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A DATA COLLECTION SYSTEM FOR REMOTE MICROWAVE LANDING SYSTEMS

by

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INTRODUCTION

PURPOSE.

The purpose of this project is to collect long-term operational data from three remote Microwave Landing System (MLS) sites. To accomplish this task, a minicomputer-based data collection system was developed and implemented. The data collected in this project will be used as an input to the MLS System Test and Evaluation Program (STEP). This work is being performed under Project #076-320-510.

BACKGROUND.

With the proposed transition to MLS as the primary FAA landing system, an operational evaluation of MLS must be made. This evaluation will provide for the development of procedures and criteria for complete field implementation. To facilitate this evaluation, the STEP plan was developed. Three of the main objectives of STEP are:

1. To develop the maintenance concept for MLS, including application of a remote maintenance monitoring system (RMMS).

2. To develop a data base on MLS reliability, maintainability, and availability.

3. To develop maintenance procedures and tolerances.

To implement the STEP plan, three airports were selected to have prototype MLS equipment installed. The criteria for selection of these airports were:

1. The potential for both user participation and benefits.

2. The airports should be close to engineering services and support provided by the FAA and the individual contractors.

To provide the means of collecting data from the MLS sites, the data collection system described in this report was developed. This system can:

1. Communicate with the three MLS sites.

2. Collect and store performance data from each site.

The central processor is programmed so the each site can be individually accessed and the requested data can be transferred to the central processor. The RMM systems contained in all three sites were manufactured by different MLS manufacturers, thus the data structures and protocols are all different. For this reason, the central processor software had to provide the necessary flexibility to support the three different formats.

The first section of this report describes the data collection system and the second section discusses the data collection activity.

DISCUSSION

SYSTEM OVERVIEW.

The three MLS sites used in this project each include a contractor-developed Remote Maintenance Monitoring System (RMMS). The three sites are a Bendix Basic Narrow MLS at Washington National Airport (DCA), Runway 18; a Texas Instruments Small Community MLS at Philadelphia International Airport (PHL), Runway 17; and a Hazeltine Small Community MLS at Clarksburg Airport (CKB), Runway 21. Each site contains an MLS RMMS Processor (MRP) which is interfaced to the MLS equipment, an auto-answer modem interfaced to the MRP, and a telephone line with a telephone number. A PDP-11/34 minicomputer is located at the FAA Technical Center and acts as the central processor in this project. The central processor periodically polls the three sites via an auto-dial modem. The central processor's software supports the communications protocol for all three sites. The data that is collected from each site is printed out on a line printer and also stored on a magnetic disk cartridge for ease of retrieval. Figure 1 shows the general system configuration.

SYSTEM DESCRIPTION.

As shown in Figure 1, the MLS data collection system consists of three parts:

1. The MLS RMMS Processor (MRP)

2. The auto-answer modem/telephone line/auto-dial modem communications network.

3. The PDP-11/34 central processor and related peripherals.

The MRP is a microcomputer that accesses the MLS equipment, collects operational and maintenance data, and makes that data available to the central processor. Each MLS site has its own microcomputer and associated software. Each MRP was designed, interfaced, and programmed by the MLS manufacturer. The MRP's purpose is to monitor certain performance parameters of the MLS. This monitoring is accomplished through A/D converters, power level monitors, and other analog circuitry. The data are collected and stored in the MRP's local memory. This data collection process is usually continuous, so current data is always available. If certain parameters are determined to be outside of predefined tolerance limits, alarm messages are generated. These messages are transmitted first during a data transfer, thus giving the maintenance personnel an immediate indication of the status of that site. In addition to outputting data, the MRP can interpret different codes sent by the central processor. These functions can include the setting of the MLS system time and date, changing parameter alarm limits, and the sending and receiving of messages.

