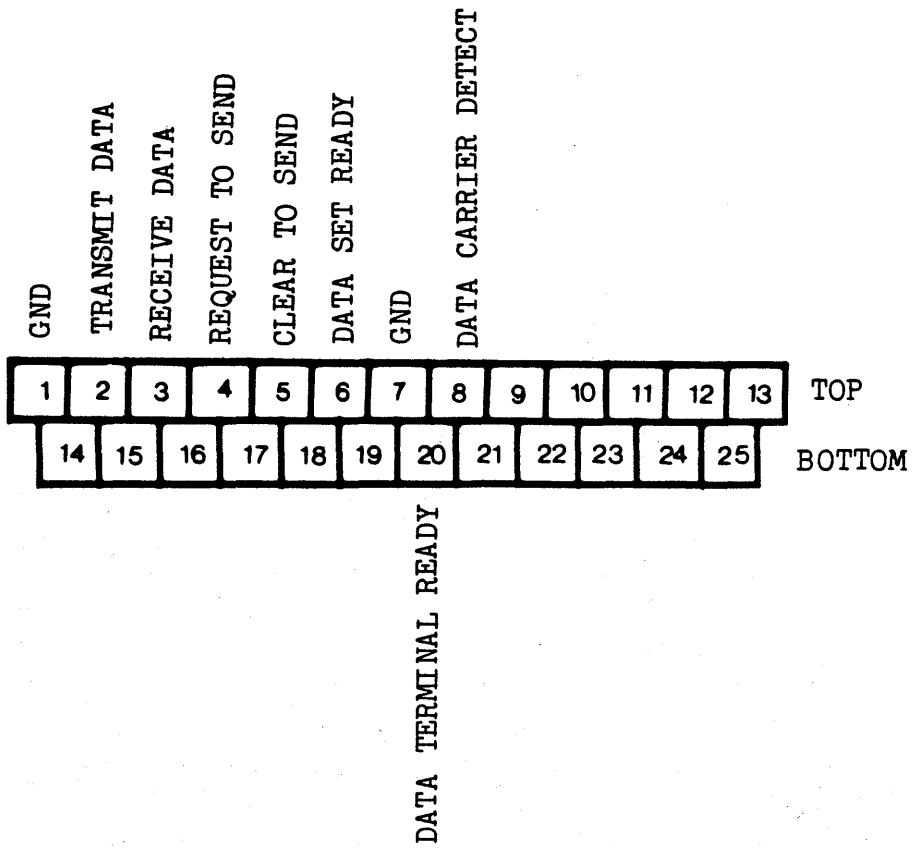


FIGURE 2-5(A)

