

digital

**PDP-12
LIBRARY**

**MARK12 A FORMATTING AND VERIFICATION
PROGRAM FOR UNCERTIFIED TAPES
(VERSION 0)**

**Order DEC-12-YITA-D from Program Library, Digital Equipment
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1. ABSTRACT

MARK12 is used to format and verify uncertified tapes for use on the PDP-12. The formatting is LINCtape format. The option of "STANDARD" (256 word) or a special 129-word format is given. The program formats the tape, writes a pattern in each block, checks the checksum on all blocks, checks all backward block numbers and finally checks all data from the last data block.

2. REQUIREMENTS

2.1 Equipment

PDP-12B or PDP-12A with at least one TUCS tape transport.

2.2 Storage

The program occupies most of core between 04000_8 and 07000_8 and uses the area 00000_8 and 02000_8 for data storage.

3. LOADING PROCEDURE

This program is loaded from a DIAL system tape by typing

```
LOAD MARK12 X
```

where X is the unit number of the system tape.

4. STARTING PROCEDURE

If the version of DIAL used does not automatically start then MARK12 is started by the following procedure:

- a. Be sure processor is stopped; momentarily press the stop switch if necessary.
- b. Press I/O Preset with the mode switch set to LINC.
- c. Press START 20.

5. USAGE AND OPTIONS

When MARK12 is started, the following display will appear on the console scope:

```
MARK12  
  
THIS PROGRAM WILL FORMAT AND CHECK  
LINC TAPES FOR THE PDF-12  
  
SELECT OPTION AND PRESS LINE FEED  
ON THE CONSOLE TELETYPE:  
  
SELECT  
  1          STD. LINC FORMAT  
  P          129 WORD FORMAT
```

The user now presses 1 or P on the console teletype. All other responses are rejected and a response can be changed by typing Rub Out or the new response. After the type of tape is selected and LINE FEED is pressed, the following display will appear:

```
AMOUNT TAPE TO BE  
MARKED ON THE RIGHT  
REEL OF UNIT 1  
  
PLACE UNIT 1 IN  
REMOTE WITH  
WRITE ENABLED, THEN  
  
PRESS THE MARK SWITCH
```

The user does as asked above. The program will examine unit 1 to be sure it is selected with write enabled. Then it will try to set the MARK flip-flop which requires the console switch to be depressed. When all is correct, the tape display will disappear and the tape will move. The process of checking the unit may cause the tape to move slightly; therefore, it is suggested unit 1 be placed in remote just prior to actually marking the tape. There are three complete passes down the tape and back. These are formatting, writing and checking. When the checking process is complete and correct, the following display will appear:

GOOD TAPE

ALLOW MARKED TAPE TO REWIND
THEN SELECT OPTION AND TYPE
LINE FEED ON THE TELETYPE

SELECT

- 1 MARK ANOTHER TAPE
- 2 RESTART DIAL

This means that the tape is good and may be used as desired. Option 1 takes the user back to the first display. Option 2 returns to the Dial system.

If the check was not correct, the following display will appear:

TAPE CHECK FAILED

SELECT

- 1 MARK ANOTHER TAPE
- 2 RESTART DIAL

This means the tape is not to be used. The return options are the same as for a good tape (see Section 6 for a discussion of check failures).

6. MECHANICAL CONSIDERATIONS AND FAILURES

The correct operation as well as formatting of tape requires that the tape travel and path be smooth, clean, and steady. The following items are suggested for most reliable operation:

- a. Be sure heads and guides are cleaned.
- b. Mount reels squarely on hubs.
- c. Before marking a new tape, run it all the way onto the take-up reel and back to the supply reel to insure optimum alignment between guide and reel.
- d. Observe tape motion and be sure the tape is not lifting off the head. If it is, the transports require service.

If there is a check failure and the above items are satisfactory, then the tape is most likely defective.

6.1 Formats

The Standard LINC Format contains 512 data blocks each containing 256 data words. The 129-word format option will generate 1536 data blocks each containing 129 data words. Most all tape programming and usage is and will be with the Standard LINC Format tape. Some special applications that simulate PDP-8 DECTape will have use for 129-word formats.

Although it is not recommended that special formats be widely used, the MARK program is organized in such a way that by minor modification virtually any format can be written. The program listings give detailed information on how to do this.

STANDARD LINC FORMAT

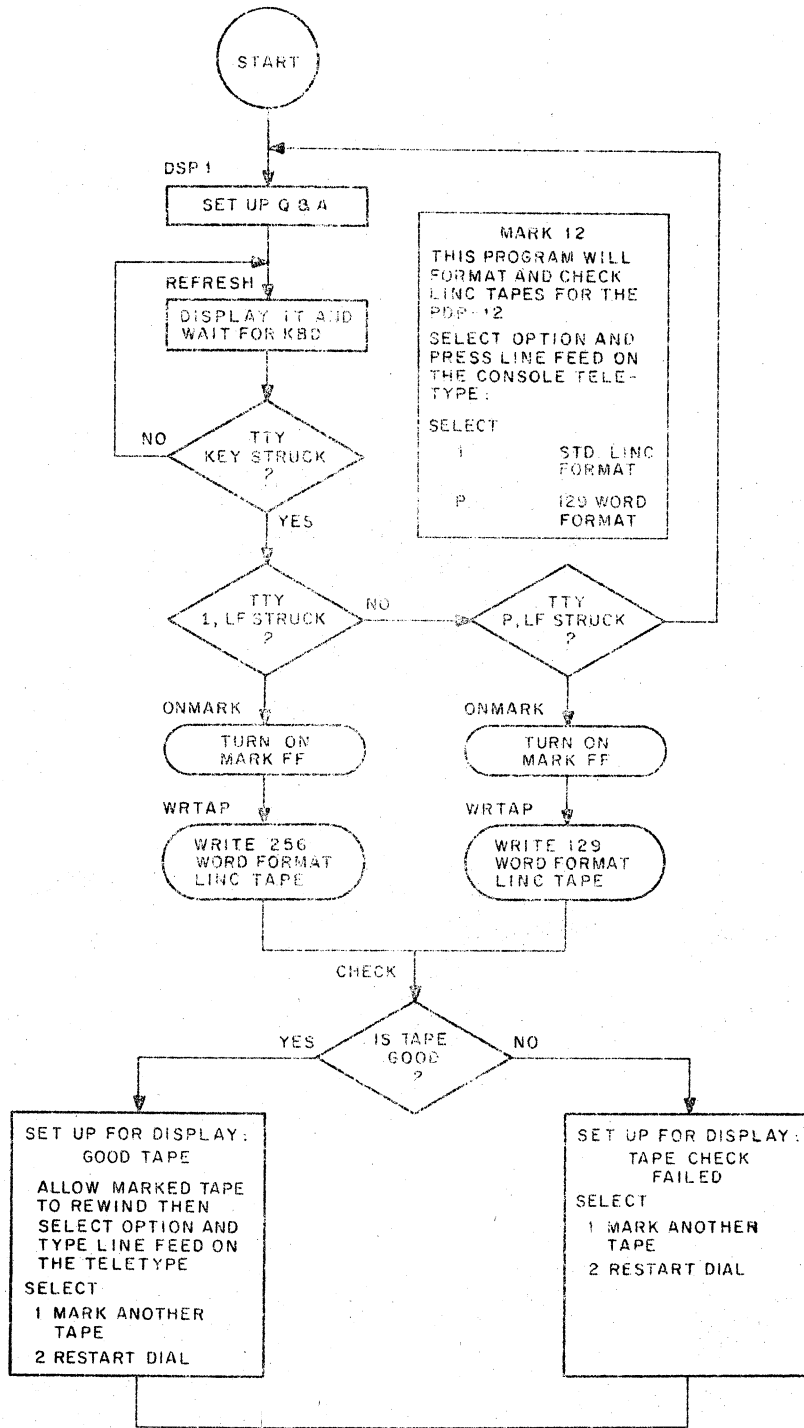
Repeated 532 times	}	1024 WORDS	FRONT END ZONE
		4095 WORDS	FRONT IM ZONE
		1 WORD	FWD BLOCK NUMBER
		1 WORD	GUARD WORD
		255 WORDS	DATA WORD
		1 WORD	FINAL DATA WORD
		3 WORDS	CHECK WORD
		1 WORD	GUARD WORD
		1 WORD	BKWD BLOCK NUMBER
		5 WORDS	IM ZONE
		8 WORDS	FINAL IM ZONE
2048 WORDS	FINAL END ZONE		

