



DECUS

PROGRAM LIBRARY

DECUS NO.	12-6
TITLE	ANDIP - ANALOG DIGITAL INTERCHANGE PROGRAM
AUTHOR	C. J. Thomson, D. Skuce
COMPANY	Montreal Neurological Institute Montreal, Quebec, Canada
DATE	July 6, 1970
SOURCE LANGUAGE	LAP6-DIAL

ANDIP - ANALOG DIGITAL INTERCHANGE PROGRAM

DECUS Program Library Write-up

DECUS No. 12-6

INTRODUCTION

This program has been written to read and write multi-channel analog data on the various devices attached to the PDP-12. It will read up to 16 channel data from the analog to digital converter, the LINCtape or the PECTape using any number of channels and will write data on the LINCtape, the PEC IBM compatible tape, the COMLOT plotter, the TEKTRONIX Graphics Terminal and the Display. The transfer of data is done either in blocks selected by the user, or in automatic modes which allow many consecutive records to be transferred. When originating data from the analog to digital converters, the number of analog channels scanned, the sample rate, and the number of seconds for which the data is to be recorded can be specified by the operator. The program runs with the program interrupt enabled so that the PDP-12 display can present the most up to date information at all times and during all transfers, except in the case of high digitizing rates from the analog to digital converters. It is intended eventually to extend this program to allow various functions to be performed on the data. These will include smoothing, differentiation and recognition of characteristic patterns such as spikes making it useful in the interpretation of clinical EEGs and other similar data. The presentation of this data on the display screen and the plotter can be varied at will using three of the analog to digital converter knobs on the control panel on the left-hand side of the computer. These three knobs provide for a vertical displacement and a change in gain and a separation of individual channels. This feature is particularly useful when wishing to output data on the COMLOT plotter or the TEKTRONIX Graphics Terminal since the display can be set up to provide the optimum presentation of the data on the plotter. The ability to plot data on the TEKTRONIX Graphics Terminal enables many records to be compared as a semi-permanent record on the storage screen, thus it is often useful to plot the data on the Graphics Terminal before output on the incremental plotter. Another advantage of outputting on the terminal, as opposed to looking at the data on the PDP-12 display, is that the Graphics Terminal uses a vector plot and joins consecutive dots in the plot whereas the PDP-12 display shows the data as a series of dots with no interpolation between the dots.

In the description that follows the number "zero" is represented as "Ø" to distinguish it from the letter "O." The console switches are "up" or "Ø" if the part nearest the operator is "up."

LOADING THE PROGRAM INTO MEMORY

This program is loaded using the standard PDP-12 DIAL loading system.

1. Mount a system tape containing ANDIP on tape unit Ø and turn on the PDP-12.
2. Set the left-hand switches to Ø7Ø1.
3. Set the right-hand switches to 73ØØ.
4. Press IO preset.
5. Press "Do."

Wait until the tapes stop moving and press "Start 2Ø." The program dial now displays some text on the screen and is in edit mode waiting for the next command which in this case will be "To load the program ANDIP." Type a line feed on the teletype or Graphics Terminal followed by LO ANDIP, Ø carriage return. The monitor then loads the program "ANDIP." The program is self-starting and after some initialization displays two horizontal lines corresponding to two analog channels of data and six numbers across the top of the screen. These six numbers change during the operation of the program and represent some of the parameters which are used and which are required by the operator. At this point, "ANDIP" is ready to accept commands from the operator. Except for the control characters, all of the commands must be terminated by a carriage return. Most of the commands consist of one or two numbers, (and in the case of two numbers, these numbers are separated by a comma), and one or more letters describing the operation to be performed. These letters have been chosen as mnemonics for the operation which they perform.

SOME CONVENTIONS AND RULES TO BE OBSERVED DURING THE EXECUTION OF "ANDIP "

Three knobs on the AD converter and one of the sense switches, sense switch Ø, are used to adjust the presentation of data on the PDP-12 display. Knob Ø is used to adjust the gain or amplification of the analog data presented. Knob 1 is used to adjust the separation of individual channels on the screen. Knob 4 is used to adjust the vertical position of all of the channels as a group on the screen. Sense switch Ø is used to decide which of the two buffers will be shown on the display. "ANDIP" is aware of three buffers which are used to store analog data. One is associated with the LINCtape, one is associated with the PEC IBM tape and a third is associated with the display. When the program is not doing anything else, it displays the contents of the display buffer. Each time the display is finished the program checks the three knobs Ø, 1 and 4 and sense switch Ø to see that the operator has not moved them. If they have not been moved the display continues uninterrupted. If they have been moved, the program transfers the data from the selected buffer back into the display buffer but modifying it according to the most recent position of the knobs and the sense switch. When using the knobs, a slight flicker will be noticed in the display as the most recent data is transferred from one of the two raw data buffers into the display buffer.

Sense switch 5 is used to instruct the program whether the data will be plotted on the TEKTRONIX Graphics Terminal (switch down) or on the COMLOT plotter (switch up). The only other switch used on the console is the least significant of the right-hand switches which is used to instruct the program whether or not to draw in a zero line for each channel on the plotter (switch up = draw zero line). All other commands and instructions come from either the teletype or the Graphics Terminal which may be used interchangeably.

INSTRUCTIONS FOR USING THE LINCTAPE

LINCtape unit 1 is always read by ANDIP, LINCtape unit Ø is always written onto by ANDIP. The commands for using LINCtape are used for editing analog data since individual blocks (one quarter of the display) can be written on LINCtape. The first four numbers across the top of the display screen are the LINCtape parameters. From left to right, these numbers have the following significance:

1. The input block number as read from LINCtape unit 1 - This number can be modified by typing the new number followed by the letter "I" on the teletype.

2. The number of blocks to be output on the output LINCtapes - This number can be modified by typing the new number followed by the letter "N."
3. The quarter of the buffer which is to be output on LINCtape unit \emptyset - This number can be modified by typing the new number followed by the letter "Q."
4. The output block number on LINCtape unit \emptyset - This number can be modified by typing the new number followed by the letter "O" on the teletype and is advanced by the second number on the screen each time data is written out on the LINCtape unit \emptyset .

Thus, in the normal course of events, data is written out on consecutive blocks of LINCtape unit \emptyset . The letter "R" is used to read in a group of four blocks from LINCtape unit one. The letter "W" is used to output n blocks where n is the second number displayed on the display screen onto unit \emptyset . All numbers typed in and displayed are in the normal decimal notation.

INSTRUCTIONS FOR THE USE OF PEC IBM COMPATIBLE TRANSPORT

This tape system is not initiated when the computer is turned on and the tape must be tensioned before it can be used. This is done by pressing the load forward button on the PEC transport twice, once to tension the tape, and once to advance the tape to a load point. After the tape is at the "load point" press the "on line button." The "write enabled" button will light if the write ring is inserted in the reel of tape. The IBM compatible tape is a nine-track tape and eight-tracks which are used for data. In order to accommodate the twelve bits from the PDP-12, only the least significant eight are output on the PEC tape. The program transforms ten bit analog data to eight bits by dividing it by four and adding 128 to make a positive number, when the command "T" (transform) is typed. Thus it is the least significant bits of data which are lost. The sign and the most significant seven bits are preserved.

The letter "P" is used to put a record onto the IBM tape. When this letter is typed, the data is taken from the PEC tape buffer and written as the next block on the PEC tape. Since the buffers are 1 \emptyset 24 words long, the PEC tape records are 1 \emptyset 24 words long. Note that this corresponds to four blocks on the LINCtape. All records on the PEC tape are written as 1 \emptyset 24 words and when reading the PEC tape 1 \emptyset 24 words are expected in each record. The letter "G" is used to get the record from the PEC tape. The next consecutive record is read in. Each time a record is read in or written out on the PEC tape, the fifth number displayed on the top of the screen is incremented by one. Two other commands for the PEC tape move the tape backwards and forwards. In these commands, if the letter "B" alone is typed, the tape rewinds until the beginning of tape and stops at the load point. If a number is typed in front of the "B," the tape backs up that number of records thus if 345B was typed the tape would back up 345 records. As the tape is backing up, the record number shown on the screen is changing continuously so that the operator can see how many records the tape is backing up.

The letter "F" is used to move the tape forward (the tape will move forward the number of records typed in front of the letter "F"). Each time a record is read or written, the hardware of the PEC tape transport and the program do some checks to make sure that there were no apparent errors and the right number of words were output, or input, and in the case of output that the write ring is in place on the tape spool. If an apparent error occurs on reading data, the tape is backed up one record and an attempt is made to read the same record again. Five attempts are made to read a bad record. After the fifth attempt the program types a question mark on the teletype to indicate that it was not able to read that record. The tape stops in front of the record which has the error. If it

is necessary to advance over that record, the command "IF" should be typed which will advance the tape over that record, so that subsequent records may be read in by again typing the command "G."

INSTRUCTIONS FOR USING THE AUTOMATIC MODES

These modes are designed to transfer several records or blocks of data from one device to another. The commands consist of one or two numbers separated by a comma, a letter, a minus sign and another letter. The first letter indicates the destination device, that is: D for drawing on the plotter or TEKTRONIX Terminal; P for the PEC tape, or L for the LINCtape. The second letter indicates the input device which can be P for the PEC tape transport, L for the LINCtape, or A for the analog to digital converters. In the case of tape to tape transfers or tape to plotter transfers, the first number represents the starting block and the second number represents the finishing block. Thus, to transcribe blocks 100-150 from LINCtape unit one onto the COM PLOT plotter, the command 100, 150 D-L is typed. The following sequence of events takes place.

The first four blocks are read into the LINCtape buffer. These then are plotted out on the plotter, the plotter advances to the beginning of the next "page," the next four blocks of data are read in. This process is continued until all the requested blocks have been written. In the case of plotting from the PEC transport, only the number of records to be plotted is typed. The tape must be positioned (with "F" and "B" commands) just before the first record to be plotted. When outputting on the plotter, it is important that the correct buffer is selected with sense switch \emptyset . If the switch is toward the operator, (or down) the PEC tape buffer is output and if the switch is away from the operator (or up) the LINCtape buffer is output.

When plotting the number of increments horizontally it can be set up only with the "D" single function command. (If no number is typed in front of the D the number of channels being displayed is used so that the data is always plotted just over 10" long.)

If a number smaller than the number of channels has been typed in front of the D and then one of the multiple transfer plot commands is used, switch 4 may be put down to cause adjacent records to be written across the screen of the TEKTRONIX Terminal.

DIGITIZING OF ANALOG DATA

ANDIP can be used to collect analog data from the 16 channel analog to digital converter and output this data on the LINCtape or the PEC tape. Another mode is also available in which the acquisition of data takes place but it is merely displayed on the oscilloscope screen. The PDP-12 will be supplied with a 16 pin quick disconnect which will allow standard 16 channel analog data from analog tape to be transcribed directly onto digital tape using this program. When all 16 channels are being used, it will be necessary to switch the analog channel switches so that all channels read from this 16 pin connector.

Normally the inputs for 8 of the channels from phone jacks and the inputs from the other 8 channels are from knobs mounted on the left-hand panel of the computer. These knobs must be disconnected during the digitizing process in order that all 16 channels are available. If less than 8 channels are required, then the data is expected to come from analog channels 10-17, however, if all 16 channels are required then the data is expected to come from channels 0-15. In order to digitize analog data, this program requires the following information: the number of channels to be digitized, the number of samples per second to be taken from each channel and

the time for which the digitizing is to take place. It also requires the letter "A" to tell it that the data is coming in from the analog to digital converter and the destination device i.e. "P" for the PEC tape or "L" for the LINCtape. The number of channels is set up by typing a number in front of the letter "C" as a command. This number of channels will then be displayed on the screen. The digitizing commands are set up by typing the number of samples per second, a comma, the number of seconds for which the data is to be acquired, an "A", a minus sign and either an "L", a "P", or no other letter. If no other letter was typed, the data is not transcribed onto either tape system.

If the letter "L" was typed in the command, the data will be output on LINCtape. Just after the command is typed, the LINCtape unit \emptyset is moved and the present data is written out onto the block specified by the 4th number across the top of the display screen. This is done as a check to make sure that the LINCtape system is working properly and is able to write and to position the LINCtape. After the tape has stopped moving, the digitizing process is ready to commence.

If the letter "P" was typed in the command, the data is to be output on the PEC tape transport. The program checks the PEC transport to make sure that it is "on line" and that the "write ring" is present in the tape reel. It is up to the operator to make sure that the tape is positioned in the right place for writing the new data. After the tape system has been checked, the program is ready to start the digitizing process. It is, at this point expecting the letter "G" (Go) to be typed. When the source of analog data is ready, i.e. the analog tape system, the letter "G" is typed on the console and the digitizing process commences. The right-most number displayed on the screen will display the number of seconds to go in the digitizing process.