SERIAL DEVICE

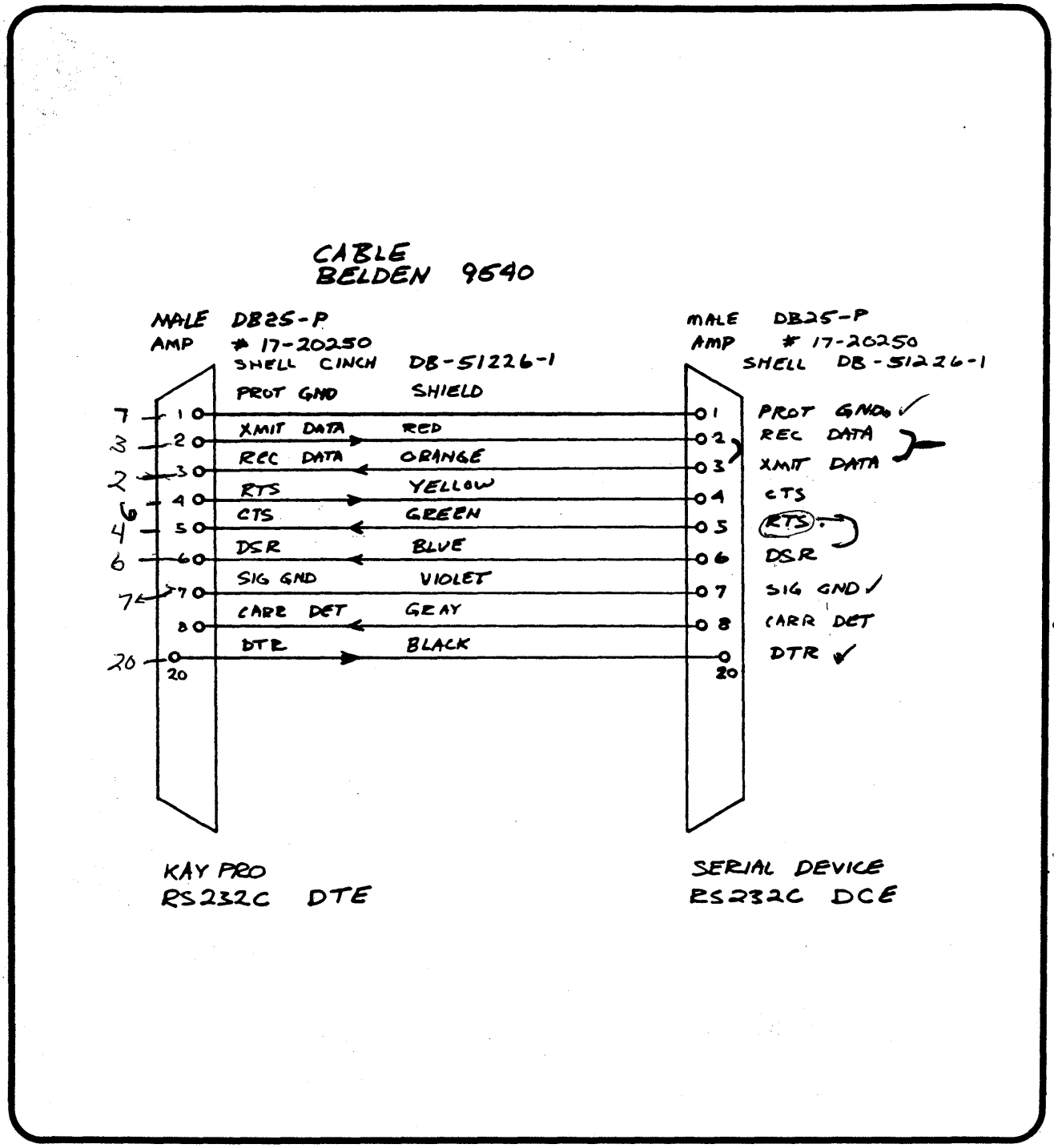


FIGURE 2-5(B)