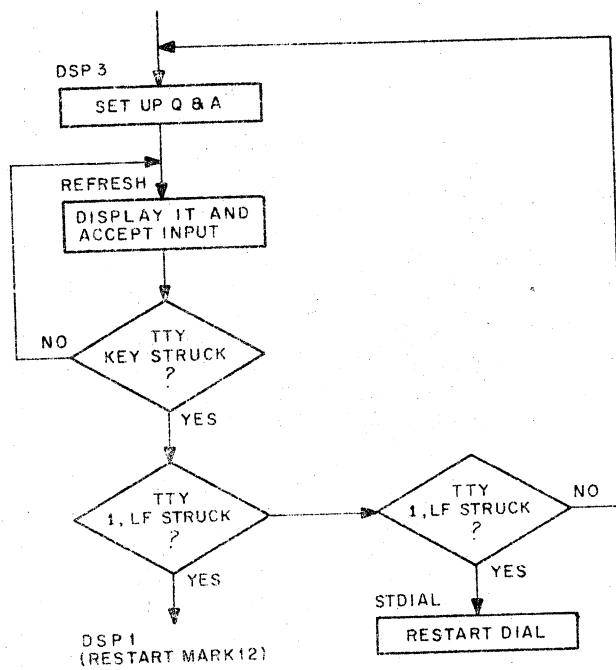
129 WORD FORMAT

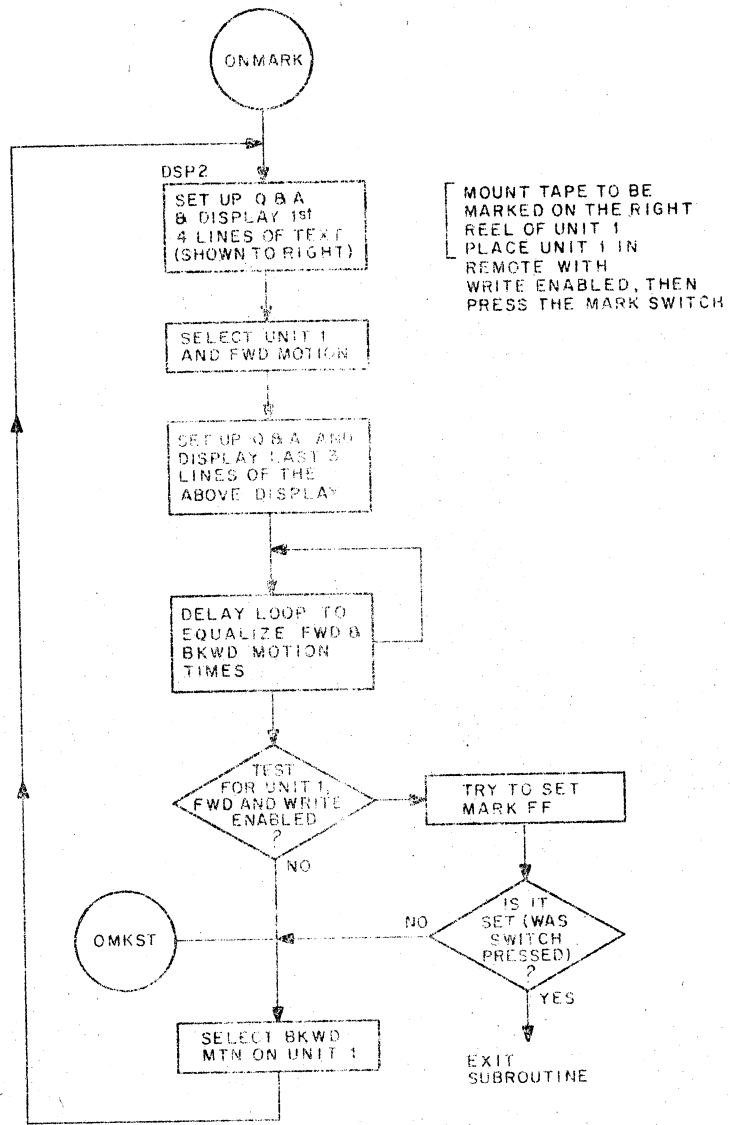
Repeated 1568 times	}	1024 WORDS	FRONT END ZONE
		4095 WORDS	FRONT IM ZONE
		1 WORD	FWD BLOCK NUMBER
		1 WORD	GUARD WORD
		128 WORDS	DATA WORDS
		1 WORD	FINAL DATA WORD
		3 WORDS	CHECK WORDS
		1 WORD	GUARD WORD
		1 WORD	BKWD BLOCK NUMBER
		5 WORDS	IM ZONE
		1023 WORDS	FINAL IM ZONE
1024 WORDS	FINAL EM ZONE		

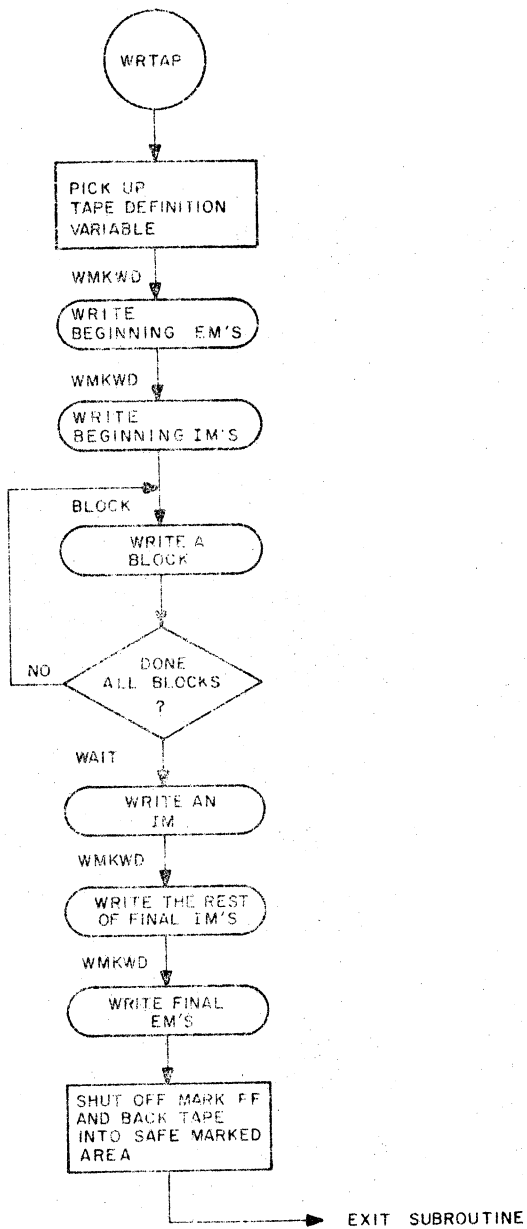
Note there are 8 and 15 data blocks respectively for each format at the front and end of the tape. These allow smooth searching and turn around. They are not used for data.

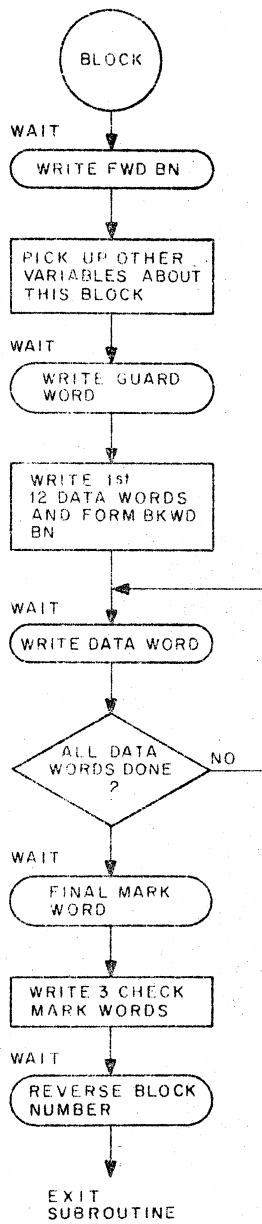
7. FLOW CHARTS

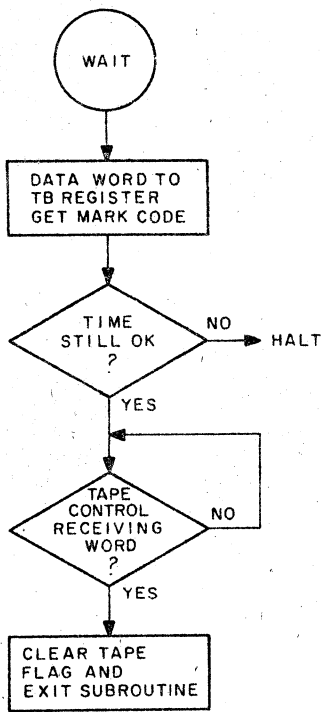
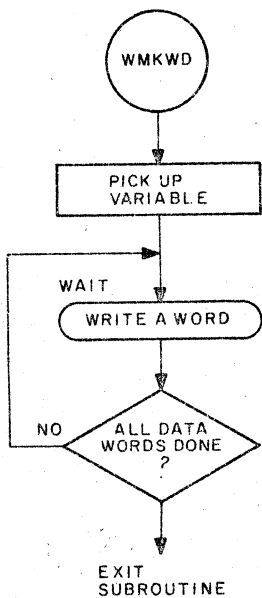












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/MARK PROGRAM FOR PDP-12
/BY R.J.CLAYTON
/5-30-69
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/MAYNARD MASS.

/VERSION MARK12-0

SEGMENT 2

LMODE

*16

0016 0701 STDIAL, 701 /READ A GROUP INST.
0017 7300 7300 /THIS WILL OVERLAY DIAL
/WHICH STARTS AT 4020

DT=2000 /THIS IS A CONSTANT USED
/FOR REFERENCING CHAR TABLES
/IN THE DATA FIELD

/THIS IS THE STARTING POINT OF
/THE MARK PROGRAM. DSP1 IS THE
/FIRST DISPLAY WHERE THE USER
/PICKS THE TYPE OF TAPE TO
/FORMAT

0020 0643 DSP1, LDF 3 /JUST IN CASE
0021 7000 JMP QAINIT /GO TO Q AND A SUBROUT.
0022 2001 DT DS1 /FIRST FRAME
0023 0762 ANS /LOCATION FOR ANS.
0024 6036 JMP DSP1R /COME HERE TO REFRESH

0025 1000 LDA /HERE AFTER LINE FEED
0026 0762 ANS
0027 1420 SHD I
0030 6100 6100
0031 6052 JMP LTAPE /GOOD SELECTION
0032 1420 SHD I
0033 2000 2000
0034 6072 JMP PTAPE/ /ALSO GOOD SELECTION
0035 6020 JMP DSP1 /GO BACK FOR A GOOD
/SELECTION

0036 1000 DSP1R, LDA /COME HERE TO REFRESH
0037 0762 ANS
0040 1420 SHD I
0041 0000 0000 /NO ANS YET
0042 7053 JMP REFRESH
0043 1420 SHD I
0044 6100 6100
0045 7053 JMP REFRESH
0046 1420 SHD I
0047 2000 2000
0050 7053 JMP REFRESH
0051 6020 JMP DSP1 /A WRONG ANSWER HAS
/BEEN GIVEN

0076
0077
0100
0101
0102
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/PROGRAM TO WRITE A
/STANDARD LINC FORMAT TAPE

0252	3202	LTAPE, PDP	
		PMODE	
4253	4313	JMS ONMARK	/GET MARK TURNED ON
4254	4712	JMS I KWRTAP	/GO WRITE THE TAPE
4255	2000	2000	/BEGINING EM
4256	7777	7777	/BEGINING IM
4257	7422	0400	/256 WORDS PER BLOCK
4260	7772	-10	/FIRST FWD BLK NUMB
4261	7772	-10	/FIRST BKWD BLK NUMB
4262	1224	1024	/TOTAL NUMBER OF BLOCKS
			/INCLUDES A FEW AT FRONT
			/AND BACK FOR TURN AROUND
4263	2025	0005	/NO OF IM BETWEEN BLOCKS
4264	3010	0010	/NUMBER OF FINAL IM CODES
4265	4002	4000	/NUMBER OF FINAL EM CODES
4266	6141	LINC	/TO LINC MODE
		LDA I	
0067	1020	1000	/NO OF BLOCKS TO CHECK
0070	1000	JMP CHECK	/CHECK WILL FINISH
0071	6635		/THE JOB

SHORT TAPE

0004	BEG. EMS
0004	BEG. IMS
0400	WDS/BLOCK
7772	1ST FWD BLK
7772	1ST BWD BLK
1014	TOTAL BLKS
0005	IMS BETW BLKS
0004	FINAL IMS
0004	FINAL EMS

/PROGRAM TO WRITE 129 WORD
/LINC FORMAT TAPE FOR TCO1
/SIMULATION

0072	0002	PTAPE, PDP	
		PMODE	
4073	4313	JMS ONMARK	
4074	4712	JMS I KWRTAP	
4075	2000	2000	
4076	7777	7777	
4077	0201	0201	
4100	7760	-20	
4101	7763	-15	
			/THE OFFSET HELPS SEARCH
			/ON TAPE WITH SHORT BLOCKS
4102	3240	3040	
4103	0005	0005	
4104	1777	1777	
4105	2000	2000	
4106	6141	LINC	
		LDA I	
0107	1020	3000	/NUMBER OF DATA BLOCKS
0110	3000		
0111	6635	JMP CHECK	

JR March 19, 71
WITH THE NEW VERSION FOR
MARKING LONG LINC TAPES

THE FOLLOWING CHANGES MARK
BLOCKS Ø - 1777 INSTEAD OF
Ø - 1577.