The operation of the digitizing process is as follows: the clock in the computer interrupts the program at the rate typed in on the keyboard for the number of samples per second, then the correct number of analog channels starting at channel \emptyset if there are more than 8 channels to be digitized or channel 1 \emptyset if there are less than 8 channels to be digitized are sampled in order and stored in memory. In the case of outputting data onto PEC tape, they are scaled to 8 bits maximum at this time. When 1024 data points have been input, the current record is written out onto the tape system and a new record is formed in memory in a separate buffer. If the digitizing rate is not too great, the record just written out onto magnetic tape is displayed on the screen, however, if the digitizing rate is high or a large number of channels are being sampled, the display flickers quite badly and sometimes disappears altogether. This is a problem relating to the time taken to digitize each channel and the calculations necessary to make sure that the data is stored correctly on the tape. Top priority in the program is given to collecting the data; lower is given to storing the data on tape and third and last to showing the data on the screen. The knobs and the sense switches which usually control the presentation of the data on the display are unavailable during the digitizing process since these analog channels may be used for bringing in analog data.

At the end of the time interval set by the operator or if CTRL/B is typed on the teletype, or the character "STX" on the TEKTRONIX Terminal is typed, the analog to digital conversion will stop. After it has stopped, the program reverts to its normal mode where the knobs are once again available for controlling the presentation of data on the screen. After a file has been completed on the PEC tape transport, the command "E" should be typed to put an end to file mark on the PEC tape.

NOTES CONCERNING THE MAXIMUM DIGITIZING RATE

In general, the PEC tape system is more suitable for storing the data since it is both faster and has very much greater capacity. The digitizing rate always depends on the number of samples per second and the number of channels to be recorded. For 1 channel records, the maximum digitizing rate is 4000 events per second onto the PEC tape transport, for 16 channel analog data the maximum rate is 400 events per second, for any other number of channels the maximum rate is somewhere in between these two limits. On the LINCtape system, the number of events per second for one channel is about 1000 per second.

If no number is typed as the number of samples per second the program assumes that the internal clock will not be used and instead a timing pulse from the analog magnetic tape system will be used to control the digitizing rate. This will have the advantage in that if the tape is played back in real time or time divided by 2 or time multiplied by 2, the true data rate will always be preserved. If no number is typed for the number of seconds, the program will run for 4096 seconds or about 1 hour and 20 minutes.

SINGLE OPERATION COMMANDS - TERMINATE BY CARRIAGE RETURN

"n" is a number between 1 and 4095

- B Back up PEC tape to beginning of tape.
- nB Back up PEC tape "n" records.
- nC Treat the data as "n" channels.
- D Draw on TEKTRONIX display (switch 5 down) or a COMLOT plotter (switch 5 up).
- nD Draw with a separation of "n" hundredths of an inch between points.
- E Write end of file on PEC tape.
- nF PEC tape forward "n" records.
- G Get next record from PEC tape.
- nI Make "n" the input block number from LINCtape unit 1.
- nN Make "n" the number of blocks to be output to LINCtape.
- nO Make "n" the output block number for LINCtape unit \emptyset .
- P Put record on PEC tape.
- nQ Select quarter number to output onto LINCtape.
- R Read (N) blocks starting at block (I) from LINCtape into memory at quarter (Q).
- T Transfer data from LINCtape buffer to PEC tape buffer and scale, to 8 bits.
- W Write out (N) blocks starting from quarter (Q) onto block (O).
- Z Zero out all buffers.

CONTROL COMMANDS

Press "CTRL" and letter on teletype.

Press function key on TEKTRONIX.

TTY	TEK	
CTRL/A	"SOH"	Restart ANDIP
CTRL/B	"STX"	Stop A/D conversion after 2 seconds
CTRL/C	"ETX"	Exit from ANDIP and return to Dial monitor
G	G	Go command to start A/D conversion

```

0000          *20
0001          /AN.D.I.P
0002          /ANALOG-DIGITAL INTERCHANGE PROGRAM
0003          /REVISED C.J.T./12,6,70
0004          ASMIEN DOLIST
0005          NOLIST
0006          SEGMNT 0
0007          LOCAL=0
0010          PMODE          /INT RETURN
0011          *0
0012          0000 1064      CHKNOB
0013          0001 0023      JMP PINT          /FOR PDPMODE
0014          /INTERRUPTS TO BE PROCESSED
0015          *6
0016          0006 5145      SCALE+4000
0017          *20
0020          LMODE
0021          0020 6321      JMP START
0022          0021 0000      HLT
0023          0022 4405      PLOT, PLOTX
0024          PMODE
0025          0023 3060      PINT, DCA TEMAC          /STORE AC
0026          0024 4463      JMS I SKPC          /FOR SERVICE
0027          0025 6141      LINC
0030          LMODE
0031          0026 0600      RFP, LIF 0
0032          0027 0002      PDP
0033          PMODE
0034          0030 6001      ION
0035          0031 5400      JMP I 0
0036          0032 1261      TOUT, QUES
0037          0033 6046      TLS
0040          0034 3143      DCA KEYTEM
0041          0035 4064      JMS DFFS
0042          0036 3153      DCA TIN+3
0043          0037 5076      JMP RESTOR
0044          LMODE
0045          *40          /LINC MODE INTS
0046          0040 1064      LINT, CHKNOB
0047          0041 1060      STC TEMAC
0050          0042 2040      ADD 40          /FORM JMP RETN
0051          0043 1620      BSE I
0052          0044 6000      6000          /"JMP"
0053          0045 4055      STC RN          /FOR LINC RETN
0054          0046 0002      PDP
0055          PMODE
0056          0047 4463      JMS I SKPC          /FOR SERVICE
0057          0050 6141      LAA, LINC
0060          LMODE
0061          0051 0600      RFL, LIF 0
0062          0052 0006      DJR          /DONT CHANGE "0"
0063          0053 0500      IOB
0064          0054 0001      6001          /ENABLE INT
0065          0055 7064      RN, JMP CHKNOB          /JMP BACK
0066          PMODE

```

MULTIPLE OPERATION COMMANDS - SUMMARY

- n,mA Digitize but do not store on tape (expensive oscilloscope mode!)
- $n,mA-L$ Digitize at n samples per second, for m seconds from analog inputs to LINCtape.
- $n,mA-P$ Digitize at n samples per second, for m seconds from analog inputs to Pec tape.
- $n,mD-L$ Sense switch \emptyset up to select LINCtape buffer. Draw data from blocks n to m of LINCtape 1 on TEKTRONIX Terminal (sense switch 5 down) or COMPLOT plotter (sense switch 5 up).
- $nD-P$ Sense switch \emptyset down to select PEC tape buffer. Draw data from the next n records of the PEC tape on TEKTRONIX Terminal (sense switch 5 down) or COMPLOT plotter (sense switch 5 up).
- $n,mP-L$ Transcribe from block n to block m of the LINCtape unit 1 onto PEC tape.

0067	0056	0000	ZZERO,	0	/STORE LOC 0
0070	0057	7775	M3,	-3	
0071	0060	0000	TEMAC,	0	
0072	0061	0000	INT,	0	
0073	0062	0000	LTEM,	0	
0074	0063	0227	SKPC,	SKPCHN	
0075	0064	0000	DFFS,	0	/STORE DATA FIELD
0076	0065	7200		CLA	
0077	0066	6141		LINC	
0100				LMODE	
0101	0067	0500		IOB	/READ IN LMODE
0102	0070	6214		6214	/THE DATA FIELD
0103	0071	0301		ROR+1	
0104	0072	1620		BSE I	
0105	0073	0640	LLDF,	640	
0106	0074	0002		PDP	
0107				PMODE	
0110	0075	5464		JMP I DFFS	
0111				PSK=6371	
0112				CLSK=6131	
0113	0076	5477	RESTOR,	JMP I.+1	
0114	0077	0267		RSTX	
0115				/INTERRUPT PROCESSING SUBROUTINES	
0116				/	
0117	0100	6036	KEYIN,	KRB	
0120	0101	4032		JMS TOUT	/ECHO
0121	0102	6141		LINC	
0122				LMODE	
0123	0103	1460		SAE I	
0124	0104	0201		201	
0125	0105	0467		SKP	
0126	0106	6321		JMP START	
0127	0107	0602		LIF 2	
0130	0110	1460		SAE I	
0131	0111	0202		202	
0132	0112	0467		SKP	
0133	0113	6023		JMP UPB	
0134	0114	1460		SAE I	
0135	0115	0203		203	
0136	0116	0467		SKP	
0137	0117	6020		JMP DIAL	
0140	0120	0600		LIF 0	
0141	0121	1460		SAE I	
0142	0122	0215	CR,	215	
0143	0123	6130		JMP KO	
0144	0124	0002		PDP	
0145				PMODE	
0146	0125	1057		TAD M3	
0147	0126	4032		JMS TOUT	
0150	0127	6141		LINC	
0151				LMODE	
0152	0130	0640	KO,	LDF 2	
0153	0131	0002		PDP	
0154				PMODE	
0155	0132	6036		KRB	

0156	0133	5544		JMP I KEYOUT	/GIVE TO CALLED
0157	0134	0100	HUN,	100	
0160	0135	4030	DIV,	DIVIDE	
0161	0136	0204	LC,	LCIN	
0162	0137	0156	PLOUT,	PLWT	
0163	0140	0167	PCN,	PECIN	
0164	0141	0223	CLN,	CLIN	
0165	0142	0162	PLN,	PLIN	
0166	0143	0000	KEYTEM,	0	
0167	0144	1261	KEYOUT,	QUES	/WAIT FOR KEYB
0170	0145	4064		JMS DFFS	/GET DATA FIELD
0171	0146	3130		DCA KO	
0172	0147	5076		JMP RESTOR	
0173			/		
0174	0150	5042	TIN,	TCF	/CLEAR FLAG
0175	0151	1143		TAD KEYTEM	
0176	0152	6141		LINC	
0177				LMODE	
0200	0153	0000		HLT	
0201	0154	0002		PDP	
0202				PMODE	
0203	0155	5432		JMP I TOUT	/DONE
0204			/PLOTTER		
0205	0156	0000	PLWT,	0	
0206	0157	4064		JMS DFFS	
0207	0160	5164		DCA PLIN+2	
0210	0161	5076		JMP RESTOR	
0211	0162	6502	PLIN,	PLCF	
0212	0163	6141		LINC	
0213				LMODE	
0214	0164	0644		LDF DISBUF	
0215	0165	0002		PDP	
0216				PMODE	
0217	0166	5556		JMP I PLWT	
0220			/PEC TAPE		
0221				PCCF=6372	
0222				PCR=6374	
0223	0167	6372	PECIN,	PCCF	/CL DONE
0224	0170	6141		LINC	
0225				LMODE	
0226	0171	0643		LDF TRUF	
0227	0172	0002		PDP	
0230				PMODE	
0231	0173	6374		PCR	/CL REWIND
0232	0174	6377		6377	
0233	0175	5576		JMP I PECOUT	
0234	0176	1261	PECOUT,	QUES	
0235	0177	6375		6375	
0236	0200	4064		JMS DFFS	
0237	0201	3171		DCA PECIN+2	
0240	0202	6376		6376	
0241	0203	5076		JMP RESTOR	
0242			/		
0243			/LINC TAPE		

0244	0204	1134	LCIN,	TAD HUN	
0245	0205	6151		6151	
0246	0206	7000		NOP	
0247	0207	6141		LINC	
0250	0210	0000		0	
0251				LMODE	
0252	0211	0011		CLR	
0253	0212	0001		AXO	/TAKE TAPE OFFIN
0254	0213	6213		JMP .	
0255	0214	0011	LCOUT,	CLR	
0256	0215	2000		ADD 0	
0257	0216	4213		STC LCOUT-1	
0260	0217	0002		PDP	
0261				PMODE	
0262	0220	4064		JMS DFFS	
0263	0221	3210		DCA LCIN+4	
0264	0222	5076		JMP RESTOR	
0265			/CLOCK		
0266	0223	6135	CLIN,	6135	
0267	0224	6141		LINC	
0270				LMODE	
0271	0225	0602		LIF 2	
0272	0226	7335		JMP NXS	
0273			/		
0274			/		
0275				PMODE	
0276				PSKR=6373	
0277			/PROCESS INTERRUPT :	IFLJD WHICH DEVICE	
0300	0227	0050	SKPCHN,	LAA	
0301	0230	7204		GLK	
0302	0231	3062		DCA LTEM	/SAVE LINK
0303	0232	1000		TAD 0	/KEEP ZERO
0304	0233	3056		DCA ZZERO	
0305	0234	6141		LINC	
0306				LMODE	
0307	0235	J500		IOB	
0310	0236	6234		6234	/"READ INT BUF"
0311	0237	4271		STC FLDS	
0312	0240	0002		PDP	
0313				PMODE	
0314	0241	5131		CLSK	
0315	0242	7410		SKP	
0316	0243	5541		JMP I CLN	/CLOCK
0317	0244	6371		PSK	/PEC TAPE
0320	0245	7410		SKP	
0321	0246	5540		JMP I PCN	
0322	0247	6373		PSKR	/PEC REWIND
0323	0250	7410		SKP	
0324	0251	5540		JMP I PCN	
0325	0252	6501		PLSF	/PLOTTER
0326	0253	7410		SKP	
0327	0254	5542		JMP I PLN	
0330	0255	6041		TSF	/TTY PRINTER
0331	0256	7410		SKP	
0332	0257	5150		JMP TIN	
0333	0260	6031		KSF	/TTY KEYBOARD
0334	0261	7410		SKP	
0335	0262	5100		JMP KEYIN	