CENTRONICS DEVICE

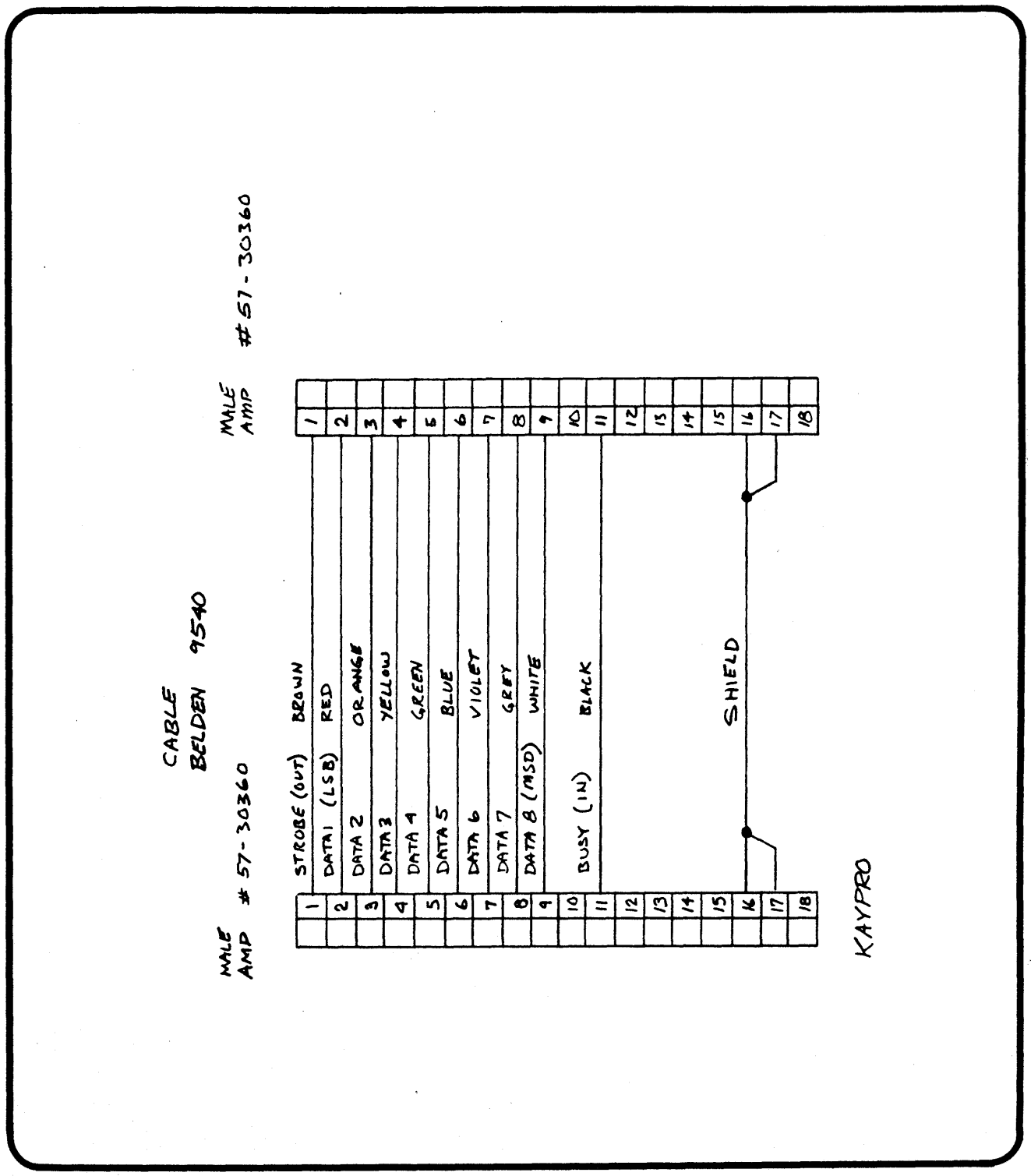


FIGURE 2-3(C)