The auto-dial modem/telco/auto-answer modem network is the telecommunications link between each MRP and the central processor. The auto-dial modem is connected to and controlled by the central processor. It is also connected to a telephone line, using a standard telephone jack. When data is desired from a specific site, that site's telephone number is output to the modem in serial form. The modem generates the proper signals to "call" that site.

Each MLS site has an assigned telephone number. When that number is dialed, the auto-answer modem at the MLS site "answers" the call by changing the telco signals to indicate that a connection has been made. Also, a signal is sent to the MRP to indicate that communications with the central processor is requested. When the data transfer is complete, the central processor signals the auto-dial modem to "hang-up", thus releasing the connection. This will allow other processors or terminals to access the MRP at that site.

The central processor can be any computer (or terminal) that can access a telephone line and send the proper commands to the MRP. For this project, the central processor is a PDP-11/34 minicomputer. Along with the computer is the auto-dial modem, tape and disk storage units, and a line printer and CRT terminal. The data collection software, written by Technical Center personnel, controls the data transfer process between the MRP and the central processor. The software also controls the storage and printing of the collected data.

The software outputs the 10-digit telephone number of the desired site to the auto-dial modem via an RS-232C port. All communications status lines are monitored and indicated by LED's on the front panel of the modem. If the link between the two modems is completed, the "carrier detect" LED is lit and the data transfer can begin. If the MRP does not complete the link within a specified time, the telephone line is released and the auto-dial modem "hangs-up". When the link is established, the user types in the appropriate codes to request the information desired. The central processor will transfer these codes to the MRP via the communications link. The received data are stored on the magnetic disk cartridge and printed out on the line printer. When the transfer is complete, the user types in the code to terminate the link. The central processor will command the auto-dial modem to "hang-up". When the auto-answer modem senses the change in the telephone line, it will also "hang-up". A list of the data collection commands is given in Table 1. A flow chart of the data collection program is shown in Appendix C. A complete listing of the program is available from the Technical Center.

MLS RMMS PROCESSOR COMMUNICATIONS.

Each MLS site has its own set of measured parameters available to the central processor. Tables 2, 4 and 5 list the parameters available from each site.

WASHINGTON NATIONAL AIRPORT COMMUNICATIONS.

The MLS at DCA has two separate MRPs: One for the elevation site equipment and one for azimuth site equipment. The two sites have different sets of parameters available. Both sites communicate with the central processor at 300 baud.

The Washington MRP can accept requests for data in two different formats. The first format uses a two ASCII-character designator for the desired parameter. The user types in the designator followed by a carriage return. The MRP will respond with the header message followed by the parameter information. The header message includes the MRP system time and date, system operational status, and system restart information.

The second format also uses the two character designator, but includes several ASCII control characters. An ASCII "R" character precedes the designator and the ASCII control character "ENQ" (Enquiry) follows the designator. The MRP, when receiving a request in this format, will include several control characters and a block checksum within the output stream. The control character "STX" (Start of Text) will be output preceding the header message, the parameter line, and the data lines. An "ETB" (End of Text Transmission Block) follows the header message, parameter line, and data lines. Following each "ETB" is a binary checksum, which is the sum of all the characters sent between the "STX" and the "ETB". This checksum is included for transmission error-checking purposes. At the end of the data block is an "EOT" (End of Transmission) character. Figure 2 shows an example of both communication formats. The characters inside the block are the ones used to compute the block checksum.

PHILADELPHIA INTERNATIONAL AIRPORT MLS COMMUNICATIONS.

The MLS at PHL is unlike the other two sites. Here the two equipments transfer data to a single communications microcomputer located at the airport. This computer is connected to the auto-answer modem and communicates with the central processor at 300 baud.