0336	0260	1134	TAD HUN	
0337	0264	6151	6151	
0340	0265	7410	SKP	
0341	0266	5536	JMP I LC	/LINC TAPE
0342	0267	6141	LINC	
0343			LMODE	
0344	0270	1020	LDA I	
0345	0271	0000	0	
0346	0272	0303	ROR+3	/FORM "LIF"
0347	0273	1560	RCL I	
0350	0274	7740	7740	
0351	0275	1620	RSE I	
0352	0276	0600	600	/LIF
0353	0277	1040	STA	
0354	0300	0026	RFP	
0355	0301	4051	STC RFL	
0356	0302	2271	ADD FLDS	
0357	0303	0242	ROL+2	
0360	0304	1560	BCL I	
0361	0305	7740	7740	
0362	0306	2073	ADD LLDF	
0363	0307	4210	STC .+1	
0364	0310	0000	HLT	
0365	0311	0002	PDP	
0366			PMODE	
0367	0312	1062	TAD LTEM	
0370	0313	7010	RAR	
0371	0314	7200	CLA	
0372	0315	1056	TAD ZZERO	
0373	0316	3000	DCA 0	/RESTOR 0
0374	0317	1060	TAD TEMAC	
0375	0320	5627	JMP I SKPCHN	
0376			/START UP ROUTINE	
0377			LMODE	
0400	0321	1020	LDA I	
0401	0322	7064	JMP CHKNOB	/FORCE DISPLAY
0402	0323	4055	STC RN	
0403	0324	1020	LDA I	
0404	0325	0050	LAA	
0405	0326	4227	STC SKPCHN	
0406	0327	0002	PDP	
0407			PMODE	
0410	0330	1122	TAD CR	
0411	0331	6046	TLS	
0412	0332	6041	TSF	
0413	0333	5332	JMP .-1	
0414	0334	6141	LINC	
0415			LMODE	
0416	0335	1020	LDA I	
0417	0336	0020	20	
0420	0337	0004	ESF	/I/O PRESET
0421	0340	1020	LDA I	
0422	0341	0100	100	/FAST SAMPLE
0423	0342	0004	ESF	/SMALL CHARS
0424	0343	7547	JMP ZZ	

0425			/		
0426			/		
0427				LIST	
0430				/PEC TAPE CONTROL AND FUNCTIONS	
0431	0344	0002		WRTCHK, PDP	
0432				Pmode	
0433	0345	6377		6377	
0434	0346	0353		AND P2000	
0435	0347	6141		LINC	
0436				Lmode	
0437	0350	0450		AZE	
0440	0351	7260		JMP BAD	
0441	0352	6000		JMP 0	
0442	0353	2000	P2000,	2000	/WRITE ENABLED
0443	0354	5032		5032	/BACK UP RECORD
0444	0355	0011	BAKUP,	CLR	
0445	0356	2000		ADD 0	
0446	0357	4364		STC BKK	
0447	0360	2354		ADD BAKUP-	
0450	0361	0002		PDP	
0451				Pmode	
0452	0362	4176		JMS PECOUT	/AND WAIT
0453	0363	6141		LINC	
0454				Lmode	
0455	0364	0000	BKK,	HLT	
0456	0365	1000	PARLRR,	LDA	
0457	0366	0377		TSTRT	
0460	0367	4021		STC 21	
0461	0370	6355		JMP BAKUP	
0462	0371	1000		LDA	
0463	0372	0377		TSTRT	
0464	0373	4021		STC 21	
0465	0374	7575		JMP BKRS	
0466	0375	6466		JMP PECTRY	
0467	0376	1020	P,	LDA I	
0470	0377	5777	TSTRT,	5777	
0471	0400	4021		STC 21	/START OF REC
0472	0401	6344		JMP WRTCHK	
0473	0402	6461		JMP PECWT	
0474	0403	7321		JMP KEYB	
0475	0404	1000	G,	LDA /READ PEC TAPE	
0476	0405	0377		TSTRT	
0477	0406	4021		STC 21	
0500	0407	0643		LDF TBUF	
0501	0410	6452		JMP PECRD	
0502	0411	6512		JMP PARBIT	
0503	0412	7321		JMP KEYB	
0504	0413	1000	REW,	LDA	
0505	0414	0061		INT	
0506	0415	0470		AZE 1	
0507	0416	6427		JMP REWX	
0510	0417	0017		COM	
0511	0420	4002		STC 2	
0512	0421	6355		JMP BAKUP	
0513	0422	6504		JMP ADREC	
0514	0423	0222		XSK I 2	
0515	0424	6421		JMP .-3	
0516	0425	7575		JMP BKRS	
0517	0426	7321		JMP KEYB	

0520	0427	6432	REW, JMP	REWIND	
0521	0430	7321		JMP	KEYE
0522	0431	0100			100
0523	0432	0011	REWIND, CLR		
0524	0433	2000		ADD 0	/SET UP RETURN
0525	0434	4450		STC	RWTN
0526	0435	2451		ADD	REWC
0527	0436	0002		PDP	
0530				Pmode	
0531	0437	6377			6377
0532	0440	0231		AND	REWIND-1
0533	0441	7440		SZA	
0534	0442	5245		JMP	.*3
0535	0443	1251		TAD	REWC
0536	0444	4176		JMS	PECOUT
0537	0445	6141		LINC	
0540				Lmode	
0541	0446	0011		CLR	
0542	0447	4510		STC	RECCNT /RESET REC COUNT
0543	0450	0000	RWTN, HLT		
0544	0451	2132	REWC, 2132		/REWIND COMMAND
0545	0452	3011	PECRD, CLR		
0546	0453	2000		ADD 0	/SET UP RETURN
0547	0454	4503		STC	PRDRTN
0550	0455	5604		STC	PRCNT
0551	0456	2530		ADD	RDCOMD
0552	0457	4533		STC	COMWD
0553	0460	6466		JMP	.*6
0554	0461	0011	PECWT, CLR		
0555	0462	2000		ADD 0	/SET UP RETURN
0556	0463	4503		STC	PRDRTN
0557	0464	2532		ADD	WTCOMD
0560	0465	4533		STC	COMWD
0561	0466	1020	PECTPY, LDA I		/WORD COUNT
0562	0467	6000			6000
0563	0470	4020		STC	20
0564	0471	2533		ADD	COMWD
0565	0472	3002		PDP	
0566				Pmode	
0567	0473	4176		JMS	PECOUT
0570	0474	0331		AND	ERCHK
0571	0475	6141		LINC	
0572				Lmode	
0573	0476	0450	PECX, AZE		
0574	0477	6365		JMP	PARERR
0575	0500	2641		ADD	ON
0576	0501	1140		ADM	
0577	0502	0510		RECCNT	
0600	0503	0000	PRDRTN, HLT		
0601	0504	1020	ADREC, LDA I		
0602	0505	0001			1
0603	0506	0016		NOP	
0604	0507	1160		ADM	I
0605	0510	0000	RECCNT, 0		
0606	0511	6000		JMP	0

```

0607          /NOW MASK OUT PARITY BIT
0610      0512  0011  PARBIT, CLR
0611      0513  2000          ADD 0
0612      0514  4527          STC RX
0613      0515  0062          SET I 2
0614      0516  3777          3777
0615      0517  1022          LDA I 2
0616      0520  1560          BCL I
0617      0521  0400          400
0620      0522  3675          ADD M177
0621      0523  1042          STA 2
0622      0524  0202          XSK 2
0623      0525  6517          JMP PARBIT+5
0624      0526  5151          STC VPOS          /FORCE DISP CHNG
0625      0527  0000  RX,    HLT
0626      0530  6022  RDCOMD, 6022
0627      0531  3264  ERCHK,  3264
0630      0532  1022  WTCOMD, 1022
0631      0533  0000  COMWD,  0
0632      0534  3022  EOFF,   3022          /EOF
0633          /WRITE END OF FILE ROUTINE.
0634      0535  0002  PECEOF, PDP
0635          PMODE
0636      0536  7200          CLA
0637      0537  1334          TAD EOFF
0640      0540  4176          JMS PECOUT          /WAIT FOR INT
0641      0541  6141          LINC
0642          LMODE
0643      0542  7321          JMP KEYB
0644          LIST
0645          /END OF PEC TAPE ROUTINES
0646          /FUNCTION ROUTINE F0: SCALE BUFFER TO
0647          /RANGE 0 TO 377 (8 BITS) TO WRITE ON
0650          /IBM 9 TRACK TAPE.
0651      0543  6545  T,      JMP XFER
0652      0544  7321          JMP KEYB
0653      0545  0011  XFER,   CLR
0654      0546  2000          ADD 0
0655      0547  4564          STC XE
0656      0550  0062          SET I 2
0657      0551  3777          3777
0660      0552  0641  NEXTPT, LDF INBUF
0661      0553  1022          LDA I 2
0662      0554  0342          SCR 2
0663      0555  1120          ADA I
0664      0556  0200  P200.   200
0665      0557  0643          LDF TBUF
0666      0560  1042          STA 2
0667      0561  0202          XSK 2
0670      0562  6552          JMP NEXTPT
0671      0563  5151          STC VPOS
0672      0564  0000  XE,    HLT

```

```

0673 /OUTPUT BUFFER IN MEMORY
0674 /ON PLOTTER
0675 /CALL IN LINC MODE
0676 /WITH STARTING ADDRESS IN AC
0677 /
0700 LIST
0701 0565 4576 OUTPLT, STC CHNLY
0702 /FOR VERT COORDINATE
0703 0565 4622 STC PL+1 /CLEAR X COORD
0704 0567 2000 ADD 0 /RETURN ADDRESS
0705 0570 4557 STC RETRN
0706 0571 1020 LDA I
0707 0572 7000 XMAX, -777
0710 0573 4660 STC COUNT /512 POINTS
0711 0574 0644 PLGO, LDF DISBUF
0712 0575 1000 LDA
0713 0576 0000 CHNLY, 0
0714 0577 1460 SAE I
0715 0600 2000 2000 /USED FOR OFF
0716 0601 0467 SKP /SCREEN DISPLAY DATA
0717 0602 6616 JMP PL-3 /DONT CHANGE Y
0720 0603 0241 ROL+1
0721 0604 2661 ADD VERT /HEIGHT FACTOR
0722 0605 4623 STC PL+2
0723 0606 2623 ADD PL+2
0724 0607 1120 ADA I
0725 DECIMAL /CHECK OFF PAGE
0726 0610 6027 -1000 /TEN INCHES MAX
0727 0611 0451 APO
0730 0612 6616 JMP .+4
0731 0613 1020 LDA I
0732 0614 1750 1000 /SET TOP OF PAG
0733 0615 4623 STC PL+2
0734 OCTAL
0735 0616 0640 LDF LOCAL
0736 0617 0002 PDP
0737 PMODE
0740 0620 7300 CLA CLL
0741 0621 4422 PL, JMS I PLOT /PLOT POINT
0742 0622 0000 0 /X COORD
0743 0623 0000 0 /Y COORD
0744 0624 2260 ISZ COUNT
0745 0625 7410 SKP
0746 0626 5242 JMP BACK /FINISHED
0747 0627 6141 LINC
0750 LMODE
0751 0630 1020 LDA I
0752 0631 0002 XINC, 2 /INCREMENT X
0753 0632 2622 ADD PL+1
0754 0633 4622 STC PL+1
0755 0634 3512 ADD NCH
0756 0635 2576 ADD CHNLY
0757 0636 4576 STC CHNLY
0758 0637 6574 JMP PLGO
0761 0640 0002 PDP
0762 PMODE
0763 0641 0001 ON, 1
0764 0642 7200 BACK, CLA
0765 0643 1222 TAD PL+1 /PRESNT X COORD
0766 0644 3247 DCA .+3

```

0767	0645	1241		TAD ON	/PEN UP
0770	0646	4422		JMS I PLOT	/ADJUST Y TO
0771	0647	0000		0	/LOCAL ZERO
0772	0650	0000		0	
0773				/PLOT "ZERO LINE" BACK TO ORIGIN WITH	
0774				/PEN DOWN IF ACS BIT 11 IS OFF	
0775	0651	7604		LAS	
0776	0652	0241		AND ON	
0777	0653	4422		JMS I PLOT	
1000	0654	0000		0	/RETURN TO
1001	0655	0000		0	/ORIGIN
1002	0656	6141		LINC	
1003			LMODE		
1004	0657	0000	RETRN,	HLT	
1005	0660	7776	COUNT,	-1	
1006	0661	1000	VERT,	1000	
1007			/EDITOR		
1010				INBUF=1	
1011				DISBUF=4	
1012				TBUF=3	
1013	0662	6664	R,	JMP RD	/READ LINC TAPE
1014	0663	7321		JMP KEYB	
1015	0664	0641	RD,	LDF INBUF	
1016	0665	0011		CLR	
1017	0666	2000		ADD 0	
1020	0667	4724		STC W-1	
1021	0670	1020		LDA I	/GET QUART NO
1022	0671	0000	QNO,	0	
1023	0672	1120		ADA I	
1024	0673	0004		4	
1025	0674	0251		ROL 11	
1026	0675	1120		ADA I	
1027	0676	0000	IBN,	0	
1030	0677	4710		STC READ+1	
1031	0700	1120		ADA I	
1032	0701	0004	NBLK,	4	
1033	0702	0017		COM	
1034	0703	4002		STC 2	
1035	0704	1020		LDA I	
1036	0705	0110		110	
1037	0706	0001		AXO	/PUT TAPE ON INT
1040	0707	0710	READ,	RDC U	
1041	0710	0000		0	
1042	0711	6214		JMP LCOUT	/WAIT FOR INT
1043	0712	1020		LDA J	
1044	0713	1001		1001	
1045	0714	1140		ADM	
1046	0715	0710		READ+1	
1047	0716	0222		XSK I 2	/2 COUNTS BLKS
1050	0717	6704		JMP READ-3	
1051	0720	5151		STC VPOS	
1052	0721	2701		ADD NBLK	
1053	0722	1140		ADM	
1054	0723	0676		IBN	/ADV BLK NO
1055	0724	7321		JMP KEYB	
1056	0725	0641	W,	LDF INBUF	
1057	0726	6730		JMP WRT	/WRITE ON LINC TAPE
1060	0727	7321		JMP KEYB	