<u>ABS LOC</u>	<u>WAS</u>	<u>CH. TO</u>
4524	1624	2024
4532	1600	2000

0112 4231 KWRTAP, WRTAP /CROSS PAGE REF.

0175					
0176					
0177					
0200					
0201					/SUBROUTINE TO TEST TAPE TRANSPORTS
0202					/AND MARK SWITCH TO DETERMINE THAT
0203					/IT IS OK TO MARK TAPE.
0204					/MUST HAVE UNIT 1 SELECTED
0205					/MUST HAVE UNIT 1 WRITE ENABLED
0206					/MUST THEN PRESS MARK SWITCH
0207					/SUBROUTINE WILL PREVENT BASHING
0210					/TAPE ON UNIT 0
0211					
0212					
0213					Pmode
0214	4113	0000			ONMARK, 0000
0215	4114	0141			LINC
0216					Lmode
0217					
0220					
0221	0115	0000	DSP2,	JMP GAINIT	/USE 0 AND A ROUTINE
0222	0116	0157	DT DS2A		/AS A DISPLAY ROUTINE
0223					/THIS WILL BE THE FIRST
0224					/HALF OF THE DISPLAY, IT
0225					/IS DONE WITH THE TAPE
0226					/GOING BACKWARD.
0227	0117	0762			ANS
0230	0120	0016			NOP
0231	0121	1020			LDA I
0232	0122	0144			0144
0233					/SET UP FOR UNIT 1 AND
0234					/FORWARD MOTION
0235	0123	0520			IOB
0236	0124	0152			0152
0237	0125	0000			JMP GAINIT
0240	0126	0230			DT DS2B
0241	0127	0762			ANS
0242	0137	0016			NOP
0243					
0244					
0245	0131	0064			SET I 4
0246	0132	0677			-100
0247	0133	0224			XSK I 4
0250	0134	0133			JMP .-1
0251					/THIS LOOP EQUALIZES
0252	0135	1020			LDA I
0253	0136	0000			5000
0254	0137	0500			/SELECT MAINT REG TO
0255	0140	0151			IOB
0256	0141	0011			/LOOK AT UNITS AND MTN
0257	0142	0500			6151
0260	0143	0154			CLR
0261	0144	1460			IOB
0262	0145	0777			6154
0263	0146	0150			/SHOULD HAVE UNIT 1,
0264	0147	0155			SAE I
0265					/WRITE ENABLED, AND
0266					5777
0267					/FWD MOTION
0270					JMP .+2
0271					/NOT YET
0272					JMP MARKSW
0273					
0274					
0275					
0276	0150	1020	ONKST,	LDA I	
0277	0151	0024		0024	/START BACKWARD MOTION
0278	0152	0500		IOB	
0279	0153	0152		6152	
0280	0154	0115		JMP DSP2	/GO BACK AND TRY AGAIN

0274	0155	1020	MARKSW.	LDA I	
0275	0156	0220		AXO	/TRY TO SET-MARK FLOP
0276	0157	0201		CLR	
0277	0160	0211		MSC I 1	/READ IT BACK
0320	0161	0221		ROL I 5	
0301	0162	0205		LZE I	
0302	0163	0472		JMP OMKST	/NOT YET PRESSED
0303	0164	0157			
0334					
0305	0155	0202	RET2,	POP	/TO POPB MODE
0306					/MARK FLIP FLOP IS ON
0307					/AND TAPE IS FWD MTN.
0310			PMODE		
0311	4166	0220		CLA	
0312	4167	0151		6151	/SET TAPE MAINT REG.
0313					/SO 10T 6154 WILL
0314					/TRANSFER AC TO 1B
0315	4170	0213		JMP I ONMARK	
0316					
0317					
0320					
0321			*4200		
0322					
0323				/DSP3	
0324				/THIS ROUTINE IS USED AFTER CHECKING	
0325				/A TAPE THAT THIS PROGRAM MARKED	
0326				/FROM HERE THE USER CALLS DIAL OR	
0327				/MARKS ANOTHER TAPE	
0330					
0331			LMODE		
0332	0200	7000	DSP3,	JMP DAINIT	/TO DISPLAY ROUTINE
0333	0201	2276	DT DS3		/CHECKING ROUTINE SETS
0334					/THIS LOCATION FOR FRAME
0335					/3 OR FRAME 4
0336	0202	0762		ANS	
0337	0203	0215		JMP DSP3R	/REFRESH RETURN
0340	0204	1000		LDA	/RETURN FROM LINE FEED
0341	0205	0762		ANS	
0342	0206	1420		SHD I	/NOW TEST THE ANSWER
0343	0207	0100		6100	
0344	0210	0020		JMP DSP1	
0345	0211	1420		SHD I	
0346	0212	0200		6200	
0347	0213	0016		JMP STDIAL	
0350	0214	0200		JMP DSP3	
0351					
0352	0215	1000	DSP3R,	LDA	/REJECT WRONG ANSWERS
0353	0216	0762		ANS	
0354	0217	1420		SHD I	
0355	0220	0100		6100	
0356	0221	7053		JMP REFRESH	
0357	0222	1420		SHD I	
0360	0223	0200		6200	
0361	0224	7053		JMP REFRESH	
0362	0225	1420		SHD I	
0363	0226	0000		0000	
0364	0227	7053		JMP REFRESH	
0365	0230	0200		JMP DSP3	/A BAD ANSWER WAS GIVEN
0366					
0367					
0370					
0371					
0372			PMODE		

```

0373
0374
0375
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0421
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0412
0411

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```

/SUBROUTINE TO WRITE TAPE
/CALLING SEQUENCE:
/JMS WRTAP
/NO OF BEGINING END MARKS
/NO OF BEGINING IM
/NUMBER OF WORDS OF DATA
/FIRST FWD BLOCK NUMBER
/FIRST BKWD BLOCK NUMBER
/NUMBER OF BLOCKS
/NO OF IM BETWEEN BLOCKS
/NO OF FINAL IM
/NO OF FINAL EM
/RETURN 10TH WORD AFTER JMS

```

```

0412      4231  0000  WRTAP,  0000
0413      4232  7200          CLA
0414      4233  1631          TAD I WRTAP
0415      4234  2231          ISZ WRTAP
0416      4235  3345          DCA KIEM          /SAVE NO OF END MARKS
0417      4236  1631          TAD I WRTAP
0420      4237  2231          ISZ WRTAP
0421      4240  3346          DCA KIIM
0422      4241  1631          TAD I WRTAP
0423      4242  2231          ISZ WRTAP
0424      4243  3274          DCA WRLOOP+2      /SET UP NO OF WRDS.
0425      4244  1631          TAD I WRTAP
0426      4245  2231          ISZ WRTAP
0427      4246  3343          DCA FBLK          /SET FWD BLOCK NO.
0432      4247  1631          TAD I WRTAP
0431      4250  2231          ISZ WRTAP
0432      4251  3275          DCA WRLOOP+3      /SET BKWD BLOCK NO.
0433      4252  1631          TAD I WRTAP
0434      4253  2231          ISZ WRTAP
0435      4254  7040          CMA
0436      4255  3344          DCA BLKCNT
0437
0440      4256  1350          TAD KHERE          /GO SYNC WITH TAPE WORD
0441      4257  3747          DCA I KWAIT1
0442      4260  1351          TAD K0200          /CLEAR TAPE WORD FLAG
0443      4261  6152          6152          /IOT TO CLEAR
0444      4262  6141          LINC
0445      4263  6607          6000 FRSTGO      /THIS IS LINC JMP INST.
0446
0447
0451      4264  1345  HERE,  TAD KIEM          /NOW WRITE FIRST END MKS.
0451      4265  4753          JMS I KWMKD      /ACTUALLY GO WRITE IT
0452      4266  0000          0000          /CODE FOR EM
0453      4267  1346          TAD KIIM          /NOW WRITE THE BEGINING
0454      4270  4753          JMS I KWMKD      /IM MARKS
0455      4271  0017          0017          /CODE FOR IM
0456
0457      4272  1343  WRLOOP, TAD FBLK
0457      4273  4752          JMS I KBLOCK      /GO WRITE IT
0461      4274  0000          0000          /NUMBER OF WORDS
0462      4275  0020          0000          /BKWD BLOCK NUMBER
0463      4276  1631          TAD I WRTAP
0464      4277  4753          JMS I KWMKD
0465      4300  0017          0017          /WRITE IM BETWEEN BLOCKS
0466      4301  2343          ISZ FBLK          /INCREMENT BLOCK NUMB.
0467      4302  7000          NOP
0470      4303  2275          ISZ WRLOOP+3
0471      4304  7000          NOP