The Philadelphia MRP is the most sophisticated of the three remote processors. There are many different data transfer functions. The three functions most frequently used in this program are the "INT" function, the "MON" function, and the "SS" function. The "INT" function requests a listing of all parameters that have been determined to be in an alarm condition since the last request. Included in this listing is the number and descriptor of the alarm parameter, the time and date of the error, and the time and date that the error was corrected. The "MON" function requests the current values for all the important parameters. Included in this listing is the number and descriptor of the parameter, the current value, and the high and low limits of that parameter (if applicable). The "SS" function requests the system time and data and the MLS system status. Other functions such as setting of system time and data and initializing the automatic transmission sequence are available. Table 3 lists the functions available from the Philadelphia MRP.

The Philadelphia MRP communicates with the central processor completely in ASCII. The user only need type in the abbreviation of the function requested. At the end of the transfer for that function, the MRP will respond with the ASCII character string "(=)". This string will indicate the end of that function transmission.

CLARKSBURG AIRPORT MLS COMMUNICATIONS.

The MLS at CKB, like the MLS at DCA, has two MRP's: One for the azimuth equipment and one for the elevation equipment. Each MRP has its own dedicated telco line and communicates at 300 baud.

The Clarksburg MRP has two different levels of data transfer available. The first level is an output stream that begins auto matically when the auto-answer modem "answers" a call from the central processor. The data contained in this stream consists of several values representing measured parameters. Also contained in this stream are status values (GO/NOGO) of certain parameters and the condition of certain indicators (ON/OFF) on the control panel. The second level of transfer is one in which the user can request a dump of the MRP's memory. Certain locations of the MRP's memory contain the binary values of measured parameters. These values can give a more meaningful interpretation of the data transferred in the first level. At the end of the first level transfer, the user types in a "*". The MRP will respond with the message "START ADDR -END ADDR". The user then types in the addresses of the memory space desired. The data contained in those addresses are then transmitted to the central processor. It should be noted that the Clarksburg site does not provide an error-checking capability.

All communications with the Clarksburg MRP are done in ASCII at 300 baud. Figure 3 is a sample of the communications with the CKB MRP. This sample printout was obtained using a standard ASCII terminal and an acoustic coupler to provide the communications link.

SYSTEM PERFORMANCE

DATA COLLECTION.

The process of collecting data from the three remote MLS sites began in July 1981. The Washington MLS was the first site from which data was collected. The other two sites, Philadelphia and Clarksburg, were not used in the data collection process until September 1981 and November 1981, respectively. Philadelphia was not used until this date because the protocol software was not completed. Clarksburg was not used because the site was not in operation until that time.

Since the start of data collection, two runs of data have been taken each day: One in the morning and one in the afternoon. The data collected during each run are stored on a magnetic disk cartridge and printed out on the line printer. At the end of each month, the data collected during that month is transferred to magnetic tape. This tape is used to generate the monthly listing and the parameter plots as required in the project. Appendix B shows a sample of the daily and monthly listings and a sample of the generated plots.

ERRORS.

The data runs discussed in this report span the time period of July 1981 to June 1982. During this time period, many data transfer errors were encountered during the data collection process. The bulk of the errors encountered so far can be divided into two categories:

1. A processor error - an error caused by a problem in either the central processor or the MRP.

2. A communications error - an error caused by a problem with either one of the modems or the telephone line.

A typical processor error would be an error in data transfer caused by the MRP sending an incorrect checksum or halting transmission in the middle of the transfer. A typical communications error would be caused by one of the modems disconnecting before the end of a transfer or noise on the telephone line. It should be noted that some of the errors encountered could be of both types, could not be placed in either category, or that an error of one type causes an error of the other type.

The Washington MLS had three distinct errors that occurred more than three times over the entire data collection period. For both Washington sites, there were a total of 795 data collections. The most frequent error was a "REPEAT REQUEST" message being sent by the MRP. This message would be transmitted after the telco link was established and before any request was sent by the central processor. This error appears to be caused by a software problem in the MRP.