1061	0730	0011	VRT,	CLR	
1062	0731	2000		ADD 0	
1063	0732	4763		STC WTR	
1064	0733	1020		LDA I	
1065	0734	7773		-4	
1066	0735	4002		STC 2	
1067	0736	1020		LDA I	
1070	0737	4000		4000	
1071	0740	1120		ADA I	
1072	0741	0000	OBN,	0	
1073	0742	4747		STC WRITE+1	
1074	0743	1020		LDA I	
1075	0744	0110		110	
1076	0745	0001		AXO	
1077	0746	0706	WRITE,	WRI	
1100	0747	0000		0	
1101	0750	0214		JMP LCOUT	
1102	0751	1020		LDA I	
1103	0752	1001		1001	
1104	0753	1140		ADM	
1105	0754	0747		WRITE+1	
1106	0755	0222		XSK I 2	
1107	0756	6743		JMP WRITE-3	
1110	0757	1020		LDA I	
1111	0760	0004		4	
1112	0761	1140		ADM	
1113	0762	0741		OBN	
1114	0763	6763	WTR,	JMP .	
1115				/PLOT ON PLOTTER OR TEK TERMINAL	
1116				/	
1117	0764	0011	PLT,	CLR	
1120	0765	2061		ADD INT	
1121	0766	0470		AZE I	
1122	0767	3512		ADD NCH	
1123	0770	4631		STC XINC	
1124	0771	6773		JMP PLTO	/AND PLOT
1125	0772	7321		JMP KEYB	
1126	0773	0011	PLTO,	CLR	
1127	0774	2000		ADD 0	
1130	0775	5063		STC CHKNOB-1	
1131	0776	1000		LDA	
1132	0777	1512		NCH	/CHANNEL NO
1133	1000	1040		STA	
1134	1001	1012		DVSOR	
1135	1002	0017		COM	
1136	1003	4010		STC 10	
1137	1004	0002		PDP	
1140				PMODE	/GET NO OF PTS
1141	1005	7040		CMA	
1142	1006	4022		JMS I PLOT	/INIT PLOTTER
1143	1007	7200		CLA	
1144	1010	4535		JMS I DIV	
1145	1011	2000		2000	/UP TO 1024
1146	1012	0002	DVSOR,	2	
1147	1013	6141		LINC	
1150				LMODE	

1151	1014	1040		STA	
1152	1015	1060		ADV+3	
1153	1016	0017		COM	
1154	1017	2671		ADD ON	
1155	1020	4572		STC XMAX	
1156	1021	2631		ADD XINC	
1157	1022	1247		MUL	
1160	1023	1060		ADV+3	
1161	1024	5060		STC ADV+3	
1162			/ONCE FOR EACH CHANNEL		
1163	1025	1020		LDA I	
1164	1026	2000		2000	/DISPLAY FIELD
1165	1027	5043		STC NXTONE	
1166	1030	1000	NXP,	LDA	
1167	1031	0010		10	/CHNO
1170	1032	1240		MUL	
1171	1033	1202		SEP	/MUL BY SEPAR
1172	1034	3151		ADD VPOS	
1173	1035	0241		ROL+1	/CH ORIGIN
1174	1036	2661		ADD VERT	
1175	1037	1040		STA	
1176	1040	0655		BACK+13	
1177	1041	4650		STC BACK+6	
1200	1042	1020		LDA I	
1201	1043	2000	NXTONE,	2000	
1202	1044	6565		JMP OUTPLT	/AND PLOT
1203	1045	0230		XSK I 10	/PLOT NO
1204	1046	0467		SKP	/NOT FINISHED
1205	1047	7055		JMP ADV	/ALL DONE
1206	1050	1000		LDA	
1207	1051	1043		NXTONE	
1210	1052	2641		ADD ON	
1211	1053	5043		STC NXTONE	
1212	1054	7030		JMP NXP	/FOR NEXT CHNL
1213	1055	0002	ADV,	PDP	
1214				Pmode	
1215	1056	7201		CLA IAC	
1216	1057	4422		JMS I PLOT	
1217	1060	2000		2000	/ON X AXIS
1220	1061	0000		0	/(Y AXIS)
1221	1062	6141		LINC	
1222				Lmode	
1223	1063	0000		HLT	
1224			/CHECK KNOB AND SENSE SW POSN		
1225			/AND MODIFY BUFFERS IF REQUIRED		
1226			LIST		
1227	1064	0011	CHKNOB,	CLR	
1230	1065	0440		SNS	
1231	1066	0017		COM	
1232	1067	1460		SAE I	
1233	1070	0000	SENS0,	0	
1234	1071	7135		JMP CHNG	
1235	1072	0100		SAM 0	
1236	1073	0101		SAM 1	/A-D 0
1237	1074	1060		STA I	

1240	1075	0000	TEM0,	0	
1241	1076	0017		COM	
1242	1077	3142		ADD KNOB0	
1243	1100	0451		APO	
1244	1101	0017		COM	
1245	1102	1120		ADA I	
1246	1103	7775		-2	
1247	1104	0471		APO I	
1250	1105	7135		JMP CHNG	
1251	1106	0104		SAM 4	/VERT SEPARATION
1252	1107	1060		STA I	
1253	1110	0001	TKNB1,	1	
1254	1111	0017		COM	
1255	1112	1120		ADA I	
1256	1113	0001	KNOB1,	1	
1257	1114	0451		APO	
1260	1115	0017		COM	
1261	1116	1120		ADA I	
1262	1117	7775		-2	
1263	1120	0471		APO I	
1264	1121	7135		JMP CHNG	
1265	1122	0100		SAM 0	
1266	1123	1060		STA I	
1267	1124	0000	TEM4,	0	
1270	1125	0017		COM	
1271	1126	3151		ADD VPOS	
1272	1127	0451		APO	
1273	1130	0017		COM	
1274	1131	1120		ADA I	
1275	1132	7773		-4	
1276	1133	0451		APO	
1277	1134	7234		JMP DISP	
1300	1135	0063	CHNG,	SET I 3	/DATA
1301	1136	3777		3777	
1302	1137	1000		LDA	
1303	1140	1075		TEM0	
1304	1141	1060		STA I	
1305	1142	0000	KNOB0,	0	
1306	1143	0242		ROL 2	
1307	1144	1060		STA I	
1310	1145	0000	SCALE,	0	
1311	1146	1000		LDA	
1312	1147	1124		TEM4	
1313	1150	1060		STA I	
1314	1151	0000	VPOS,	0	
1315	1152	1000		LDA	
1316	1153	1110		TKNB1	
1317	1154	5113		STC KNOB1	
1320	1155	0440		SNS	
1321	1156	0017		COM	
1322	1157	1040		STA	
1323	1160	1070		SENS0	
1324	1161	0451		APO	
1325	1162	7166		JMP .+4	/CHECK BUFFER

1326	1163	1020		LDA I	
1327	1164	0643		LDF TBUF	/GET THIS INSTR
1330	1165	7170		JMP .+3	
1331	1166	1020		LDA I	
1332	1167	0641		LDF INBUF	
1333	1170	5176		STC FILD	
1334	1171	3113		ADD KNOB1	/SEPARATION
1335	1172	0342		SCR 2	
1336	1173	5202		STC SEP	/OF CHANNELS
1337	1174	0043		SET 5	
1340	1175	1515		CNCH	
1341	1176	0000	FILD,	HLT	
1342	1177	1000		LDA	
1343	1200	0005		5	
1344	1201	1260		MUL I	
1345	1202	0020	SEP,	20	
1346	1203	3151		ADD VPOS	
1347	1204	1060		STA I	
1350	1205	0001	TM1,	1	
1351	1206	1023		LDA I 3	
1352	1207	1246		MUL 6	
1353	1210	3205		ADD TM1	
1354	1211	0640		LDF DISBUF	
1355	1212	1043		STA 3	/DISPLAY BUF
1356	1213	1120		ADA I	
1357	1214	7400		-377	
1360	1215	0471		APO I	
1361	1216	7223		JMP NO	/DONT DISP
1362	1217	1120		ADA I	
1363	1220	0776		776	
1364	1221	0471		APO I	
1365	1222	7226		JMP .+4	
1366	1223	1320	NO,	LDA I	
1367	1224	2000		2000	
1370	1225	1043		STA 3	
1371	1226	0203		XSK 3	
1372	1227	0467		SKP	
1373	1230	7234		JMP DISP	
1374	1231	0225		XSK I 5	
1375	1232	7170		JMP FILD	
1376	1233	7174		JMP FILD-2	
1377	1234	0344	DISP,	LDF DISBUF	
1400	1235	0063		SET I 3	
1401	1236	3777		3777	
1402	1237	0064		SET I 4	
1403	1240	3777		3777	
1404	1241	0224	NEXT,	XSK I 4	/ADV DISP HORIZ
1405	1242	0467		SKP	
1406	1243	7724		JMP DISPAR	/FINISHED
1407	1244	1023		LDA I 3	/EVEN CHANNEL
1410	1245	1460		SAE I	
1411	1246	2000		2000	/DONT DISP
1412	1247	0144		DIS 4	
1413	1250	1023		LDA I 3	
1414	1251	1460		SAE I	
1415	1252	2000		2000	
1416	1253	0144		DIS 4	
1417	1254	7241		JMP NEXT	

1420			/COMMAND ERROR		
1421	1255	0277	QMARK,	277	
1422	1256	0212		212	
1423	1257	0207		207	
1424	1260	0002	BAD,	PDP	/BAD COMMAND
1425				PMODE	
1426	1261	7200	QUES,	CLA	
1427	1262	1255		TAD QMARK	
1430	1263	4032		JMS TOUT	
1431	1264	7200		CLA	
1432	1265	1256		TAD QMARK+1	
1433	1266	4032		JMS TOUT	
1434	1267	7200		CLA	
1435	1270	1257		TAD QMARK+2	
1436	1271	4032		JMS TOUT	
1437	1272	6141		LINC	
1440				LMODE	
1441	1273	7321		JMP KEYB	
1442				PMODE	
1443	1274	4200	DECIN,	INREAL	
1444	1275	0000	NUCHAR,	0	
1445	1276	4144		JMS KEYOUT	/GET NEXT CHAR
1446	1277	1357		TAD TEM	
1447	1300	3357		DCA TEM	/FOR AUTO MODES
1450	1301	1061		TAD INT	
1451	1302	7040		CMA	
1452	1303	1356		TAD NUM1	
1453	1304	3307		DCA DIFF	/NO OF RECORDS
1454	1305	7140		CMA CLI,	
1455	1306	4535		JMS I DIV	
1456	1307	7777	DIFF,	-1	
1457	1310	0004		4	
1460	1311	1317		TAD M1	
1461	1312	3014		DCA 14	
1462	1313	4144		JMS KEYOUT	/GET RETURN
1463	1314	2275		ISZ NUCCHAR	
1464	1315	5675		JMP I NUCCHAR	
1465	1316	7523	BKAR,	-255	/MINUS
1466	1317	7777	M1,	-1	
1467	1320	0000	MCZ,	0	
1470	1321	0002	KEYB,	2	/PDP
1471	1322	7200		CLA	
1472	1323	1122		TAD CR	
1473	1324	4032		JMS TOUT	
1474	1325	4674		JMS I DECIN	
1475	1326	3357		DCA TEM	
1476	1327	1357		TAD TEM	
1477	1330	1346		TAD MCOMA	
1500	1331	7650		SNA CLA	
1501	1332	4350		JMS NUM2	
1502	1333	4144		JMS KEYOUT	
1503	1334	3320		DCA MCZ	
1504	1335	1320		TAD MCZ	
1505	1336	1316		TAD BKAR	
1506	1337	7650		SNA CLA	
1507	1340	4275		JMS NUCCHAR	