```


0472	4305	2344	ISZ BLKCNT	/DONE ALL BLOCKS YET?
2473	4306	5272	JMP WRLOOP	AND
2474	4307	2231	ISZ WRTAP	
2475				
2476	4310	4747	JMS I KWAIT1	/WRITE FIRST OF THE
2477	4311	2217	2217	/THE FINAL IM, CALLED THIS
2520				/WAY TO CUT DOWN ON TIME,
2521				/THINGS ARE A BIT PRESSES
2522				/AT THIS POINT
2523				
0504	4312	2240	CLA JMA	
0505	4313	1531	TAD I WRTAP	
0506	4314	2231	ISZ WRTAP	
0507	4315	4753	JMS I KWMKD	
0510	4316	2017	0017	/WRITE FINAL IM MARKS
0511	4317	1531	TAD I WRTAP	
0512	4320	2231	ISZ WRTAP	
0513	4321	4753	JMS I KWMKD	
0514	4322	0000	0000	/WRITE FINAL END MARKS
0515	4323	6141	LINC	
0516				
0517	2324	2011	CLR	
0520	0325	2001	AXO	/CLEAR MARK FLOP
0521	0326	0064	SET I 4	
0522	0327	7727	-50	/DELAY A WHILE AND
0523	0330	1020	LDA I	/BACK UP THE TAPE ON
0524	0331	0024	0024	/UNIT 1 SO THAT CHECK
0525	0332	0500	IOB	/PROGRAM CAN TEST THE
0526	0333	6152	6152	/TAPE
0527	0334	2225	XSK I 5	
0530	0335	6330	JMP .-5	
0531	0336	0224	XSK I 4	
0532	0337	6330	JMP .-7	
0533	0340	0002	PDP	
0534				
0535	4341	7200	CLA	
0536	4342	5631	JMP I WRTAP	/ALL DONE GO BACK
0537				
0540				
0541	4343	0000	FBLK, 0000	/VARIABLES
0542	4344	0000	BLKCNT, 0000	
0543	4345	0000	KIEM, 0000	
0544	4346	0000	KIIM, 000	
0545	4347	4500	KWAIT1, WAIT	
0546	4350	4263	KHERE, HERE-1	/WILL BE INCREMENTED
0547	4351	0200	K0200, 0200	
0550				
0551	4352	4400	KBLOCK, BLOCK	/CROSS PAGE REF.
0552	4353	4620	KWMKD, WMKWD	
0553				
0554				
0555			#4400	
0556				
0557				
0560				
0561				
0562				
0563				
0564				
0565				
0566				
0567				
0570				

```

/SUBROUTINE TO WRITE A BLOCK
/OF TAPE
/CALLING SEQUENCES:
/JMS BLOCK WITH FWD BLOCK NO IN
/THE AC.
/FIRST LOCATION AFTER JMS CONTAINS
/NUMBER OF DATA WRDS IN BLOCK
/SECOND LOCATION AFTER JMS CONTAINS
/BACKWARD BLOCK NUMBER

```

0571 / THIS ROUTINE WILL WRITE:
 0572 / BM (FWD)
 0573 / GM
 0574 / OM (MIN. 14; MAX. 4096)
 0575 / FM
 0576 / CM (THREE WORDS)
 0577 / GM
 0600 / BN (BKWD)
 0601 /
 0602 /
 0603 /

0604	4400	0000	BLOCK,	0000	/USED IN COMP. FORM
0605	4401	0000		CMA	
0606	4402	4711		JMS I KWAIT	/WRITE FWD BM
0607	4403	0016		0016	/BLOCK NO CODE WORD
0608	4404	0000		TAD I BLOCK	/GET NO OF DATA WORDS
0609	4405	0000		CMA CLL	
0610	4406	0000		TAD K0016	
0611	4407	7430		SZL	/LESS THAN 14 WORDS
0612	4408	7402		HLT	
0613	4409	7450		SNA	
0614	4410	7402		HLT	/SPECIFIED 14 WORDS
0615	4411	3265		DCA COUNTA	/SAVE NUMBER OF WORDS
0616	4412	2200		ISZ BLOCK	/MOVE POINTER
0617	4413	1500		TAD I BLOCK	/GET BKWD BLOCK NO
0618	4414	3270		DCA BKBNS	/SAVE IT
0619	4415	3271		DCA BKBNA	/CLEAR BKWD BLK
0620	4416	4711		JMS I KWAIT	/ASSEMBLY REGISTER
0621	4417	0002		0002	/WRITE GUARD WORD
0622	4420	1307		TAD K7764	/GUARD MARK CODE
0623	4421	3266		DCA COUNTB	
0624	4422	1310		TAD KB1TAB	/COUNT OF 12
0625	4423	3267		DCA TEMPA	/SET UP BIT TABLE POINTER
0626	4424	1313	BLKLP1,	TAD K5252	
0627	4425	4711		JMS I KWAIT	/WRITE 1ST 12
0628	4426	0011		0011	/WORDS AND FORM
0629	4427	1270		TAD BKBNS	/BKWD BLK NO FOR
0630	4428	7004		RAL	/WRITING ON TAPE
0631	4429	3270		DCA BKBNS	
0632	4430	7430		SZL	
0633	4431	1667		TAD I TEMPA	/GET A BIT
0634	4432	1271		TAD BKBNA	/COMBINE WITH OTHER
0635	4433	3271		DCA BKBNA	/BITS AND SAVE THEM
0636	4434	2267		ISZ TEMPA	/MOVE POINTER
0637	4435	2266		ISZ COUNTB	/DONE 12 YET
0638	4436	5226		JMP BLKLP1	/NO
0639	4437	1313	BLKLP2,	TAD K5252	/WRITE REST OF DATA WORDS
0640	4438	4711		JMS I KWAIT	/WRITE DATA WORD
0641	4439	0011		0011	/DATA MARK CODE
0642	4440	2265		ISZ COUNTA	/DONE YET
0643	4441	5243		JMP BLKLP2	/NO
0644	4442	1313		TAD K5252	
0645	4443	4711		JMS I KWAIT	/WRITE FINAL MARK
0646	4444	0013		0013	/FINAL MARK CODE
0647	4445	7325		CLA IAC STL RAL	/WRITE 3 CHECK WORDS
0648	4446	4712		JMS I KWMKWD	
0649	4447	0001		0001	/CHECKMARK CODE
0650	4448	0002		JMS I KWAIT	/WRITE GUARD MARK
0651	4449	0002		0002	/GUARD MARK CODE
0652	4450	1271		TAD BKBNA	
0653	4451	4711		JMS I KWAIT	/WRITE BKWD BLOCK NO.
0654	4452	0007		0007	/BACKWARD BLK NO CODE

0670	4463	2200	132	BLOCK	132	INCREMENT RETURN
0671	4464	5600	2		2	/OR BACK
0672	4465	0000		COUNTA,	0	/COUNTER NO OF DATA WRDS
0673	4466	0000		COUNTB,	2	/COUNTER 1ST * WORDS
0674	4467	0000		TEMPA,	2	/RANDOM USAGE
0675	4470	0000	0000	BKBNS,	0000	/SAVE BKBWD BN AS CALLED
0676	4471	0000	0000	BKBNA,	0000	/FORM BKBWD BN THAT
0677						/WILL BE WRITTEN ON TAPE
0700	4472	0400	0400	B1TAB,	0400	/TABLE USED TO FORM
0701	4473	1000	1000			/BACKWARD BLOCK NO.
0702	4474	0000	0000			
0703	4475	4000	4000			
0704	4476	0000	0000			
0705	4477	0000	0000			
0706	4500	0100	0100			
0707	4501	0000	0000			
0710	4502	0001	0001			
0711	4503	0002	0002			
0712	4504	0004	0004			
0713	4505	0010	0010			
0714						
0715						
0716	4506	0016	K0016,	0016		/CONSTANTS
0717	4507	7764	K7764,	7764		
0720	4510	4472	K01TAB,	B1TAB		
0721	4511	4600	KWAIT,	WAIT		
0722	4512	4620	KWMKWD,	WMKWD		
0723	4513	5252	K5252,	5252		
0724						
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0747						
0750						
0751						
0752						
0753						
0754						
0755						
0756						
0757						
0760						
0761	4600	0000	WAIT,	0000		
0762	4601	6154		6154		
0763						
0764						
0765						
0766						

*4600

/SUBROUTINE TO WAIT FOR COMPLETION
 /OF CURRENT TAPE WORD
 /AND THEN TRANSFER DATA TO TAPE
 /CONTROL FOR THE NEXT WORD
 /(4 LINES)

/CALLING SEQUENCE:
 /JMS WAIT FOLLOWED BY MARK CODE
 /TO BE GENERATED. THE AC
 /CONTAINS THE DATA WORD TO
 /BE WRITTEN WITH THE ABOVE
 /MARK CODE.

/PROGRAM MUST RETURN WITH THE
 /NEXT WORD TO BE WRITTEN WITHIN
 /42 MICROSECONDS
 /THIS SUBROUTINE TAKES UP TO
 /52 MICROSECONDS IF SYSTEM CYCLE
 /TIME WERE TO GET AS SLOW AS
 /1.9 MICROSEC.

/PUT DATA WORD IN TB
 /THE ACTUAL WORD WRITTEN
 /ON THE TAPE WILL BE THE
 /COMP OF THE NUMBER JUST
 /PLACED IN THE TB REG.

0767	4602	7300	CLA CLL	/GET MARK COD
0770	4603	1600	TAD I WAIT	/GO TO LINC M
0771	4604	6141	LINC	
0772			LMODE	
0773	2625	2437	SXL I 17	/TEST TO SEE IF TAPE
0774	2626	2202	HLT	/WORD FF IS UP, IF SO
0775				/THEN WE HAVE DELAYED
0776				/AND ALL IS LOST.
0777	2627	2417	FRSTGO, SXL 17	/NOW WAIT FOR TAPE WORD
1222	2612	2527	JMP .-1	/FLIP FLOP
1221	2611	2328	LDA I	
1222	2612	2202	PDP	/TO PDP 8 MODE
1223	2613	2222	PDP	
1224			Pmode	
1225	4614	5152	6152	/CLEAR TAPE FLAG
1226	4615	2202	ISZ WAIT	/INCREMENT RETURN
1227	4616	7202	CLA	
1212	4617	5620	JMP I WAIT	/GO BACK

/SUBROUTINE TO WRITE A NUMBER
 /WORDS OF A GIVEN MARK CODE
 /CALLING SEQUENCE:
 / IS JMS MKWRD FOLLOWED BY CODE WORD.
 / AC CONTAINS NO OF WORDS TO BE WRITTEN
 /THIS SUBROUTINE ADDS 17 CYCLES TO THE
 /WAIT ROUTINE AND MUST BE CALLED WITHIN
 /20 MICROSEC. OF THE LAST WAIT EXIT.
 /THIS ADDS 10 MICROSEC. TO THE WAIT
 /EXIT TIME