INTEGRAL DATA SYSTEMS

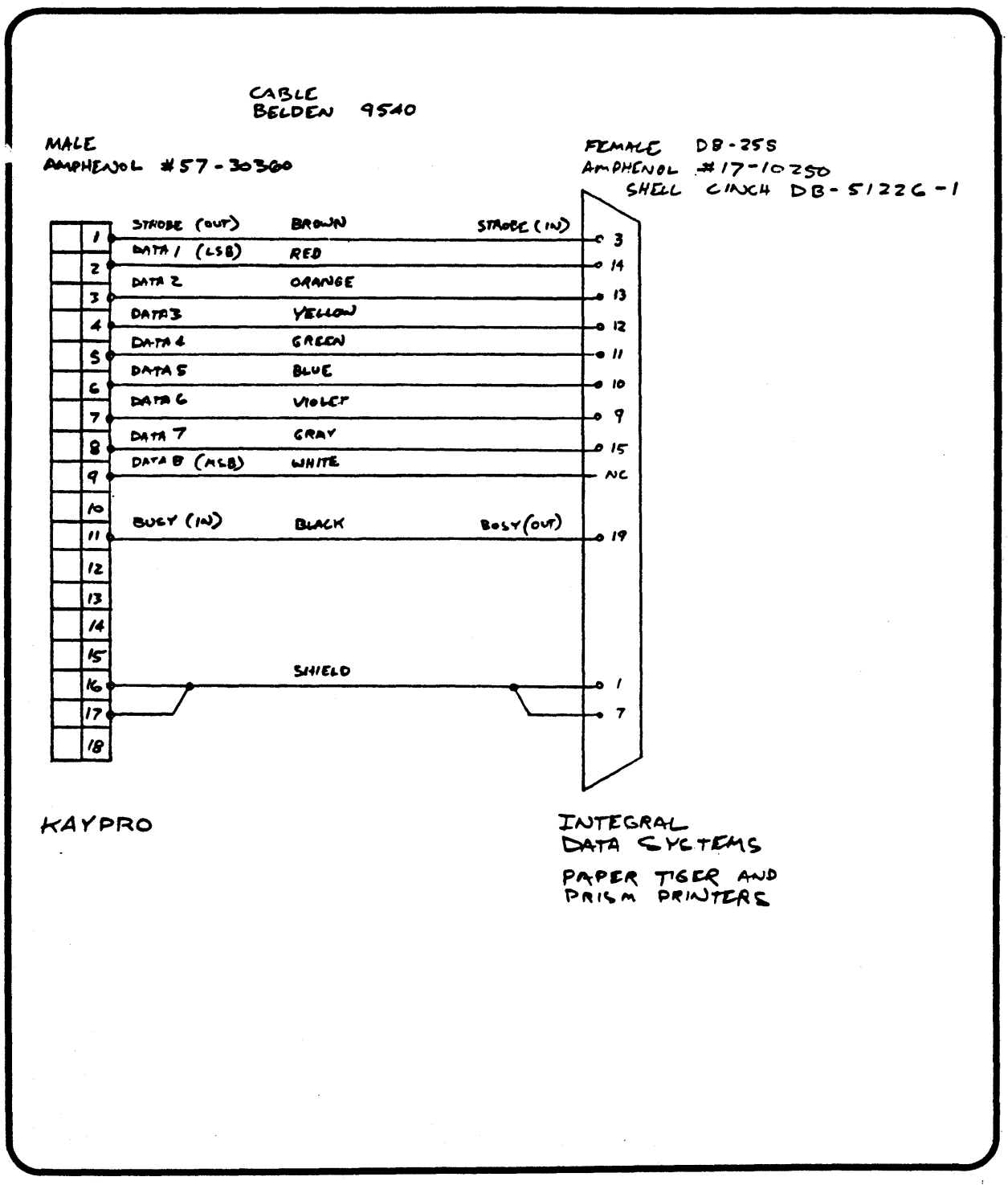


Table 2-5

Technical Documentation
KAYPRO II Decimal Equivalents of Characters

32		33	!	34	"	35	#	36	$	37	%	38	&	39	'
40	(	41	)	42	*	43	+	44	,	45	-	46	.	47	/
48	0	49	1	50	2	51	3	52	4	53	5	54	6	55	7
56	8	57	9	58	:	59	;	60	<	61	=	62	>	63	?
64	@	65	A	66	B	67	C	68	D	69	E	70	F	71	G
72	H	73	I	74	J	75	K	76	L	77	M	78	N	79	O
80	P	81	Q	82	R	83	S	84	T	85	U	86	V	87	W
88	X	89	Y	90	Z	91	[	92	\	93	]	94	^	95	_
96	'	97	a	98	b	99	c	100	d	101	e	102	f	103	g
104	h	105	i	106	j	107	k	108	l	109	m	110	n	111	o
112	p	113	q	114	r	115	s	116	t	117	u	118	v	119	w
120	x	121	y	122	z	123	{	124	¦	125	}	126	~	127	
128		129	α	130	β	131	⅞	132	δ	133	∈	134	φ	135	γ
136	θ	137	ι	138	σ	139	κ	140	λ	141	μ	142	ν	143	ω
144	π	145	η	146	ρ	147	Σ	148	τ	149	η	150	ψ	151	≠
152	Ξ	153	Ω	154	ξ	155	{	156	¦	157	}	158	~	159	

Table 2-6

Non-Linear Systems Inc.