This problem could be solved by having the MRP software clear the request input buffer after a transfer is complete. Another frequent error, no response after request, can be caused by several problems. Two reasons could be not having the MRP connected to the modem or the MRP software has "crashed". The third error, no connection, could be caused by bad telephone line conditions or the auto-answer modem is unplugged. Other miscellaneous errors include the site not responding to a request the first time, incorrect control characters being sent and the site "hanging-up" in the middle of the transfer. All of these errors mentioned, except for the no connection error, can be traced back to problems with the MRP.

(It should be noted that since the beginning of the data collection process, both Washington sites have been sending data with a checksum error being detected by the central processor. After careful analysis, the error was determined to be an incorrect checksum being sent by the MRP. Again, this error is attributable to problems with the MRP.)

There was only one error which occurred more than three times in the Philadelphia site. In the 387 data collections attempted, there were only 6 no responses and only once did the site not connect. Recently, (after June 30, 1982 however) the Philadelphia MRP was shutting down the RMM system of the MLS after being dialed from an out-of-state line. This problem was reported to the technician at the site.

The Clarksburg MLS had only one error that occurred over three times in 628 data collections. This error, no site connection, occurred 54 times.

Table 6 contains a list of the signicant errors and the number of times each error occurred for the Washington and Clarksburg sites.

CONCLUSIONS AND RECOMMENDATIONS

Based upon the performance of the data collection system up to this point in time, the following conclusions can be drawn:

1. The data collection system designed and implemented in this program accomplished its purpose.

2. The RMMS concept is valid as applied to the MLS and in particular, to the MLS sites used in this project.

3. Using the auto-answer/auto-dial modems with a standard telephone line is acceptable for an RMMS application.

4. The modem/telco communications link used in this program contributed a very small percentage of the total number of errors encountered.

The following recommendations are made to aid in the specification of future MLS RMM systems:

1. A standard data and command transfer protocol be established for both the central processor and the MRP.

2. An error-checking capability (binary or CRC-type checksums) be included in the standard protocol.

3. A standard set of commands be defined for both the MRP and the central processor.

4. An auto-reset function be included in the MRP software in case of communication problems during a data transfer.

5. A reset function be provided so that the central processor can reset the MRP.

6. A standard set of parameters for data transfer be established for all MLS equipment. Any additional parameters which are deemed necessary for any indivual site should be handled by a different central processor function.