1232	4620	0000	WMKWD, 0000	
1233	4621	7341	CMA IAC	
1234	4622	3234	OCA WMCNT	/SET UP NO OF WRDS.
1235	4623	1520	TAD I WMKWD	/PICK UP MARK CODE
1236	4624	3226	OCA WMCODE	
1237	4625	4203	JMS WAIT	/GO WRITE A WORD
1238	4626	2000	WMCODE, 0000	/HOLDS MARK CODE
1239	4627	2234	ISZ WMCNT	/DONE ALL WORDS YET
1240	4628	5225	JMP .-3	/NO
1241	4630	7202	CLA	/YES GO BACK
1242	4631	2220	ISZ WMKWD	/INCREMENT RETURN
1243	4632	2220	JMP I WMKWD	
1244	4633	5620		
1245				
1246				
1247				
1248				
1249	4634	0000	WMCNT, 0000	

/SUBROUTINE TO CHECK THE TAPE THAT HAS
 /JUST BEEN WRITTEN. ENTER CHECK WITH THE
 /TOTAL NUMBER OF POSITIVE DATA BLOCKS
 /IN THE AC. THE SUBROUTINE WILL WRITE
 /A PATTERN OF 11+11+11 ETC. IN EACH BLOCK
 /THEN BACKWARD BLOCK NUMBERS ARE CHECKED
 /THEN ALL BLOCKS ARE READ INTO CORR AND

1066
1067
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1107
1108
1109
1110
1111
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1122
1123
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1125
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1164

2635 4666
2636 2640
2637 2781
2640 3777
2641 1020
2642 0011
2643 1061
2644 2642
2645 0201
2646 6643

2647 0711
2650 4660
2651 1020
2652 0020
2653 0001
2654 1020
2655 0000
2656 0023
2657 0736
2660 0000
2661 1020
2662 0001
2663 1140
2664 0660
2665 1460
2666 0000
2667 6654

0670 0733
0671 0000
0672 0733
0673 0000
0674 1120
0675 0001
0676 1060
0677 0000
0700 0733
0701 0000
0702 1440
0703 0677
0704 6747
0705 0450
0706 6674

0707 1020
0710 0020
0711 0001
0712 0011
0713 4720

/THEIR CHECKSUMS VERIFIED. THEN THE LAST
/DATA BLOCK IS CHECKED TO BE SURE ALL
/DATA IS CORRECT.

/EXIT IS TO DSP3 ROUTINE WHICH TELLS
/THE USER IF THE TAPE IS GOOD OR BAD
/AND ALLOWS MORE MARKING OR RETURN TO
/DIAL

LMODE
CHECK, STC CFBLK /SAVE NUMBER OF BLOCKS
LCF 2
SET I 1 /GENERATE TEST PATTERN
3777
LDA I
11
STA I 1
ADD .-2
XSK 1
JMP .-3 /NOT DONE YET

CLR
STC WBLKNO
LDA I
0020 /SET UP EXTENDED ADDRESS
AXO /FORMAT FOR TAPE

WLOOP, LDA I
0000
TMA /LOAD TMA SETUP REG.
WRI I U /WRITE ON TAPE

WBLKNO, LDA I
1
ADM
WBLKNO
SAE I /WRITTEN LAST BLK YET
CFBLK, 0000 /HOLDS FINAL BLOCK NO
JMP WLOOP

MTB I U /NOW TEST BKWD BLK NO.

0000
MTB I U
0000
ADA I
0001
STA I
BTEST, 0000
MTB I U
0000
SAE
BTEST
JMP RRROR /BKWN BN WRONG
AZE
JMP BTEST-3 /NOT DONE YET

LDA I /NOW CHECK WRITTEN TAPE
0020
AXO /EX ADD FORM
CLR
STC RBLKNO

1165	0714	1020	RLOOP,	LOA I	
1166	0715	0000		0000	
1167	0716	0023		TMA	
1170	0717	0732		RCE I U	
1171	0720	0000	RBLKNC,	0000	
1172	0721	1450		SAE I	
1173	0722	7777		7777	/CHECKSUM OK
1174	0723	6747		JMP RERROR	/NO
1175	0724	1020		LOA I	/YES
1176	0725	0001		0001	
1177	0726	1140		ADM	
1178	0727	0720		RBLKNC	
1201	0730	1440		SAE	
1202	0731	0566		CFBLK	
1203	0732	6714		JMP RLOOP	
1224					
1225	0733	0061		SET I 1	/DONE NOW CHECK LAST
1206	0734	3777		3777	/BLOCK
1207	0735	1020		LOA I	/THIS IS DATA TEST
1210	0736	0011		0211	
1211	0737	1461	DLOOP,	SAE I 1	
1212	0740	6747		JMP RERROR	
1213	0741	2735		ADD -3	
1214	0742	0201		XSK 1	
1215	0743	6737		JMP DLOOP	
1216					
1217	0744	1020		LOA I	
1220	0745	2276		DT DS3	/SET UP FOR GOOD TAPE
1221					/DISPLAY FRAME
1222	0746	6751		JMP .+3	
1223					
1224	0747	1020	RERROR,	LOA I	/COME HERE ON CHECKING
1225	0750	2423		DT DS4	/ERROR, SET UP FOR ERROR
1226					/DISPLAY FRAME
1227					
1230	0751	4201		SIC DSP3+1	
1231	0752	0643		LDF 3	
1232	0753	0011		CLR	
1233	0754	0001		AXO	/CLEAR EXTENDED ADD.
1234					/FORMAT AND HEAD THE
1235	0755	0733		MTB I U	/TAPE FOR THE FRONT
1236	0756	0000		0000	/END
1237	0757	0733		MTB I U	
1240	0760	0000		0000	
1241					
1242	0761	6200		JMP DSP3	
1243					
1244	0762	0000	ANS,	0000	/LOCATION FOR ANSWERS
1245	0763	1000		0000	/FROM Q AND A
1246					
1247					/OANDA SUBROUTINE FOR THE
1250					/PDP-12
1251					/REMOVE *1000 BELOW IF
1252					/INSERTING SOURCE DIRECTLY
1253					/INTO YOUR PROGRAM SOURCE
1254					*1000 /REMOVE, IF DESIRED
1255					/
1256					/TO HERE TO INITIALIZE THE ROUTINE
1257					/
1260	1000	1020	GAINIT,	LOA I	/SAVE JMP RETURN
1261	1001	0002		2	
1262	1002	2000		ADD 0	
1263	1003	1060		STA I	

1264	1004	0000	GAB,	0	JMP	+3	
1265	1005	3200			ADD QAL+3		
1266	1006	4001			STC 1		/PTR TO FIRST RAM
1267	1007	1001			LDA 1		/GET FIRST PA
1270	1010	3264			ADD QAG+1		/PTR TO HALFWORD-1
1271	1011	5057			STC QAG-3		
1272	1012	1321			LDA I 1		
1273	1013	0052			STC QARFSH-1		
1274	1014	4006			STC 6		/XR6 USED AS A SWITCH. =2 IF NO ANSWER FIELD, =1 IF YES
1275	1015	0043	QACA,		SET 3	/XR3 TO	PTR TO ANSWERS
1276	1016	0052			QARFSH-1		
1277	1017	0044			SET 4		/XR4 TO PTR TO QUESTIONS
1300	1020	1057			QAG-3		/TO HERE IF FIRST TIME THROUGH OR FOLLOWING A OR
1301							
1302	1021	0041			SET 1		
1303	1022	0004			4		
1304	1023	7270			JMP QAT		
1305	1024	0016			NOP		/F
1306	1025	1324			LDH I 4		/H. BUMP PTR IF H OR F
1307	1026	7231	GAD,		JMP QAO		
1310	1027	7035			JMP .+6		/74
1311	1028	7057			JMP QAE		/34
1312	1029	1460			SAE I		/CR?
1313	1032	0043			43		
1314	1033	7026			JMP QAD		/NO
1315	1034	7021			JMP QACA+4	/EXAMINE NEXT CHAR	
1316							/INITIALIZE ANSWER BUFR
1317	1035	1343			STH 3		/74 TO ANSWERS
1320	1036	1324			LDH I 4		/NEXT HALFWORD
1321	1037	1120			ADA I		
1322	1040	7717			-60		
1323	1041	0017			COM		
1324	1042	4006			STC 6		
1325	1043	1363			STH I 3		/0 IN AC
1326	1044	0226			XSK I 6		
1327	1045	7043			JMP .-2		/RUMP PTR TO ANSWERS
1330	1046	1323			LDH I 3		
1331	1047	7026			JMP QAD		/ANSWER BUFR IS INITIATED
1332							
1333	1050	1343	QAE,		STH 3		
1334	1051	0064			SET I 4		/XR4 TO PTR TO LAST TYPED CHAR IN ANSWER BUFR
1335	1052	0000			0		/-----RE-ENTER HERE TO REFRESH-----
1336							/INITIAL Y POSITION
1337	1053	1020	QARFSH,		LDA I		/NOTE VERT IS SET HIGH
1340	1054	0377			377		
1341	1055	5113			STC QAH-1		
1342	1056	0063			SET I 3		/XR3 TO PTR TO HALFWORD QUESTIONS-1
1343	1057	0000			0		
1344	1060	0045			SET 5		/XR5 TO PTR TO LAST DISPLAYED CHAR IN ANSWER BUFR
1345	1061	1052			QARFSH-1		
1346	1062	0041	GAG,		SET 1		
1347	1063	0003			3		
1350	1064	7270			JMP QAT		
1351	1065	7374			JMP .+7		/F
1352	1066	1323			LDH I 3		/H. BUMP PTR
1353	1067	1020			LDA I		/NEITHER. ASSUME HALF SIZE
1354	1070	1560			BCL I		
1355	1071	5103			STC QAM+2		/SET INSTR TO CLEAR FF FOR HALF SIZE
1356	1072	3512			ADD QAW		/NOP IN AC
1357	1073	7101			JMP QAM		
1360	1074	1323			LDH I 3		/BUMP PTR
1361	1075	1020			LDA I		
1362	1076	1620			BSE I		