KAYPRO II TECHNICAL NOTE: Video software driver

The KAYPRO II video section was designed to imitate the control sequences of a Lear-Siegler ADM-3A terminal. For most commercial software this means you can "install" or customize the display characteristics by choosing the ADM-3A from an install/config menu. For custom software or those instances where there is no choice of "ADM-3A" on the menu, the following information may help.

****

VIDEO CONTROL SEQUENCES
(Those similar to ADM-3A)

Designation	Dec	[Hex]	Action
Bell	07	[07]	Beep sent to keyboard
Backspace	08	[08]	Non-destructive cursor left
Line Feed	10	(OA]	Cursor down
Vertical Tab	11	[OB]	Cursor up (screen does not scroll)
Form Feed	12	[OC]	Non-destructive cursor right
Return	13	[OD]	
ETB	23	[17]	Clear to End of Screen
Cancel	24	[18]	Clear to End of Line
Substitute	26	[1A]	Clear Screen (also homes cursor)
Record Sep.	30	[1E]	Home cursor

ESCAPE SEQUENCES

ESC A	27,65	Display lower case alphabet
ESC G	27,71	Display lower case as Greek
ESC E	27,69	Insert Line
ESC R	27,82	Delete Line
ESC = (row + 32) (column + 32)		Position cursor
ESC = [y + 20H) [x + 20H]		same

Please note that while the normal ASCII printable characters are displayed on the screen, the operation of control codes not documented above is subject to change, and may not be what your software expects. As an example, the NULL character [OH] will be displayed on the screen as an accent grave (`).

Table 2-7

KAYPRO II SYSTEM MAP

TRACK	SECTOR	MEMORY ADDRESS	SYSGEN IMAGE	CP/M MODULE NAME
00	01	FA00	0900	Cold Boot
00	02	E400	0980	CCP
"	03	E480	0A00	"
"	04	E500	0A80	"
"	05	E580	0B00	"
"	06	E600	0B80	"
"	07	E680	0C00	"
"	08	E700	0C80	"
"	09	E780	0D00	"
"	10	E800	0D80	"
"	11	E880	0E00	"
"	12	E900	0E80	"
"	13	E980	0F00	"
"	14	EA00	0F80	"
"	15	EA80	1000	"
"	16	EB00	1080	"
00	17	EB80	1100	CCP
00	18	EC00	1180	BIOS
"	19	EC80	1200	"
"	20	ED00	1280	"
"	21	ED80	1300	"
"	22	EE00	1380	"
"	23	EE80	1400	"
"	24	EF00	1480	"
"	25	EF80	1500	"
"	26	F000	1580	"
"	27	F080	1600	"
"	28	F100	1680	"
"	29	F180	1700	"
"	30	F200	1780	"
"	31	F280	1800	"
"	32	F300	1880	"
"	33	F380	1900	"
"	34	F400	1980	"
"	35	F480	1A00	"
"	36	F500	1A80	"
"	37	F580	1B00	"
"	38	F600	1B80	"
"	39	F680	1C00	"
"	40	F700	1C80	"
01	17	F780	1D00	"
"	18	F800	1D80	"
"	19	F880	1E00	"
"	20	F900	1E80	"
01	21	F980	1F00	BIOS

continued on next page...

Table 2-7

KAYPRO II SYSTEM MAP (cont.)

TRACK	SECTOR	MEMORY ADDRESS	SYSGEN IMAGE	CP/M MODULE NAME
01	22	FA00	1F80	CBIOS
"	23	FA80	2000	"
"	24	FB00	2080	"
01	25	FB80	2100	CBIOS
01	01-16			Directory
02-39	02-40			Data