1510	1341	1320		TAD MCZ	
1511	1342	1347		TAD MCR	
1512	1343	7640		SZA CLA	
1513	1344	5261		JMP BAD+1	
1514	1345	5360		JMP IDENT	
1515	1346	7524	MCOMA,	-254	
1516	1347	7563	MCR,	-215	
1517	1350	0000	NUM2,	0	
1520	1351	1061		TAD INT	
1521	1352	3356		DCA NUM1	/PICK UP
1522	1353	4674		JMS I DECIN	/SECOND NUMBER
1523	1354	3357		DCA TEM	
1524	1355	5750		JMP I NUM2	
1525	1356	0000	NUM1,	0	
1526	1357	0000	TEM,	0	
1527	1360	7200	IDENT,	CLA	
1530	1361	6141		LINC	
1531				LMODE	
1532	1362	3357		ADD TEM	
1533	1363	1460		SAE I	
1534	1364	0303		303	/ACCEPT NOCH
1535	1365	0467		SKP	
1536	1366	7510		JMP C	
1537	1367	1460		SAE I	
1540	1370	0311		311	/ACPT NEW INPUT
1541	1371	0467		SKP	
1542	1372	7520		JMP II	
1543	1373	1460		SAE I	
1544	1374	0304		304	
1545	1375	0467		SKP	
1546	1376	6764		JMP PLT	/PLOT DISP BUFF
1547	1377	1460		SAE I	
1550	1400	0317		317	/ACPT NEW OUTPT
1551	1401	0467		SKP	
1552	1402	7525		JMP O	
1553	1403	1460		SAE I	
1554	1404	0327		327	/WRITE DISP BUFF
1555	1405	0467		SKP	
1556	1406	6725		JMP W	
1557	1407	1460		SAE I	
1560	1410	0302		302	/READ LINCTAPE
1561	1411	0467		SKP	
1562	1412	6662		JMP R	
1563	1413	1460		SAE I	
1564	1414	0316		316	/ACPT NBLK
1565	1415	0467		SKP	
1566	1416	7532		JMP N	
1567	1417	1460		SAE I	
1570	1420	0306		306	
1571	1421	0467		SKP	
1572	1422	7567		JMP ADVU	/FORWARD RECORD
1573	1423	1460		SAE I	
1574	1424	0301		301	/ADDNBCK TOIBN
1575	1425	0467		SKP	
1576	1426	7537		JMP A	

1577	1427	1460	SAE I	
1600	1430	0321	321	/QUARTER NO QNO
1601	1431	0467	SKP	
1602	1432	7542	JMP Q	
1603	1433	1460	SAE I	
1604	1434	0307	307	/READ FROM PEC
1605	1435	0467	SKP	
1606	1436	6434	JMP G	
1607	1437	1460	SAE I	
1610	1440	0302	302	/REWIND PEC
1611	1441	0467	SKP	
1612	1442	6413	JMP REW	
1613	1443	1460	SAE I	
1614	1444	0320	320	/PUT ON PEC
1615	1445	0467	SKP	
1616	1446	6376	JMP P	
1617	1447	1460	SAE I	
1620	1450	0332	332	/ZERO BUFFER
1621	1451	0467	SKP	
1622	1452	7547	JMP ZZ	
1623	1453	1460	SAE I	
1624	1454	0324	324	/TRANSFORM BUF
1625	1455	0467	SKP	
1626	1456	6543	JMP T	
1627	1457	1460	SAE I	
1630	1460	0305	305	/PEC "EOF"
1631	1461	0467	SKP	
1632	1462	6535	JMP PEEOF	
1633	1463	1460	SAE I	
1634	1464	0620	304+314	/PLOT FROM LINC
1635	1465	0467	SKP	
1636	1466	7611	JMP FROML	
1637	1467	1460	SAE I	
1640	1470	0624	304+320	/PLOT FROM PEC
1641	1471	0467	SKP	
1642	1472	7630	JMP FROMP	
1643	1473	1460	SAE I	
1644	1474	0534	320+314	/LINC TO PECTAPE
1645	1475	0467	SKP	
1646	1476	7646	JMP LTOP	
1647	1477	1460	SAE I	
1650	1500	0621	320+301	
1651	1501	0467	SKP	
1652	1502	7662	JMP A1OPEC	/TO PEC TAPE
1653	1503	1460	SAE I	
1654	1504	0615	314+301	
1655	1505	0467	SKP	
1656	1506	7665	JMP ATOLIN	/TO LINC TAPE
1657	1507	7260	JMP BAD	
1660			/SMALL FUNCTION PROCESSING ROUTINES	
1661	1510	7751	C, JMP OCTIN	
1662	1511	1060	STA I	
1663	1512	0002	NCH, 2	
1664	1513	0017	COM	
1665	1514	1060	STA I	
1666	1515	7775	CNCH, -2	
1667	1516	5151	STC VPOS	
1670	1517	7321	JMP KEYB	

1671	1520	7751	II,	JMP OCTIN	
1672	1521	1560		BCL I	
1673	1522	7000		7000	
1674	1523	4676		STC IBN	
1675	1524	7321		JMP KEYB	
1676	1525	7751	O,	JMP OCTIN	
1677	1526	1560		BCL I	
1700	1527	7000		7000	
1701	1530	4741		STC OBN	
1702	1531	7321		JMP KEYB	
1703	1532	7751	N,	JMP OCTIN	
1704	1533	1560		BCL I	
1705	1534	7770		7770	
1706	1535	4701		STC NBLK	
1707	1536	7321		JMP KEYB	
1710	1537	0011	A,	CLR	
1711	1540	3515		ADD CNCH	
1712	1541	7663		JMP SCUP	/LIKE SCOPE
1713	1542	7751	Q,	JMP OCTIN	
1714	1543	1560		BCL I	
1715	1544	7774		7774	
1716	1545	4671		STC QNO	
1717	1546	7321		JMP KEYB	
1720	1547	0641	ZZ,	LDF INBUF	/ZERO ALL BUFFS
1721	1550	7556		JMP ZE	
1722	1551	0644		LDF DISBUF	
1723	1552	7556		JMP ZE	
1724	1553	0643		LDF TBUF	
1725	1554	7556		JMP ZE	
1726	1555	7321		JMP KEYB	
1727	1556	1000	ZE,	LDA	
1730	1557	0000		0	/JMP RETN
1731	1560	5566		STC RETN	
1732	1561	0063		SET I 3	
1733	1562	3777		3777	
1734	1563	1063		STA I 3	
1735	1564	0203		XSK 3	
1736	1565	7563		JMP .-2	
1737	1566	0000	RETN,	HLT	
1740	1567	1020	ADV,	LDA I	
1741	1570	6032		6032	
1742	1571	4354		STC BAKUP-1	
1743	1572	2476		ADD PECK	
1744	1573	4506		STC ADREC+2	
1745	1574	6413		JMP REW	
1746	1575	1020	BKRS,	LDA I	
1747	1576	5032		5032	
1750	1577	4354		STC BAKUP-1	
1751	1600	2417		ADD REW+4	
1752	1601	4506		STC ADREC+2	
1753	1602	2641		ADD ON	
1754	1603	1160		ADM I	
1755	1604	0000	PRCNT,	0	
1756	1605	1468		SAE I	
1757	1606	0005		5	
1760	1607	6000		JMP 0	
1761	1610	7260		JMP DAD	

```

1762 /
1763 /
1764 /AUTOMATIC FUNCTIONS
1765 /PLOT FROM LINC TAPE
1766 /
1767 1611 0011 FROML, CLR
1770 1612 3356 ADD NUM1
1771 1613 4676 STC IBN /FIRST BLOCK
1772 1614 6664 FLN, JMP RD
1773 1615 6773 JMP PLTO
1774 1616 7622 JMP WHPLTN
1775 1617 0234 XSK I 14
1776 1620 7614 JMP FLN
1777 1621 7321 JMP KEYB
2000 /
2001 1622 0011 WHPLTN, CLR /STOP IF TEKPLT
2002 1623 2000 ADD 0
2003 1624 5627 STC .+3
2004 1625 0602 LIF 2
2005 1626 6751 JMP PLTFN
2006 1627 0000 HLT
2007 /
2010 /PLOT FROM PECTAPE
2011 1630 7751 FROMP, JMP OCTIN
2012 1631 0017 COM
2013 1632 4014 STC 14
2014 1633 1000 LDA
2015 1634 0377 TSTRT
2016 1635 4021 STC 21
2017 1636 6452 JMP PECRD
2020 1637 0643 LDF TBUF
2021 1640 6512 JMP PARBIT /REMOVE PARITY B
2022 1641 6773 JMP PLTO /READ &PLOT
2023 1642 7622 JMP WHPLTN
2024 1643 0234 XSK I 14
2025 1644 7533 JMP FROMP+3
2026 1645 7321 JMP KEYB
2027 /
2030 /
2031 /LINC TO PECTAPE
2032 1646 0011 LTOP, CLR
2033 1647 3356 ADD NUM1
2034 1650 4676 STC IBN /FIRST BLOCK
2035 1651 6664 LTX, JMP RD /READ LINC TAPE
2036 1652 6545 JMP XFER
2037 1653 1020 LDA I
2040 1654 5777 5777
2041 1655 4021 STC 21 /ADDRESS
2042 1656 6461 JMP PECWT
2043 1657 0234 XSK I 14
2044 1660 7651 JMP LTX
2045 1661 7321 JMP KEYB
2046 /
2047 1662 6344 ATOPEC, JMP WRTCHK
2050 1663 0602 SCUP, LIF 2
2051 1664 7203 JMP CLSET /AND SET CLOCK
2052 1665 0641 ATOLIN, LDF INBUF
2053 1666 6730 JMP WRT /AND WRITE BLK
2054 1667 1020 LDA I
2055 1670 7773 -4

```

2056	1671	1140	ADM	
2057	1672	0741	OBN	/BACK UP CNTR
2060	1673	3673	ADD .	
2061	1674	7663	JMP SCUP	/WITH NZERO AC
2062			/	
2063	1675	7600	M177,	-177
2064	1676	7705	ANPEC,	JMP INTSET
2065	1677	6461		JMP PECWT /WRITE DATA
2066	1700	7703		JMP ANLINC+2
2067	1701	7705	ANLINC,	JMP INTSET
2070	1702	6730		JMP WRT
2071	1703	0602		LIF 2
2072	1704	7335		JMP NXSAM+1
2073	1705	1020	INTSET,	LDA I
2074	1706	5463		MODINT
2075	1707	0500		IOB
2076	1710	6002		6002
2077	1711	4077		STC RESTOR+1
2100	1712	6000		JMP 0
2101	1713	5720	DISO,	STC DTEM /DISPLAY DIGIT
2102	1714	2000		ADD 0
2103	1715	5723		STC BKX
2104	1716	0602		LIF 2
2105	1717	1020		LDA I
2106	1720	0000	DTEM,	0
2107	1721	7004		JMP DISDIG
2110	1722	0011		CLR
2111	1723	0000	BKX,	HLT
2112	1724	0642	DISPAR,	LDF 2 /DISPLAY PARAMETERS
2113	1725	0011		CLR
2114	1726	1040		STA
2115	1727	3013		XCOORD+2000 /CLEAR X COORD
2116	1730	2676		ADD IBN
2117	1731	7713		JMP DISO
2120	1732	2701		ADD NBLK
2121	1733	7713		JMP DISO
2122	1734	2671		ADD QNO
2123	1735	7713		JMP DISO
2124	1736	2741		ADD OBN
2125	1737	7713		JMP DISO
2126	1740	2510		ADD RECCNT
2127	1741	7713		JMP DISO
2130	1742	0642		LDF 2
2131	1743	1000		LDA
2132	1744	7371		2000 SECCNT
2133	1745	0017		COM
2134	1746	2641		ADD ON
2135	1747	7713		JMP DISO
2136	1750	7064		JMP CHKNOB
2137	1751	1000	OCTIN,	LDA
2140	1752	0061		INT
2141	1753	6000		JMP 0
2142			/BOOTSTRAP TO DIAL MONITOR	
2143			/	
2144				SEGMENT 2
2145				*15
2146	0015	0643		LDF 3
2147	0016	0701		RCG
2150	0017	7300		7300