1363	1077	5103		STC QAM+2	/SET INSTR TO SET UP FOR FULL SIZE
1364	1100	3513		ADD QAW+1	/ADD 90 IN AC
1365	1101	5245	GAM,	STC QAP+3	
1366	1102	0024		MSC I 4	/EAD CONTROL REGISTER
1367	1103	1620		BSE I	/THIS INSTR CHANGES. EITHER BSE & OR BCL &
1370	1104	0000		220	
1371	1105	0004		MSC 4	/AC TO CONTROL REGISTER
1372	1106	0061		SET I 1	/XR1 TO INITIAL X POSITION
1373	1107	0100		122	
1374	1110	0022		LDA I	/Y COORDINATE MULTIPLE
1375	1111	7737		-40	
1376	1112	1060		ADM I	/Y COORDINATE
1377	1113	0000		0	
1400	1114	1323	QAH,	LDH I 3	
1401	1115	7232		JMP QAO+1	/74 BUMP PTR TO NEXT CHAR, PUT 40 IN AC
1402	1116	7301		JMP QAZ	/34
1403	1117	7136		JMP QAJ	/NEITHER
1404	1120	1420		SHD I	
1425	1121	4300		4300	
1406	1122	7062		JMP QAG	/CR, MOVE X AND Y COORDINATE
1407	1123	7242		JMP QAP	/ISPLAY CHAR
1410	1124	7114		JMP QAH	/PICK UP NEXT CHAR
1411	1125	7242		JMP QAP	/TO HERE IF DISPLAYING ANSWER BUFR
1412	1126	1520		SRG I /SWITCH	TO DISPLAY CURSOR. EITHER 0000 OR 7777
1413	1127	0000		0	/IFXR4=XR5, THEN SWITCH=7777
1414	1130	7516		JMP QAF	
1415					/QUESTION MODE
1416	1131	1325	QAI,	LDH I 5	
1417	1132	7232		JMP QAO+1	
1420	1133	7114		JMP QAH	/74
1421	1134	7114		JMP QAH	/34
1422	1135	7125		JMP QAI-4	/NEITHER, DISPLAY IT
1423	1136	7521	QAJ,	JMP GETKBD	/TO HERE IF DISPLAYED BUFFER
1424	1137	0470		AZE I	
1425	1140	7004		JMP QAB	/NOTHING TYPED, EXIT
1426	1141	0062		SET I 2	
1427	1142	1412		QAY	
1430	1143	1402		SHD 2	/LF?
1431	1144	7311		JMP QAK+4	/YES, EXIT
1432	1145	1422		SHD I 2	/CR?
1433	1146	7223		JMP QAN	
1434	1147	0206		XSK 6	/IS THERE AN ANSWER FIELD?
1435	1150	7053		JMP QARFSH	
1436	1151	1422		SHD I 2	/<?
1437	1152	7175		JMP QAL	
1440	1153	1422		SHD I 2	/>?
1441	1154	7305		JMP QAK	
1442	1155	1422		SHD I 2	/ALT?
1443	1156	7015		JMP QACA	/REINITIALIZE
1444	1157	1422		SHD I 2	/BACK SLASH?
1445	1160	7053		JMP QARFSH	/IGNORE
1446	1161	1422		SHD I 2	/RUBOUT?
1447	1162	7075		JMP QAL	/IGNORE
1450	1163	1422		SHD I 2	/TAB?
1451	1164	7053		JMP QARFSH	/IGNORE
1452	1165	5172		STC .+5	/ACCEPTABLE CHAR
1453	1166	7231		JMP QAO	/TEST NEXT CHAR
1454	1167	7263		JMP QAG	/74 BACK PTR UP BY 1
1455	1170	7263		JMP QAG	/34 +
1456	1171	1020		LDA I	/OK, STORE IT
1457	1172	0000		0	
1460	1173	1344		STH 4	
1461	1174	7053		JMP QARFSH	/REDISPLAY

1462	1175	1304	GAL,	LDR 4	/TO HERE IF RUBBOOT OR
1463	1176	7232		JMP QAO+1	
1464	1177	7053		JMP QARFSH	/74 IGNORE
1465	1200	1775		-6002	
1466	1201	1302		LDR 2	/TEST THE CHAR
1467	1202	1460		SAE 1	/RUBBOOT?
1470	1203	0737		37	
1471	1204	7063		JMP QAO	/NO. BACK PTR UP BY 1
1472	1205	2045		SET 5	
1473	1206	0704		4	
1474	1207	2043		SET 3	
1475	1210	2204		4	
1476	1211	7213		JMP .+2	/BUMP PTR
1477	1212	1325		LDR 1 5	/GET NEXT CHAR
1500	1213	1323		LDR 1 3	
1501	1214	7232		JMP QAO+1	/IF 74 OR 34, REPLACE CURRENT CHAR WITH 0
1502	1215	0016		NOP	
1503	1216	0011		CLR	
1504	1217	1345		STH 5	/WAS IT 74 OR 34?
1505	1220	0450		AZE	/NO. CONTINUE
1506	1221	7212		JMP .-7	/BACK PTR UP BY 1
1507	1222	7263		JMP QAO	/TO HERE IF CR
1510					
1511	1223	2206	GAN,	XSK 6	/EXIT ROUTINE IF NO ANSWER FIELD
1512	1224	7311		JMP QAK+4	
1513	1225	7231		JMP QAO	
1514	1226	7053		JMP QARFSH	/74 MOVE PTR TO NEXT QUESTION FIELD
1515	1227	7051		JMP QAE+1	/34 END OF BUFR. MOVE PTR TO FIRST QUESTION FIELD
1516	1230	7225		JMP GAN+2	
1517					
1520	1231	1024	GAO,	LDR 1 4	/SR
1521	1232	1420		SHD 1	/
1522	1233	7400		7400	+1 74 BEGIN FIELD
1523	1234	6000		JMP 0	+2 34 END BUFR
1524	1235	1460		SAE 1	+3 NEITHER 74 NOR 34
1525	1236	0034		34	
1526	1237	0020		XSK 1 0	
1527	1240	0020		XSK 1 0	
1530	1241	0000		JMP 0	
1531					
1532	1242	0241	GAP,	ROL 1	/SR TO DISP LINC CHAR IN AC
1533	1243	3430		ADD QAX+4	/MULT BY 2 FOR INDEX TO ADDRESS OF TABLE
1534	1244	4002		STC 2	
1535	1245	3506		ADD QAU	/ADDRESS OF CHAR TO DISP IN XR2
1536	1246	3506		ADD QAU	/THIS INSTR CHANGES. EITHER OP OR ADD 9U
1537	1247	2001		ADD 1	/ADD 4 TO XR1 TO SPACE CHAR
1540	1250	4001		STC 1	
1541	1251	2005		ADD 5	/GET ADDRESS OF ANSWER BUFR
1542	1252	0017		COM	
1543	1253	2024		ADD 4	
1544	1254	0450		AZE	
1545	1255	0011		CLR	
1546	1256	5127		STC QAI-2	/SWITCH=0 OR 7777
1547	1257	3113		ADD QAH-1	/Y COORDINATE IN AC
1550	1260	1742		DSC 2	
1551	1261	1762		DSC 1 2	/DISPLAY CHAR
1552	1262	6002		JMP 0	
1553	1263	1020	GAQ,	LDA 1	/BACK UP PTR BY 1
1554	1264	3777		-4000	
1555	1265	1140		ADM	
1556	1266	0004		4	
1557	1267	7053		JMP QARFSH	/REDISPLAY

1561	1270	1321	OAT,	LCH I 1
1562	1271	1422		SHD I
1563	1272	0600		0600
1564	1273	6000		JMP 0
1565	1274	1460		SAE I
1566	1275	0100		10
1567	1276	0200		XSK I 0
1570	1277	0200		XSK I 0
1571	1300	0100		JMP 0
1572				
1573	1321	1323	OAZ,	LCH I 3
1574	1322	1320		LDA I
1575	1323	0040		40
1576	1324	1125		JMP QAI-4
1577				
1602	1325	1324	OAK,	LCH I 4
1601	1326	7470		AZE I
1602	1327	7203		JMP QAO
1603	1312	7424		JMP QAX
1604				
1625	1311	1320		LDA I
1626	1312	0001		1
1627	1313	1140		ADM
1630	1314	1304		QAB
1631	1315	1324		JMP QAB
1612				
1613	1316	1131	OAV,	0101
1614	1317	2121		0101
1615	1320	4477		4477
1616	1321	7744		7744
1617	1322	5177		5177
1622	1323	2651		2651
1621	1324	4136		4136
1622	1325	2241		2241
1623	1326	4177		4177
1624	1327	3641		3641
1625	1330	4577		4577
1626	1331	4145		4145
1627	1332	4477		4477
1630	1333	4044		4044
1631	1334	4136		4136
1632	1335	2645		2645
1633	1336	1077		1077
1634	1337	7710		7710
1635	1340	7741		7741
1636	1341	0041		0041
1637	1342	4142		4142
1640	1343	4076		4076
1641	1344	1077		1077
1642	1345	4324		4324
1643	1346	0177		0177
1644	1347	0301		0301
1645	1350	3077		3077
1646	1351	7730		7730
1647	1352	3077		3077
1650	1353	7726		7726
1651	1354	4177		4177
1652	1355	7741		7741
1653	1356	4477		4477
1654	1357	3044		3044
1655	1360	4276		4276
1656	1361	0376		0376
1657	1362	4477		4477

/SIR
/ +1 F
/ +2 H
/ +3 NEITHER

/TO HERE IF >
/IS CURRENT CHAR BLANK?
/YES, IGNORE
/MOVE DOT FORWARD
/TO HERE TO EXIT WITH SKIP

/CHARACTER PATTERNS
/KBD 0, ILLEGAL, USED AS MARKER

/1:A
/2:B
/3:C
/4:D
/5:E
/6:F
/7:G
/10:H
/11:I
/12:J
/13:K
/14:L
/15:M
/16:N
/17:O
/20:P
/21:Q
/22:R

1660	1363	3146	3146
1661	1364	5121	5121
1662	1365	4651	4651
1663	1366	4042	4042
1664	1367	4077	4077
1665	1370	2177	2177
1666	1371	7721	7721
1667	1372	2176	2176
1670	1373	7422	7422
1671	1374	7677	7677
1672	1375	7721	7721
1673	1376	1461	1461
1674	1377	6314	6314
1675	1400	2770	2770
1676	1401	7327	7327
1677	1402	4543	4543
1700	1403	6151	6151
1721	1404	4177	4177
1702	1405	0000	0000
1703			
1704	1406	0000	0
1705	1407	0000	0
1706	1410	0000	0000
1727	1411	7741	7741
1710			
1711	1412	4543	GAY, 4543
1712	1413	7476	7476
1713	1414	3634	3634
1714	1415	3747	3747
1715	1416	0000	0000
1716	1417	0000	0000
1717	1420	7500	7500
1720	1421	0000	0000
1721	1422	7000	7000
1722	1423	0070	0070
1723			
1724	1424	7232	QAX, JMP QAO+1
1725	1425	7263	JMP QAG
1726	1426	7263	JMP QAG
1727	1427	7053	JMP QARFSH
1730	1430	1316	QAV
1731	1431	0000	0
1732	1432	5166	5166
1733	1433	0526	0526
1734			
1735	1434	0000	0
1736	1435	0000	0
1737	1436	3600	3600
1740	1437	0041	0041
1741	1440	4100	4100
1742	1441	0036	0036
1743	1442	2050	2050
1744	1443	0050	0050
1745	1444	0404	0404
1746	1445	0437	0437
1747	1446	0500	0500
1750	1447	0006	0006
1751	1450	0404	0404
1752	1451	0404	0404
1753	1452	0001	0001
1754	1453	0000	0000
1755	1454	0601	0601
1756	1455	4030	4030

/23:S
 /24:T
 /25:U
 /26:V
 /27:W
 /30:X
 /31:Y
 /32:Z
 /33:/
 /34:BACKSLASH IGNORED ON INPUT
 /NOT USED
 /NOT USED
 /35:]
 /CODES 36:ALT, 37:RUBOUT NOT DISPLAYED
 /LF,CR
 /<>
 /ALT, BACKSLASH
 /RUBOUT, TAB
 /40:SPACE
 /41:X!
 /42:"
 /CODES 43:, 44:, 45:LF NOT DISPLAYED
 /NOT USED
 /46: &
 /CODE 47:TAB NOT DISPLAYED
 /NOT USED
 /NOT USED
 /50:(
 /51:)
 /52:*
 /53:+
 /54:,
 /55:-
 /56:.
 /57:\

1757	1456	4536	4536	/60:0	
1760	1457	3651	3651		
1761	1460	2101	2101	/61:1	
1762	1461	0177	0177		
1763	1462	4523	4523	/62:2	
1764	1463	2151	2151		
1765	1464	4122	4122	/63:3	
1766	1465	2651	2651		
1767	1466	2414	2414	/64:4	
1770	1467	0477	0477		
1771	1470	5172	5172	/65:5	
1772	1471	0551	0551		
1773	1472	1506	1506	/66:6	
1774	1473	4225	4225		
1775	1474	4443	4443	/67:7	
1776	1475	6250	6250		
1777	1476	5126	5126	/70:8	
2002	1477	2651	2651		
2001	1500	5122	5122	/71:9	
2002	1501	3651	3651		
2003	1502	2200	2200	/72:1	
2004	1503	0000	0000		
2005	1504	4601	4601	/73:1	
2006	1505	0000	0000		
2007				/CODE 74:<NOT DISPLAYED	
2010	1506	0002	GAU, 2	/CONSTANT	
2011	1507	0000	0	/NOT USED	
2012	1510	1212	1212	/75:=	
2013	1511	1212	1212		
2014				/CODE /6:> NOT DISPLAYED	
2015	1512	0016	QAW, NOP		
2016	1513	3506	ADD QAU		
2017	1514	4020	4020	/77:?	
2020	1515	2055	2055		
2021			/		
2022	1516	1760	QAF, DSC I		
2023	1517	6000	6000		
2024	1520	7131	JMP QAI		
2025			/		
2026				/END Q+A	
2027			/		
2030			/		
2031			/		
2032			/		
2033			/KEYBOARD INPUT ROUTINE		
2034			/		
2035			QAKRB=6036 /PDP-8 IOT KBD		
2036			QATSF=6041 /TSF		
2037			QATLS=6046 /TLS		
2040			/		
2041	1521	1000	GETKBD, LDA		
2042	1522	0000	0		
2043	1523	5643	STC QAEXIT+6 /SAVE RETURN		
2044	1524	2001	ADD 1 /SAVE XRS 1 AND 2		
2045	1525	5642	STC QAEXIT+3		
2046	1526	2002	ADD 2		
2047	1527	5642	STC QAEXIT+5		
2050	1530	5636	STC QAEXIT+1		
2051	1531	0415	KST /HAS SOMETHING TYPED?		
2052	1532	6000	JMP 0 /NO: EXIT		
2053	1533	0500	IOB		
2054	1534	6036	QAKRB /GET TTY CHAR, CLEAR FLAG		
2055	1535	1000	STA 1 /SAVE IT		

2056	1536	2000	QATY,	0	
2057	1537	1120	ADA I		
2060	1540	7542	-237		
2061	1541	6451	APD		/BETWEEN 240 AND 237?
2062	1542	7524	JMP QACNTR		/CONTROL CHAR. CHECK FOR CR, LF, TAB
2063					
2064	1543	2061	SET I 1		/NO
2065	1544	1654	QACHAR-1		
2066	1545	2062	SET I 2		
2067	1546	7772	-7		
2072	1547	1020	LDA		
2073	1550	1536	QATY		
2072	1551	1461	SAE I 1		
2073	1552	7554	JMP .+2		
2074	1553	7635	JMP QAEXIT		/ILLEGAL CHAR. DONT ECHO
2075	1554	0222	XSK I 2		/CHECKED THEM ALL?
2076	1555	7551	JMP .-4		
2077					
2100	1556	1120	ADA I		
2101	1557	7440	-337		
2102	1560	0451	APD		/BETWEEN 240 AND 337?
2103	1561	7575	JMP QALEGL		/YES. LEGAL CHAR
2104					
2105	1562	1461	SAE I 1		/NO. CHECK FURTHER.
2106	1563	7572	JMP .+7		
2107	1564	1020	LDA I		/RUBOUT
2110	1565	0334	334		
2111	1566	7644	JMP QATPE		/ECHO BACKSLASH
2112	1567	1020	LDA I		
2113	1570	0037	37		
2114	1571	7637	JMP QAEXIT+2		/LEGAL EXIT
2115					
2116	1572	1461	SAE I 1		
2117	1573	7635	JMP QAEXIT		/ILLEGAL
2120					/ALT
2121	1574	7637	JMP QAEXIT+2		/EXIT, DONT ECHO
2122					
2123	1575	1000	QALEGL, LDA		
2124	1576	1536	QATY		
2125	1577	7644	JMP QATPE		/ECHO CHAR
2126	1600	3536	ADD QATY		
2127	1601	1560	BCL I		/STRIP IT TO 6-BIT
2130	1602	7700	7700		
2131	1603	7637	JMP QAEXIT+2		
2132					/TO HERE IF CONTROL CHAR
2133	1604	1460	QACNTR, SAE I		
2134	1605	7755	7755		
2135	1606	7621	JMP QACKLF		
2136	1607	1020	LDA I		/CR
2137	1610	0043	43		
2140	1611	5636	STC QAEXIT+1		
2141	1612	1020	LDA I		
2142	1613	0215	215		
2143	1614	7644	JMP QATPE		
2144	1615	1020	LDA I		
2145	1616	0212	212		
2146	1617	7644	JMP QATPE		
2147	1620	7635	JMP QAEXIT		
2150					
2151	1621	1460	QACKLF, SAE I		
2152	1622	7752	7752		
2153	1623	7627	JMP .+4		
2154	1624	1020	LDA I		/LF

2155	1625	0345	45	
2156	1626	7611	JMP QACNTR+5	
2157	1627	1460	SAE I	
2160	1630	7751	7751	
2161	1631	7635	JMP QAEXIT	/ILLEGAL
2162	1632	1020	LDA I	
2163	1633	1047	07	
2164	1634	7637	JMP QAEXIT+2	/EXIT, DONT ECHO
2165			/	
2166	1635	1022	QAEXIT, LDA I	/GET 6-BIT ASCII
2167	1636	7000	0	
2170	1637	1061	SET I 1	/RESTORE XRS
2171	1640	1000	0	
2172	1641	1062	SET I 2	
2173	1642	7000	0	
2174	1643	6100	JMP	/EXIR SVR GETKBD
2175			/SVR TO PRINT C(AC)	
2176	1644	0500	GATPE, 106	
2177	1645	6046	QATLS	/POP-B IOT TLS
2200	1646	1000	LDA	
2201	1647	0000	0	
2202	1650	5554	STC .+4	/SAVE RETURN
2203	1651	7500	IUB	
2224	1652	0041	GATSE	/WAIT FOR FLAG
2205	1653	7651	JMP .-2	
2206	1654	6000	JMP	/EXIT
2207			/	
2210	1655	0043	GACHAR, 243	/HASH
2211	1656	0244	244	/DOLLAR SIGN
2212	1657	0045	245	/PER CENT
2213	1660	0247	247	/APOSTROPHE
2214	1661	0300	300	/AT SIGN
2215	1662	0336	336	/UP ARROW
2216	1663	0337	337	/BACK ARROW
2217	1664	0040	40	/RUBOUT
2220	1665	0036	36	/ALT
2221			/END OF SVR GETKBD	
2222				
2223				
2224				
2225				
2226				
2227				
2230				
2231				
2232				
2233				
2234				
2235				
2236				
2237				
2240				
2241				
2242				
2243				
2244				
2245				
2246				
2247				
2250				
2251				
2252				
2253				

REFRESH=QAINIT+53

SEGMNT3
*0001

/FRAME 1
/ MARK12
/THIS PROGRAM WILL FORMAT AND CHECK
/LINC TAPES FOR THE POP-12

/SELECT OPTION AND PRESS LINE FEED
/ON THE CONSOLE TELETYPE

/SELECT -

/ 1 STD LINC FORMAT

/ 2 129 WORD FORMAT

2254		
2255		
2256		/FRAME 2
2257		
2260		/MOUNT TAPE TO BE
2261		/MARKED ON THE RIGHT
2262		/REEL OF UNIT 1
2263		
2264		/PLACE UNIT 1 IN
2265		/REMOTE WITH
2266		/WRITE ENABLED, THEN
2267		
2270		/PRESS THE MARK SWITCH
2271		
2272		
2273		/FRAME 3
2274		
2275		/ GOOD TAPE
2276		
2277		/ALLOW MARKED TAPE TO REWIND
2300		/THEN SELECT OPTION AND TYPE
2301		/LINE FEED ON THE TELETYPE
2302		
2303		/SELECT -
2304		
2305		/ 1 MARK ANOTHER TAPE
2306		
2307		/ 2 RESTART DIAL
2310		
2311		
2312		
2313		/FRAME 4
2314		
2315		/TAPE CHECK FAILED
2316		
2317		/SELECT -
2320		
2321		/ 1 MARK ANOTHER TAPE
2322		
2323		/ 2 RESTART DIAL
2324		
2325		
2326	0001	0540
2326	0002	4340
2326	0003	4015
2326	0004	0122
2326	0005	1340
2326		DS1, TEXT ZF MARK 12
2327	0006	6162
2327		H
2330	0007	4310
2330	0010	4310
2330	0011	4240
2330	0012	4240
2330	0013	2410
2330	0014	1123
2330	0015	4022
2330	0016	2217
2330	0017	0722
2330	0020	0115
2330	0021	4027
2330	0022	1114
2330	0023	1440