2151	0020	0011	DIAL,	CLR	
2152	0021	0204		ESF	
2153	0022	0015		JMP 15	
2154			/DIAL STARTS		
2155	0023	1020	UPB,	LDI I /STOP A TO D CONVERSION	
2156	0024	7776		7776	
2157	0025	5371		STC SECCNT	
2160	0026	0600		LIF 0	
2161	0027	7321		JMP KEYB	
2162				ASMIFN DOLIST	
2163				NOLIST	
2164				Pmode	
2165				/SINGLE PRECISION SIGNED DIVIDE SUBROUTINE	
2166				/CALLING SEQUENCE:	
2167			/	C(AC) CONTAINS HIGH ORDER DIVIDEND	
2170			/	JMS DIVIDE	
2171			/	LOW ORDER DIVIDEND	
2172			/	DIVISOR	
2173			/	RETURN: C(AC)=QUOTIENT; REMAINDER IN	
			HDIVND		
2174			/IF DIVISION ERROR OCCURS, LINK IS SET TO 1		
2175			/	AND CODE FOR ERROR IS FOUND IN AC	
2176	4030	0000	DIVIDE,	0	
2177	4031	7100		CLL	
2200	4032	7510		SPA /DIVIDEND<0?	
2201	4033	7060		CMA CML /YES COMPLEMENT AND SET C(L)	
2202	4034	3350	DCA HDIVND	/HIGH ORDER DIVIDEND	
2203	4035	7420		SNL	
2204	4036	7040		CMA	
2205	4037	3353	DCA SDVND	/SET DIVIDEND SIGN SWI	
			TCH		
2206	4040	1630	TAD I DIVIDE	/FETCH LOW ORDER DIVID	
			END		
2207	4041	7430		SZL	
2210	4042	7141		CMA CLL IAC /YES: COMPLEMENT	
2211	4043	3351		DCA LDIVND /LOW ORDER DIVIDEND	
2212	4044	7430		SZL /CARRY?	
2213	4045	2350		ISZ HDIVND /YES	
2214	4046	2230		ISZ DIVIDE	
2215	4047	1630	TAD I DIVIDE	/FETCH DIVISOR	
2216	4050	7100		CLL	
2217	4051	7500		SMA	
2220	4052	7061		CMA CML IAC /NEGATE IT	
2221	4053	3352		DCA DIVSOR /SAVE DIVISOR	
2222	4054	7420		SNL /WAS IT <0?	
2223	4055	7040		CMA /YES: AC=-1	
2224	4056	1353		TAD SDVND	
2225	4057	3354		DCA SNSWER /ANSWER SIGN SWITCH	
2226	4058	2230		ISZ DIVIDE	
2227	4061	1352		TAD DIVSOR	
2230	4062	0357		AND MASK	
2231	4063	7650		SNA CLA /TEST FOR ZERO DIVISOR	
2232	4064	5340		JMP DZERO	
2233	4065	1350		TAD HDIVND /TEST FOR OVERFLOW	
2234	4066	7640		SZA CLA	
2235	4067	5274		JMP CONT / HDIVND NOT= 0	
2236	4070	1352		TAD DIVSOR /SINCE HDIVND=0, TEST	

			LDIVND	
2237	4071	1351	TAD	LDIVND
2240	4072	7710	SPA	CLA
2241	4073	5343	JMP	DFRAC /DIVIDEND < DIVISOR=FR
			ACTION	
			CONT,	CLL
2242	4074	7100	TAD	DIVSOR /COMPARE DIVSOR
2243	4075	1352	TAD	HDIVND /WITH DIVIDEND
2244	4076	1350	TAD	HDIVND /WITH DIVIDEND
2245	4077	7630	SZL	CLA /OVERFLOW?
2246	4100	5630	JMP	I DIVIDE /YES
2247	4101	1350	TAD	HDIVND /TEST FOR OVERFLOW
2250	4102	1352	TAD	DIVSOR
2251	4103	7740	SMA	SZA CLA
2252	4104	5341	JMP	DOVER /HIGH ORDER DIVIDEND >
			DIVISOR	
2253	4105	1356	TAD	M13 /13 SHIFTS
2254	4106	3355	DCA	DIVCNT
2255	4107	5320	JMP	DV2
2256				/DIVIDE LOOP
2257	4110	1350	DV3,	TAD HDIVND
2260	4111	7004		RAL
2261	4112	1350	DCA	HDIVND /DIVIDEND LEFT SHIF.
2262	4113	1350	TAD	HDIVND
2263	4114	1352	TAD	DIVSOR /COMPARE DIVISOR; DIVI
			DEND	
2264	4115	7430	SZL	
2265	4116	3350	DCA	HDIVND /REMAINDER AFTER SUBTR
			ACT	
2266	4117	7200		CLA
2267	4120	1351	DV2,	TAD LDIVND /QUOTIENT BITS
2270	4121	7004		RAL /ENTER HERE
2271	4122	3351	DCA	LDIVND
2272	4123	2355	ISZ	DIVCNT /DONE 12?
2273	4124	5310	JMP	DV3 /NO; CONTINUE
2274	4125	1350	TAD	HDIVND /REMAINDER
2275	4126	2353	ISZ	SDVND /DIVIDEND<0?
2276	4127	7041	CMA	IAC /YES
2277	4130	3350	DCA	HDIVND
2300	4131	1351	TAD	LDIVND /QUOTIENT
2301	4132	7510	SPA	
2302	4133	5346	JMP	QOVER
2303	4134	2354	ISZ	SNSWER /ANSWER<0?
2304	4135	7041	CMA	IAC /YES; NEGATE
2305	4136	7100	CLL	
2306	4137	5630	JMP	I DIVIDE /EXIT
2307	4140	7240	DZERO,	CLA CMA /ZERO DIVISOR DETECTED, SET AC=7777
2310	4141	7120	DOVER,	STL /SET LINK
2311	4142	5630		JMP I DIVIDE
2312	4143	7140	DFRAC,	CLL CMA /SET AC=7776
2313	4144	7004		RAL
2314	4145	5341		JMP DOVER
2315	4146	7200	QOVER,	CLA
2316	4147	5341		JMP DOVER

2317	4150	0000	HDIUND, 0	
2320	4151	0000	LDIUND, 0	
2321	4152	0000	DIVSOR, 0	
2322	4153	0000	SDUND, 0	
2323	4154	0000	SNSWER, 0	
2324	4155	0000	DIVCNT, 0	
2325	4156	7763	M13, -15	/-13(10)
2326	4157	3777	MASK, 3777	
2327			/	
2330			PMODE	
2331			ASMIFN DOLIST	
2332			NO:LIST	
2333			/INPUT A REAL DECIMAL NUMBER	
2334			/C.J.T 15/4/70	
2335			/CALL IN PDP MODE	
2336			/ONRETURN NEXT ASCII CHAR IS	
2337			/IN AC. THE BINARY NUMBER	
2340			/IS IN "INT" /THE DECIMAL	
2341			/POINT LOCATION IS IN "DT"	
2342			/AS ONE +NO OF DIGITS FROM RIGHT	
2343			/	
2344			PAGE	
2345	4200	0000	INREAL, 0	
2346	4201	7300	CLA CLL	
2347	4202	3256	DCA DT	
2350	4203	3061	DCA INT	
2351	4204	4144	JMS KEYOUT	
2352	4205	4226	JMS CHECKN	/CHECK NO OR CH
2353	4206	4211	JMS TOBIN	/CONVERT TO BIN
2354	4207	5204	JMP INREAL+4	/NEXT ONE
2355	4210	5300	JMP I INREAL	
2356			/	
2357			/CONVERT TO BINARY NUMBER	
2360	4211	0000	TOBIN, 0	
2361	4212	3255	DCA TN	
2362	4213	1256	TAD DT	/DEC PNT
2363	4214	7740	SZA CLL CLA	
2364	4215	2256	ISZ DT	
2365	4216	1061	TAD INT	/NUMBER
2366	4217	7104	CLL RAL	
2367	4220	7006	RTL	/MUL BY 8
2370	4221	1061	TAD INT	
2371	4222	1061	TAD INT	/ADD 2X
2372	4223	1255	TAD TN	/ADD NU DIGIT
2373	4224	3061	DCA INT	/NEXT DIGIT
2374	4225	5611	JMP I TOBIN	
2375			/	
2376			/CHECK FOR DIGIT OR LETTER	
2377	4226	0000	CHECKN, 0	
2400	4227	3255	DCA TN	
2401	4230	1255	TAD TN	
2402	4231	1254	TAD M256	
2403	4232	7650	SNA CLA	
2404	4233	5252	JMP DOT	/DECIMAL POINT
2405	4234	1255	TAD TN	
2406	4235	1261	TAD M260	
2407	4236	7510	SPA	
2410	4237	5245	JMP XY	/NOT DIGIT

2411	4240	1260		TAD M12	
2412	4241	7500		SMA	
2413	4242	5245		JMP XY	
2414	4243	4257		TAD TWELVE	
2415	4244	5626		JMP I CHECKN	/DIGIT
2416	4245	2226	XY,	ISZ CHECKN	
2417	4246	7200		CLA	
2420	4247	1255		TAD TN	
2421	4250	2226		ISZ CHECKN	
2422	4251	5626		JMP I CHECKN	
2423	4252	2256	DOT,	ISZ DT	
2424	4253	5246		JMP XY+1	/DECIMAL POINT
2425	4254	7522	M256,	-256	
2426	4255	0000	TN,	0	
2427	4256	0000	DT,	0	
2430	4257	0012	TWELVE,	12	
2431	4260	7766	M12,	-12	
2432	4261	7520	M250,	-260	
2433				PAGE	
2434				LMODE	
2435	0400	0600		LIF LOCAL	
2436	0401	6321		JMP START	
2437			/		
2440				ASMIFN DOLIST	
2441				NOLIST	
2442				/OUTPUT ON PLOTTER	
2443				/PLOTTER DEVICE CODES	
2444				PLPU=6504 /PEN UP	
2445				PLPR=6511 /PEN RIGHT	
2446				PLDU=6512 /DRUM UP	
2447				PLDD=6514 /DRUM DOWN	
2450				PLPL=6521 /PEN LEFT	
2451				PLUD=6522 /DRUM UP	
2452				PLPD=6524 /PEN DOWN	
2453				PLSF=6501 /SKIP ON FLAG	
2454				PLCF=6502 /CLEAR FLAG	
2455				/CALLING SEQ	
2456				/C(AC)=-1; INITIALIZE	
2457				/C(AC)=0; PLOT WITH PEN DOWN	
2460				/C(AC)=1; PLOT WITH PEN UP	
2461				/JMS PLOTX	
2462				/X COORD IN STEPS (HERE IF AC=-1)	
2463				/Y COORD IN STEPS	
2464			/		
2465				PMODE	
2466	4402	4600		PLOTT1, PL1	
2467	4403	4602		PLOTT2, PL2	
2470			/		
2471	4404	4614		WHPLOT, WHICHP	
2472	4405	0000		PLOTX, 0	
2473	4406	4604		JMS I WHPLOT	
2474	4407	7510		SPA	/MOVE PEN
2475	4410	5227		JMP PLOTA	/NO
2476	4411	1354		TAD PLOTPN	/ADD PEN STATUS
2477	4412	7112		CLL RTR	
2500	4413	7710		SPA CLA	
2501	4414	5236		JMP PLOT1	/NO PEN CHANGE

2502	4415	7620	SNL CLA	
2503	4416	5223	JMP .+5	/LOWER THE PEN
2504	4417	3354	DCA PLOTPN	/RAISE THE PEN
2505	4420	4753	JMS I PLIO	
2506	4421	6504	PLPU	
2507	4422	5236	JMP PLOT1	
2510	4423	2354	ISZ PLOTPN	
2511	4424	4753	JMS I PLIO	
2512	4425	6524	PLPD	
2513	4426	5236	JMP PLOT1	/DONE
2514	4427	7200	PLOTA, CLA	
2515	4430	4753	JMS I PLIO	
2516	4431	6504	PLPU	/RAISE PEN
2517	4432	3354	DCA PLOTPN	
2520	4433	3355	DCA PLOTNK	
2521	4434	3356	DCA PLOTNY	/X&Y COORDS ZERO
2522	4435	5605	JMP I PLOTX	
2523			/	
2524			/	
2525			/	
2526	4436	1355	PLOT1, TAD PLOTNK	/OLD VALUE
2527	4437	7141	CIA CLL	
2530	4440	1605	TAD I PLOTX	
2531	4441	7420	SNL	/L=0; NX<NPX
2532	4442	7341	CIA	
2533	4443	3357	DCA PLOTDX	/ABS VAL OF DIFF
2534	4444	7004	RAL	
2535	4445	3362	DCA PLOTMV	/SIGN BIT
2536	4446	1605	TAD I PLOTX	/PREVIOUS X
2537	4447	3355	DCA PLOTNK	
2540	4450	2205	ISZ PLOTX	/INC POINTER
2541	4451	1356	TAD PLOTNY	/OLD Y COORD
2542	4452	7141	CIA CLL	
2543	4453	1605	TAD I PLOTX	
2544	4454	7420	SNL	/L=0; NY<NY
2545	4455	7041	CIA	
2546	4456	3360	DCA PLOTDY	/ABS DIFF
2547	4457	1362	TAD PLOTMV	/SIGN BIT
2550	4460	7004	RAL /BIT 10(1)	DRM DOWN
2551	4461	3362	DCA PLOTMV	/BIT 11(1) LEFT
2552	4462	1605	TAD I PLOTX	/SET NEW
2553	4463	3356	DCA PLOTNY	/OLD Y
2554	4464	2205	ISZ PLOTX	
2555	4465	1357	TAD PLOTDX	
2556	4466	7141	CIA CLL	
2557	4467	1360	TAD PLOTDY	
2560	4470	7620	SNL CLA	/L=0; DY <DX
2561	4471	5304	JMP PLOT2	
2562	4472	1357	TAD PLOTDX	
2563	4473	3361	DCA PLOTNA	
2564	4474	1360	TAD PLOTDY	
2565	4475	3357	DCA PLOTDX	
2566	4476	1361	TAD PLOTNA	
2567	4477	3360	DCA PLOTDY	
2570	4500	7001	IAC	/SET MAJOR MOVE
2571	4501	0362	AND PLOTMV	
2572	4502	1202	TAD PLOTT1	
2573	4503	5307	JMP .+4	

2574	4504	1362	PLOT2,	TAD PLOTMV	
2575	4505	7110		CLL RAR	
2576	4506	1203		TAD PLOTT2	
2577	4507	3361		DCA PLOTNA	
2600	4510	1761		TAD I PLOTNA	
2601	4511	3350		DCA PLOT4	
2602	4512	1362		TAD PLOTMV	/SET COMBINED
2603	4513	1352		TAD PLOTT3	
2604	4514	3362		DCA PLOTMV	
2605	4515	1762		TAD I PLOTMV	
2606	4516	3341		DCA PLOTDB	
2607	4517	1357		TAD PLOTDX	
2610	4520	7110		CLL RAR	
2611	4521	3361		DCA PLOTNA	
2612	4522	1357		TAD PLOTDX	
2613	4523	7040		CMA	
2614	4524	3362		DCA PLOTMV	
2615	4525	2362	PLOT3,	ISZ PLOTMV	
2616	4526	7410		SKP	
2617	4527	5605		JMP I PLOTX	/ALL DONE
2620	4530	1361		TAD PLOTNA	
2621	4531	1360		TAD PLOTDY	
2622	4532	3361		DCA PLOTNA	
2623	4533	1361		TAD PLOTNA	
2624	4534	7141		CIA CLL	
2625	4535	1357		TAD PLOTDX	
2626	4536	7620		SZL CLA	
2627	4537	5347		JMP PLOT4-1	/SINGLE MOTION
2630	4540	4753		JMS I PL10	
2631	4541	0000	PLOTDB,	0	/COMBINED
2632	4542	1357		TAD PLOTDX	
2633	4543	7041		CIA	
2634	4544	1361		TAD PLOTNA	
2635	4545	3361		DCA PLOTNA	
2636	4546	5325		JMP PLOT3	
2637	4547	4753		JMS I PL10	
2640	4550	0000	PLOT4,	0	
2641	4551	5346		JMP .-3	
2642	4552	4604	PLOTT3,	PL3	
2643			/		
2644	4553	4742	PL10,	PLH	
2645			/		
2646	4554	0000	PLOTPN,	0	
2647	4555	0000	PLOTNX,	0	
2650	4556	0000	PLOTNY,	0	
2651	4557	0000	PLOTDX,	0	
2652	4560	0000	PLOTDY,	0	
2653	4561	0000	PLOTNA,	0	
2654	4562	0000	PLOTMV,	0	
2655			/		
2656				LIST	
2657	4563	4720	TP1,	TKPVEC	
2660	4564	4722	TP2,	TKPVEC+2	
2661	4565	4724	TP3,	TKPVEC+4	
2662				LMODE	

2663	0566	0000	PX,	0
2664				PMODE
2665	4567	1363		TAD TP1
2666	4570	1364		TAD TP2
2667	4571	1365		TAD TP3
2670	4572	1202		TAD PLOTT1
2671	4573	1203		TAD PLOTT2
2672	4574	1352		TAD PLOTT3
2673				PAGE
2674	4600	6511	PL1,	PLPR
2675	4601	6521		PLPL
2676	4602	6512	PL2,	PLDU
2677	4603	6514		PLDD
2700	4604	6513	PL3,	PLDU!PLPR
2701	4605	6523		PLUD!PLPL
2702	4606	6515		PLDD!PLPR
2703	4607	4210		JMS .+1
2704	4610	0000		0
2705	4611	6514		PLDD
2706	4612	6521		PLPL
2707	4613	5510		JMP I .-3
2710	4614	0000	WHICHP,	0
2711	4615	6141		LINC
2712				LMODE
2713	0616	0465		SNS I 5
2714	0617	6634		JMP I EKP
2715	0620	4566		STC PX
2716	0621	2572		ADD PX+4
2717	0622	4502		STC PLOT2-2
2720	0623	2573		ADD PX+5
2721	0624	4506		STC PLOT2+2
2722	0625	2574		ADD PX+6
2723	0626	4513		STC PLOT2+7
2724	0627	2706		ADD GS+1
2725	0630	4553		STC PLIO
2726	0631	2566		ADD PX
2727	0632	0002		PDP
2730				PMODE
2731	4633	5614	WHP,	JMP I WHICHP
2732				LMODE
2733	0634	4566	TEKP,	STC PX
2734	0635	0011		CLR
2735	0636	2567		ADD PX+1
2736	0637	4502		STC PLOT2-2
2737	0640	2570		ADD PX+2
2740	0641	4506		STC PLOT2+2
2741	0642	2571		ADD PX+3
2742	0643	4513		STC PLOT2+7
2743	0644	2707		ADD GS+2
2744	0645	4553		STC PLIO
2745	0646	2566		ADD PX
2746	0647	0002		PDP
2747				PMODE
2750	4650	7700		SMA CLA
2751	4651	5703		JMP I PPEN

2752	4652	1305		TAD GS	
2753	4653	6046		TLS	
2754	4654	4312		JMS TWAIT	
2755	4655	4706		JMS I PYX1	/PEN UP&DOWN FOR DLAY
2756	4656	6504		PLPU	
2757	4657	4706		JMS I PYX1	
2760	4660	6524		PLPD	
2761	4661	6141		LINC	
2762				LMODE	
2763	0662	1020		LDA I	
2764	0663	0000	XCORDT,	0	
2765	0664	0444		SNS 4	
2766	0665	0011		CLR	
2767	0666	0002		PDP	
2770				PMODE	
2771	4667	6052		6052	
2772	4670	7200		CLA	
2773	4671	6066		6066	/VECTOR TO 0,0
2774	4672	4312		JMS TWAIT	
2775	4673	1310		TAD US	
2776	4674	6046		TLS	
2777	4675	4312		JMS TWAIT	
3000	4676	1304		TAD RS	
3001	4677	6046		TLS	
3002	4700	4312		JMS TWAIT	
3003	4701	5702		JMP I .+1	
3004	4702	4432		PLOTA+3	
3005	4703	4436	PPEN,	PLOT1	
3006				LMODE	
3007	0704	0036	RS,	36	
3010	0705	0035	GS,	35	
3011				PMODE	
3012	4706	4742	PYX1,	PLH	
3013	4707	4732		TKP	
3014	4710	0037	US,	37	
3015	4711	0212	LF,	212	
3016	4712	0000	TWAIT,	0	
3017	4713	7200		CLA	
3020	4714	6041		TSF	
3021	4715	5314		JMP .-1	
3022	4716	6042		TCF	
3023	4717	5712		JMP I TWAIT	
3024	4720	0044	TKP'EC,	44	
3025	4721	0040		40	
3026	4722	0046		46	
3027	4723	0042		42	
3030	4724	0045		45	
3031	4725	0047		47	
3032	4726	0043		43	
3033	4727	0041		41	
3034	4730	4566		PX	
3035	4731	0010		10	
3036	4732	0000	TKP,	0	/VECTOR ON TEK
3037	4733	1730		TAD I TKP-2	
3040	4734	7640		SZA CLA	
3041	4735	1331		TAD TKP-1	/DARK VECTOR

3042	4736	1732		TAD I TKP
3043	4737	6046		TLS
3044	4740	4312		JMS TWAIT
3045	4741	5732		JMP I TKP
3046	4742	0000	PLH,	0
3047	4743	1742		TAD I PLH
3050	4744	3345		DCA .+1
3051	4745	7402		HLT
3052	4746	2342		ISZ PLH
3053	4747	4537		JMS I PLOUT
3054	4750	5742		JMP I PLH
3055			/	
3056			/	
3057			/	
3060			/	
3061				LMODE
3062	0751	0445	PLTFN,	SNS 5
3063	0752	6775		JMP FNX
3064	0753	1000		LDA
3065	0754	4555	PNXI,	PLOTNX
3066	0755	1140		ADM
3067	0756	0663		XCORDT
3070	0757	1120		ADA I
3071	0760	6017		-1760
3072	0761	0451		APO
3073	0762	6775		JMP FNX
3074	0763	0011		CLR
3075	0764	4663		STC XCORDT
3076	0765	0002		PDP
3077				PMODE
3100	4766	3754		DCA I PNXI
3101	4767	1310		TAD US
3102	4770	4032		JMS TOUT
3103	4771	7200		CLA
3104	4772	1311		TAD LF
3105	4773	4032		JMS TOUT
3106	4774	6141		LINC
3107				LMODE
3110	0775	0600	FNX,	LIF LOCAL
3111	0776	7627		JMP W/PLIN+5
3112			/	
3113			/END OF PLOTTING	
3114			ASMIFN DOLIST	
3115			NOLIST	
3116			/DISOCT. A SUBROUTINE TO DISPLAY A	
3117			/MEMORY LOCATION IN DECIMAL ON THE CRT.	
3120			/AC MUST CONTAIN DESIRED ADDRESS.	
3121			/X AND Y MUST BE SET BELOW.	
3122			DECIMAL	
3123	0777	6027	HITEN,	-1000
3124	1000	7633		-100
3125	1001	7765		-10
3126	1002	7776		-1
3127				OCTAL
3130	1003	0000	SSVAL,	0
3131	1004	3034	DISDIG,	ADD ONEX
3132	1005	5024		STC DIS4
3133	1006	0640		LDF LOCAL
				/NO OUTPUT
				/DIGIT (OCTAL)

3134	1007	1000		LDA	
3135	1010	0000		0	/ OLD DATA FELD
3136	1011	5063		STC RETURN	
3137	1012	0061		SET I 1	/SET X COORD
3140	1013	0000	XCOORD,	0	
3141	1014	0070		SET I 13	/13 COUNTS DIGIT
3142	1015	7773		-4	
3143	1016	1020		LDA I	
3144	1017	2777		ADD HITEN	/RESET 10 POWER
3145	1020	5025		STC SXX	/IN SXX
3146	1021	0011	DIS3,	CLR	
3147	1022	4003		STC 3	
3150	1023	1020	NX,	LDA I	
3151	1024	0000	DIS4,	0	/NO TO BE OUT,
3152	1025	2777	SXX,	ADD HITEN	
3153	1026	0451		APO	
3154	1027	7033		JMP .+4	
3155	1030	0223		XSK I 3	
3156	1031	5024		STC DIS4	
3157	1032	7023		JMP NX	
3160	1033	1020		LDA I	
3161	1034	0001	ONEX,	1	/INCREMENT
3162	1035	3025		ADD SXX	
3163	1036	5025		STC SXX	
3164	1037	2003		ADD 3	
3165	1040	0241		ROL 1	
3166	1041	1120		ADA I	
3167	1042	1064		CHTAB	
3170	1043	4014		STC 14	
3171	1044	1120		ADA I	
3172	1045	0360	YCOORD,	0360	/CRT Y COORD
3173	1046	1754		DSC 14	
3174	1047	0070		SET I 10	
3175	1050	1770		1770	
3176	1051	0230		XSK I 10	
3177	1052	7051		JMP .-1	
3200	1053	1774		DSC I 14	
3201	1054	0233		XSK I 13	/SKP ON 4TH DIGT
3202	1055	7021		JMP DIS3	
3203	1056	1020		LDA I	
3204	1057	0110		110	
3205	1060	1140		ADM	
3206	1061	1013		XCOORD	
3207	1062	0600		LIF LOCAL	
3210	1063	0000	RETURN,	0	/RETURN TO CALL
3211	1064	4536	CHTAB,	4536	
3212	1065	3651		3651	
3213	1066	2101		2101	
3214	1067	0177		0177	
3215	1070	4523		4523	
3216	1071	2151		2151	
3217	1072	4122		4122	
3220	1073	2651		2651	
3221	1074	2414		2414	
3222	1075	0477		0477	
3223	1076	5172		5172	
3224	1077	0651		0651	
3225	1100	1506		1506	
3226	1101	4225		4225	
3227	1102	0000		0000	

3230	1103	6050	6050	
3231	1104	5126	5126	
3232	1105	2651	2651	
3233	1106	5122	5122	
3234	1107	3651	3651	/"9"
3235				
3236			LIST	
3237			PAGE	
3240			/AUTO ANALOG DATA COLLECTION ROUTINES	
3241			CLLR=6132	/CONTROL
3242			CLAB=6133	/PRESET REG
3243			CLEN=6134	/ENABLE
3244			LMODE	
3245	1200	1100	FRQSET, 1100	/CLOCK FREQ
3246	1201	0060	HT, 60	/400KC HI PART
3247	1202	0520	620	
3250	1203	0640	CLSET, LDF LOCAL	
3251	1204	5450	STC WHICH	/PEC OR LINC TAP
3252	1205	1020	LDA I	
3253	1206	2021	ADD 21	
3254	1207	1040	STA	
3255	1210	3155	2000 VPOS+4	/TO SWAP BUFFERS
3256	1211	1020	LDA I	
3257	1212	7234	JMP DISP	
3260	1213	1040	STA	
3261	1214	3065	2000 CHKNOB+1	
3262	1215	1000	LDA	
3263	1216	3515	2000+CNCH	
3264	1217	5340	STC CHC	/NO OF CHS
3265	1220	1040	STA	
3266	1221	3070	2000 SENS0	
3267	1222	3340	ADD CHC	/CHK >8 CHS
3270	1223	1120	ADA I	
3271	1224	0010	10	
3272	1225	0471	APO I	
3273	1226	7235	JMP .+7	/<8 CHNLS
3274	1227	1020	LDA I	
3275	1230	0100	SAM 0	
3276	1231	5336	STC NXS+1	/SAMPLE 0 FIRST
3277	1232	1020	LDA I	
3300	1233	0101	SAM 1	
3301	1234	7242	JMP .+6	
3302	1235	1020	LDA I	/<8 CHNLS
3303	1236	0110	SAM 10	
3304	1237	5336	STC NXS+1	
3305	1240	1020	LDA I	
3306	1241	0111	SAM 11	
3307	1242	5342	STC SAMP-2	
3310	1243	1000	LDA	
3311	1244	3356	2000 NUM1	
3312	1245	0450	AZE	
3313	1246	7261	JMP CLYES	/USE REAL CLK
3314	1247	3202	ADD HT+1	
3315	1250	0017	COM	