2330 2224 2617
2330 2225 2215
2330 2226 3124
2330 2227 4001
2330 2230 1624
2330 2231 4023
2330 2232 1425

H THIS PROGRAM WILL FORMAT AND CHECK

2331 2233 1713
2331 2234 4112
2331 2235 4142
2331 2236 4242
2331 2237 4111
2331 2242 1623
2331 2241 4024
2331 2242 1722
2331 2243 1623
2331 2244 4026
2331 2245 1722
2331 2246 4024
2331 2247 1705
2331 2250 4120
2331 2251 2420
2331 2252 5561

H LINC TAPES FOR THE PDP-12

2332 2253 6243
2333 2254 1043
2333 2255 1040
2333 2256 4340
2333 2257 4023
2333 2262 1514
2333 2261 2503
2333 2262 2443
2333 2263 1720
2333 2264 2411
2333 2265 1716
2333 2266 4001
2333 2267 1604
2333 2272 1022
2333 2271 2225
2333 2272 2323
2333 2273 4314
2333 2274 1116
2333 2275 1548
2333 2276 2605

H SELECT OPTION AND PRESS LINE FEED

2334 2277 2504
2334 2122 4310
2334 2121 4040
2334 2122 4040
2334 2123 1716
2334 2124 4024
2334 2125 1025
2334 2126 4223
2334 2127 1716
2334 2118 2317
2334 2111 1405
2334 2112 4024
2334 2113 2514
2334 2114 0524
2334 2115 3120
2334

H ON THE CONSOLE TELETYPE

2366 0263 2205
2366 0264 2323
2366 0265 4024
2366 0266 1705
2366 0267 4715
2366 0270 2100
2366 0271 1340
2366 0272 1327
2366 0273 1124
2367 0274 7312
2367 0275 4334
2371
2372
2373 0276 0643
2373 0277 0642
2373 0300 4040
2373 0301 0717
2373 0302 1724
2373 0303 4024
2373 0304 0122
2374 0305 0543
2375 0306 0643
2375 0307 1040
2375 0310 4040
2375 0311 0114
2375 0312 1417
2375 0313 2740
2375 0314 1501
2375 0315 2213
2375 0316 2504
2375 0317 4024
2375 0320 0120
2375 0321 0540
2375 0322 2417
2375 0323 4022
2375 0324 0527
2375 0325 1116
2376 0326 0443
2376 0327 1040
2376 0330 4040
2376 0331 2410
2376 0332 0516
2376 0333 4023
2376 0334 0514
2376 0335 0503
2376 0336 2440
2376 0337 1720
2376 0340 0411
2376 0341 1716
2376 0342 4001
2376 0343 1604
2376 0344 4024
2376 0345 3120
2377 0346 0543
2377 0347 1040
2377 0350 4040

F PRESS THE MARK SWITCH

NE

DS3. TEXT ZF

F GOOD TAPE

H ALLOW MARKED TAPE TO REWIND

H THEN SELECT OPTION AND TYPE

2377	0351	1411
2377	0352	1605
2377	0353	4026
2377	0354	3535
2377	0355	0443
2377	0356	1715
2377	0357	4324
2377	0360	1235
2377	0361	4324
2377	0362	0514
2377	0363	2524
2377	0364	3120
2377		
2400	0365	2543
2400		
2401	0366	0543
2401	0367	0623
2401	0370	0514
2401	0371	0503
2401	0372	2440
2401	0373	4074
2401		
2402	0374	6143
2402		
2403	0375	0643
2403	0376	0640
2403	0377	6140
2403	0400	1521
2403	0401	2213
2403	0402	4001
2403	0403	1617
2403	0404	2410
2403	0405	0522
2403	0406	4024
2403	0407	2120
2403		
2404	0410	2543
2404		
2405	0411	0643
2405	0412	0640
2405	0413	6240
2405	0414	2205
2405	0415	2324
2405	0416	0122
2405	0417	2440
2405	0420	0411
2405		
2406	0421	0114
2406	0422	4334
2406		
2407		
2410		
2411		
2412	0423	0643
2412	0424	0640
2412	0425	4340
2412	0426	2401
2412	0427	2305
2412	0430	4003
2412	0431	1005
2412	0432	0313
2412	0433	4006
2412	0434	0111

H LINE FEED ON THE TELETYPE

FSELECT <1

F 1 MARK ANOTHER TAPE

F 2 RESTART DIAL

12.

DS4. TEXT ZF

2350 0202 0718
2351 0203 2443
2351 0204 2642
2351 0205 2205
2351 0206 2514
2351 0207 1217
2351 0210 2642
2351 0211 2516
2351 0212 1124
2351 0213 4061
2352 0214 5643
2353 0215 0643
2353 0216 0640
2353 0217 2314
2353 0220 2123
2353 0221 3540
2353 0222 2516
2353 0223 1124
2353 0224 4361
2353 0225 4211
2354 0226 1643
2354 0227 3402
2355
2356
2357 0230 4342
2357
2360 0231 4340
2360
2361 0232 4340
2361
2362 0233 4340
2362
2363 0234 4342
2363 0235 4306
2363 0236 4022
2363 0237 0515
2363 0240 1724
2363 0241 0540
2363 0242 2711
2363 0243 2410
2364 0244 4243
2364 0245 0642
2364 0246 2722
2364 0247 1124
2364 0250 0540
2364 0251 0516
2364 0252 0102
2364 0253 1405
2364 0254 0454
2364 0255 4024
2364 0256 1705
2365 0257 1643
2365
2366 0260 0640
2366 0261 4306
2366 0262 4020

F MARKED ON THE RIGHT

F REEL OF UNIT 1.

F

F PLACE UNIT 1 IN

\E
DS28, TEXT Z

F REMOTE WITH

F WRITE ENABLED, THEN

F

2335	0116	0543
2335		
2336	0117	4243
2336	0120	1523
2336	0121	2514
2336	0122	3523
2336	0123	2442
2336	0124	4274
2336		
2337	0125	5143
2337		
2340	0126	4243
2340	0127	2642
2340	0130	4251
2340	0131	4243
2340	0132	2324
2340	0133	2442
2340	0134	1411
2340	0135	1623
2340	0136	4226
2340	0137	1722
2340	0140	1521
2340		
2341	2141	2443
2341		
2342	0142	3643
2342	0143	2642
2342	0144	4222
2342	0145	4242
2342	0146	5162
2342	0147	7142
2342	0150	2717
2342	0151	2204
2342	0152	4226
2342	0153	1722
2342	0154	1521
2342		
2343	0155	2443
2343	0156	3422
2343		
2344		
2345		
2346		
2347	0157	4326
2347	0160	4315
2347	0161	1725
2347	0162	1524
2347	0163	4224
2347	0164	2122
2347	0165	0540
2347	0166	2417
2347	0167	4222
2347		
2350	0170	3543
2350	0171	0542
2350	0172	1501
2350	0173	2213
2350	0174	2524
2350	0175	4217
2350	0176	1542
2350	0177	2412
2350	0200	0540
2350	0201	2211

FSELECT <1

F 1 STD LINC FORMAT

F P 129 WORD FORMAT

\Z

DS2A, TEXT Z

F MOUNT TAPE TO BE

2412 2435 1405
 2412
 2413 0436 0443
 2413
 2414 0437 0543
 2414
 2415 0440 0543
 2415
 2416 0441 0543
 2416 0442 0523
 2416 0443 0514
 2416 0444 0503
 2416 0445 0440
 2416
 2417 0446 0461
 2417
 2422 0447 4306
 2422 0450 4306
 2422 0451 4061
 2422 0452 4015
 2422 0453 0122
 2422 0454 1340
 2422 0455 0116
 2422 0456 1724
 2422 0457 1005
 2422 0460 2240
 2422 0461 2401
 2422
 2421 0462 2205
 2421
 2422 0463 4306
 2422 0464 4306
 2422 0465 4262
 2422 0466 4040
 2422 0467 2205
 2422 0470 2324
 2422 0471 0122
 2422 0472 2440
 2422 0473 0411
 2422
 2423 0474 0114
 2423
 2424 0475 4306
 2424 0476 4334
 2424
 2425
 2426

F TAPE CHECK FAILED

F

F

F

F

FSELECT <1

F

F 1 MARK ANOTHER TAPE

F

F 2 RESTART DIAL

F

\Z

0000 ERRORS

ANS 4762
 BKBNA 4471
 BKBNB 4472
 BLK01 4344
 BLKL01 4426
 BLKL02 4443
 BLOCK 4402
 BTEST 4677
 BITAB 4472
 CFBL 4666
 CHEC 4635
 COUNTA 4465
 COUNTB 4466

DLODP 4737
DSP1 4020
DSP1 036
DSP2 4115
DSP3 4200
DSP3A 4215
DS1 6281
DS2A 6157
DS2B 6232
DS3 6276
DS4 6423
DT 2007
FBLK 4343
FRSTGO 4607
GETKBD 5521
HERE 4264
KBLOCK 4352
KB1TAR 4510
KHERE 4352
KIEM 4345
KIIM 4346
KWAIT 4511
KWAITL 4347
KWMKD 4353
KWMKD 4512
KWRTAP 4112
K0016 4506
K0200 4351
K5252 4513
K7764 4507
LTAPE 4252
MARKS 4155
OMKST 4152
ONMARK 4113
PTAPE 4072
QAB 5004
QACA 5015
QACHAR 5655
QACKL 5621
QACNTR 5624
QAD 5026
QAE 5052
QAEXIT 5635
QAF 5516
QAG 5062
QAH 5114
QAI 5131
QAINIT 5020
QAJ 5136
QAK 5305
QAKRB 6036
QAL 5175
QALEGL 5575
QAM 5101
QAN 5223
QAO 5231
QAP 5242
QAQ 5263
QARFSH 5053
QAT 5270
QATLS 6046
QATPE 5644
QATSF 6041

QATY	5536
QAU	5506
QAV	5316
QAW	5512
QAX	5424
QAY	5412
QAZ	5301
RBLKNO	4720
REFRES	1053
RERROR	4747
RET2	4165
RLOOP	4714
STDIAL	4016
TEMPA	4467
WAIT	4600
WBLKNO	4660
WLOOP	4654
WMCNT	4634
WMCODE	4626
WMKWD	4620
WRLOOP	4272
WRTAP	4231