3316	1251	5253		STC SCON	/ASSUME 400/SEC
3317	1252	1020		LDA I	/FROM TAPE
3320	1253	6100		6100	/TIME FORM CLK
3321	1254	0002		PDP	/INPUT ONE
3322				PMODE	
3323	5255	6132		CLLR	
3324	5256	7240		CLA CMA	/OVERFLC EACH
3325	5257	6133		CLAB	/TIME
3326	5260	5331		JMP DXX	
3327				LMODE	
3330	1261	0017	CLYES,	COM	
3331	1262	1060		STA I	
3332	1253	0000	SCON,	0	
3333	1264	0017		COM	
3334	1265	0321		ROR I 1	
3335	1266	5273		STC DV+2	
3336	1267	0002		PDP	
3337				PMODE	
3340	5270	1201		TAD HT	
3341	5271	4535	DV,	JMS I DIV	
3342	5272	6300		6300	
3343	5273	0400		400	/DIV 400000/NUM1
3344	5274	7041		CIA	
3345	5275	6133		CLAB	/SET CLK
3346	5276	7200		CLA	
3347	5277	1200		TAD FRQSET	
3350	5300	6132		CLLR	
3351	5301	7200	DXX,	CLA	
3352	5302	1061		TAD INT	
3353	5303	7041		CIA	
3354	5304	3371		DCA SECCNT	
3355	5305	1372		TAD GX	
3356	5306	4032		JMS TOUT	
3357	5307	4144		JMS KEYOUT	/WAIT FOR GO
3360	5310	1374		TAD MG	
3361	5311	7440		SZA	
3362	5312	5773		JMP I QQ	
3363	5313	1375		TAD X100	
3364	5314	6134		CLEN	/START CLOCK
3365	5315	6141		LINC	
3366				LMODE	
3367	1316	0072		SET I 12	
3370	1317	3777		3777	/FOR DATA
3371	1320	1020		LDA I	
3372	1321	0641		LDF INBUF	
3373	1322	1040		STA	
3374	1323	1335		NXS	
3375	1324	5440		STC CHBUF	
3376	1325	1020		LDA I	
3377	1326	0342		SCR 2	/PEC SCALE
3400	1327	5345		STC SAMP+1	
3401	1330	0002		PDP	
3402				PMODE	
3403	5331	7200		CLA	
3404	5332	1263		TAD SCON	
3405	5333	3370		DCA SCINC	/SET CNTS/SEC
3406	5334	5076	NXSAM,	JMP RESTOR	/WAIT FOR CLK

3407				I.MODE	
3410	1335	0641	NXS,	LDF INBUF	
3411	1336	0110		SAM 10	
3412	1337	0062		SET I 2	
3413	1340	7776	CHC,	-1	
3414	1341	1020		LDA I	
3415	1342	0111		SAM 11	
3416	1343	5344		STC SAMP	
3417	1344	0111	SAMP,	SAM 11	/SAMPLE EACH CH
3420	1345	0342		SCR 2	
3421	1346	1120		ADA I	/SCALE PEC ONLY
3422	1347	0200		200	
3423	1350	1072		STA I 12	
3424	1351	0212		XSK 12	
3425	1352	0467		SKP	
3426	1353	7413		JMP SWAPBF	/WRITE DATA
3427	1354	1020		LDA I	
3430	1355	0001		1	
3431	1356	1140		ADM	
3432	1357	1344		SAMP	
3433	1360	0222		XSK I 2	
3434	1361	7344		JMP SAMP	
3435	1362	0002		PDP	
3436				PMODE	
3437	5363	2370		ISZ SCINC	
3440	5364	5334		JMP NXSAM	
3441	5365	2371		ISZ SECCNT	
3442	5366	5331		JMP NXSAM-3	/RESET SEC COUNT
3443	5367	5076		JMP FINSAM	
3444	5370	0000	SCINC,	0	
3445	5371	0000	SECCNT,	0	
3446			/		
3447	5372	0307	GX,	307	
3450	5373	1261	QQ,	QUES	
3451	5374	7471	NG,	-307	
3452	5375	0100	X100,	100	
3453	5376	7200	FINSAM,	CLA	
3454	5377	6134		6134	/STOP CLOCK
3455	5400	6141		LINC	
3456				LMODE	
3457	1401	1072		STA I 12	/ZERO AREA
3460	1402	0212		XSK 12	
3461	1403	7401		JMP .-2	
3462	1404	0640		LDF LOCAL	
3463	1405	1020		LDA I	
3464	1406	0440		SNS	
3465	1407	1040		STA	
3466	1410	3155		2000+VPOS+4	/RESTOR SNSE SW
3467	1411	1040		STA	
3470	1412	3065		2000 CHKNOB+1	
3471			/SWAP DATA BUFFERS AND WRITE OUT DATA		
3472	1413	0072	SWAPBF,	SET I 12	
3473	1414	3777		3777	
3474	1415	1000		LDA	
3475	1416	1440		CHBUF	
3476	1417	0640		LDF LOCAL	
3477	1420	1460		SAE I	
3500	1421	0641		LDF INBUF	
3501	1422	7432		JMP .+10	

3502	1423	1020	LDA I	
3503	1424	1777	1777	
3504	1425	1040	STA	
3505	1426	2021	2000 21	
3506	1427	1020	LDA I	
3507	1430	0643	LDF TBUF	
3510	1431	7440	JMP .+7	
3511	1432	1020	LDA I	
3512	1433	5777	5777	
3513	1434	1040	STA	
3514	1435	2021	2000 21	
3515	1436	1020	LDA I	
3516	1437	0641	LDF INBUF	
3517	1440	0000	CHBUF, HLT	
3520	1441	1040	STA	
3521	1442	1440	CHBUF	
3522	1443	5335	STC NXS	
3523	1444	0500	IOB	
3524	1445	6001	6001	/ALLOW CLOCK
3525			/TO BRING IN MORE DATA	
3526	1446	0600	LIF LOCAL	/CHNG FIELD WRT
3527	1447	1020	LDA I	
3530	1450	0000	WHICH, 0	
3531	1451	0470	AZE I	
3532	1452	7676	JMP ANPEC	
3533	1453	1020	LDA I	/NOT PEC DONT
3534	1454	7350	JMP SAMP+4	/SCALE DATA
3535	1455	5345	STC SAMP+1	
3536	1456	3450	ADD WHICH	
3537	1457	0451	APO	
3540	1460	7135	JMP CHNG	
3541	1461	7701	JMP ANLINC	
3542			/	
3543			PMODE	
3544	5462	0267	RSTX	
3545	5463	7200	MODINT, CLA	
3546	5464	1262	TAD MODINT-1	
3547	5465	3077	DCA RESTOR+1	
3550	5466	6001	ION	
3551	5467	6141	LINC	
3552			LMODE	
3553	1470	0600	LIF LOCAL	
3554	1471	7135	JMP CHNG	
3555			DOLIST=0	
3556			/19/6/70	

0000 ERRORS

A	1537
ADREC	0504
ADV	1055
ADVU	1567
ANLINC	1701
ANPEC	1676
ATOLIN	1665
ATOPEC	1662
BACK	0642
BAD	1260
BAKUP	0355
BKAR	1316
BKK	0364
BKRS	1575
BKX	1723
C	1510
CHBUF	5440
CHC	5340
CHECKN	4226
CHKNOB	1064
CPNG	1135
CHNLY	0576
CHTAB	5064
CLAB	6133
CLEN	6134
CLIN	0223
CLLR	6132
CLN	0141
CLSET	5203
CYES	5261
CNCH	1515
COMWD	0533
CONT	4074
COUNT	0660
CR	0122
DECIN	1274
DFFS	0064
DFRAC	4143
DIAL	4020
DIFF	1307
DISBUF	0004
DISDIG	5004
DISG	1713
DISP	1234
DISPAR	1724
DIS3	5021
DIS4	5024
DIV	0135
DIVCNT	4155
DIVIDE	4030
DIVSOR	4152
DOLIST	0000
DOT	4252
DOVER	4141
DT	4256
DTEM	1720
DV	5271

DVSOR	1012
DV2	4120
DV3	4110
DXX	5301
DZERO	4140
EOFF	0534
ERCHK	0531
FILD	1176
FINSAM	5376
FLDS	0271
FLN	1614
FNX	4775
FROML	1611
FROMP	1630
FRQSET	5200
G	0404
GS	4705
GX	5372
HDIVND	4150
HITEN	4777
HT	5201
HUN	0134
IBN	0676
IDENT	1360
II	1520
INBUF	0001
INREAL	4200
INT	0061
INTSET	1705
KEYB	1321
KEYIN	0100
KEYOUT	0144
KEYTEM	0143
KNOB0	1142
KNOB1	1113
KO	0130
LAA	0050
LC	0136
LCIN	0204
LCOUT	0214
LDIVND	4151
LF	4711
LINT	0040
LLDF	0073
LOCAL	0030
LTEM	0062
LTOP	1646
LTX	1651
MASK	4157
MCOMA	1346
MCR	1347
NCZ	1320
MG	5374
MODINT	5463
MJ	1317
M12	4260
M13	4156

M177	1675
M256	4254
M260	4261
M3	0057
N	1532
NBLK	0701
NCH	1512
NEXT	1241
NEXTPT	0552
NO	1223
NUCHAR	1275
NUM1	1356
NUM2	1350
NX	5023
NXP	1030
NXS	5335
NXSAM	5334
NXTONE	1043
O	1525
OBN	0741
OCTIN	1751
ON	0641
ONEX	5034
OUTPLT	0565
P	0376
PARBIT	0512
PARERR	0365
PCCF	6372
PCN	0140
PCR	6374
PECEOF	0535
PECIN	0167
PECOUT	0176
PECRD	0452
PECTRY	0466
PECWT	0461
PECX	0476
PINT	0023
PL	0621
PLCF	6502
PLDD	6514
PLDU	6512
PLGO	0574
PLH	4742
PLIN	0162
PLIO	4553
PLN	0142
PLOT	0022
PLOTA	4427
PLOTDB	4541
PLOTDX	4557
PLOTDY	4560
PLOVMV	4562
PLOTNA	4561
PLOTNX	4555
PLOTNY	4556
PLOTPN	4554

PLOTT1	4432
PLOTT2	4403
PLOTT3	4552
PLOTX	4405
PLOT1	4436
PLOT2	4504
PLOT3	4525
PLOT4	4550
PLOUT	0137
PLPD	6524
PLPL	6521
PLPR	6511
PLPU	6504
PLSF	6501
PLT	0764
PLTFN	4751
PLTO	0773
PLUD	6522
PLWT	0156
PL1	4600
PL2	4602
PL3	4604
PNXI	4754
PPEW	4733
PRCNT	1604
PBDRTN	0503
PSK	6371
PSKR	6373
PX	4566
PYX1	4706
P200	0556
P2000	0353
Q	1542
QMARK	1255
QNO	0671
QOVER	4146
QQ	5373
QUES	1261
R	0662
RD	0664
RDCOMD	0530
READ	0707
RECCNT	0510
RESTOR	0076
RETN	1566
RETRN	0657
RETURN	5063
REW	0413
REWC	0451
REWIND	0432
REWX	0427
RFL	0051
RFP	0026
RN	0055
RS	4704

RSTX	0450
RWTN	0450
RX	0527
SAMP	5344
SCALE	1145
SCINC	5370
SCON	5263
SCUP	1663
SDVND	4153
SECCNT	5371
SENS0	1070
SEP	1202
SKPC	0063
SKPCHN	0227
SNSWER	4154
SSVAL	5003
START	0321
SWAPBF	5413
SXX	5025
T	0543
TBUF	0003
TEKP	4634
TEM	1357
TEMAC	0060
TEM0	1075
TEM4	1124
TIN	0150
TKNB1	1110
TKP	4732
TKPVEC	4720
TM1	1205
TN	4255
TOBIN	4211
TOUT	0032
TP1	4563
TP2	4564
TP3	4565
TSTRT	0377
TWAIT	4712
TWELVE	4257
UPB	4023
US	4710
VERT	0661
VPOS	1151
U	0725
WHICH	5450
WHICHP	4614
WHP	4633
WHPLOT	4404
WHPLTN	1622
WRITE	0746
WRT	0730
WRTCHK	0344
WTCOMD	0532
WTR	0763

XCOORD 5013
XCOORDT 4663
XE 0564
YFLR 054L
XINC 2631
YMAX 0572
XY 4245
X100 5375
YCOORD 5045
ZE 1556
ZZ 1547
ZZERO 0056