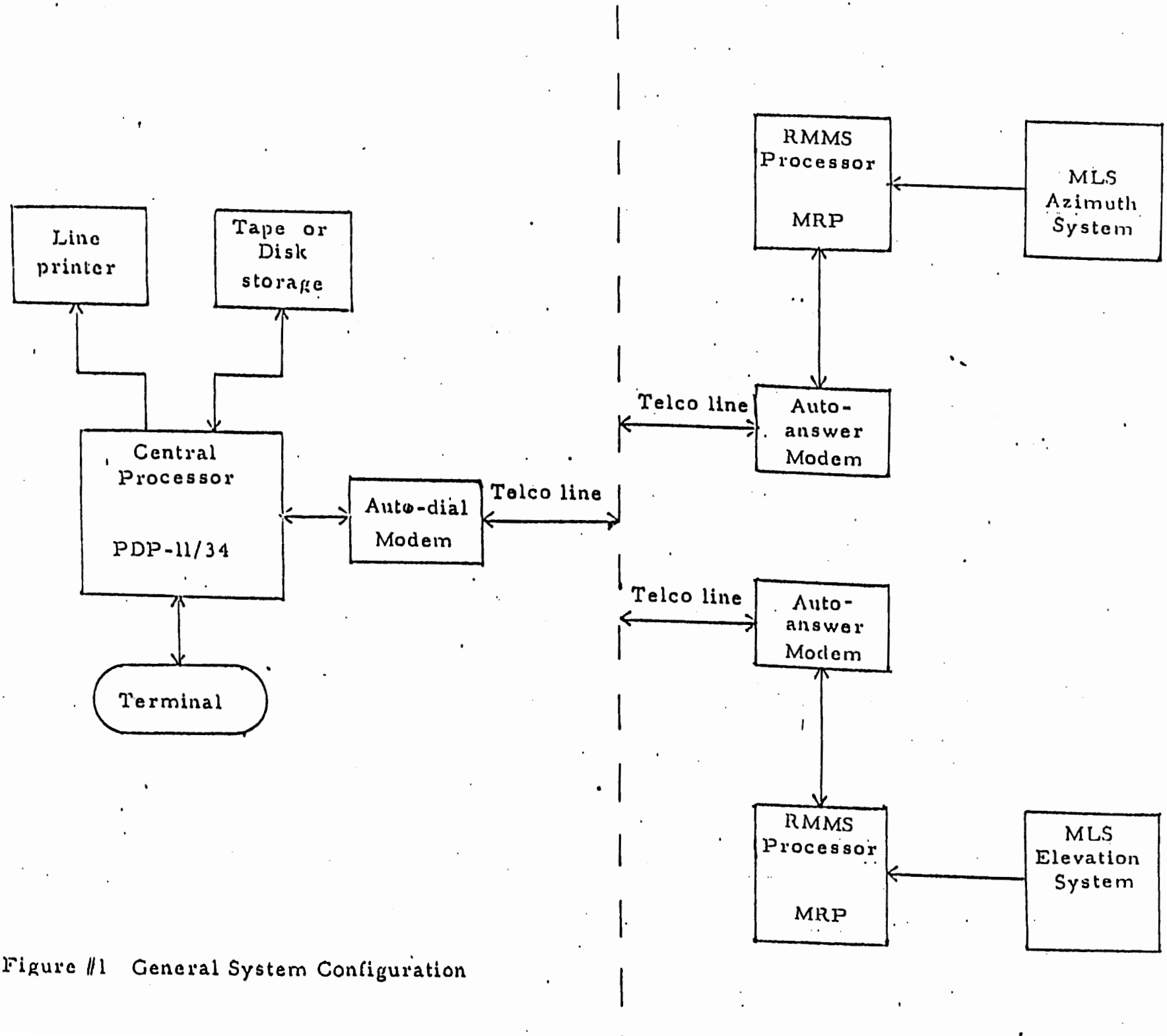


Figure #1 General System Configuration

Figure #2. Washington MRP Communication Protocol Example

1. Data Stream using first format

User Input: 09

```
LF    DATE 001 TIME 2359CRLF
      SYSTEM IS ON AND IN OPERCRLFLF
      RESTRTS - TODAY 000 - YSTRDAY 999          CRLF
LF    09 * FREQUENCY                             CRLF
LF    MEAS = -10. KHZCRLFLF
      LIMS = - 10. AND + 10. KHZCRLFLF
      PREV = + 10. KHZ                           CRLFLF
```

2. Data Stream using second format

User Input: RC9ENQ

```
STX | DATE 001 TIME 2359CRLFLF
    | SYSTEM IS ON AND IN OPERCRLFLF
    | RESTRTS - TODAY 000 - YSTRDAY 999          ETBLRC
STX | 09 * FREQUENCY                             ETBLRC
STX | MEAS = -10. KHZCRLFLF
    | LIMS = - 10. AND + 10. KHZCRLFLF
    | PREV = + 10. KHZ                           ETBLRCEOT
```

Figure #3. Sample Communications with Clarksburg MRP

```
STATION I.D.:    MCKB AZ
PREAMBLE. 001011000100111101001000  DW1: 00011101010100010111000010100000
                 UNITS          DATA          THRESHOLD     OUT-OF-TOL COUNT
PFE               DEG            + .01            13            0
CMN               DEG               .00           13            0
OUTLIER                                            4            0
DPSK PHASE        DEG              0             10            0
FREQ              HZ         5268831             10            0

DPSK. PWR      TX. PWR       DPSK. CD. CK     R. CLR. PWR
 G              G             G                G
S. B. PWR      BSU. CK       S. B. PK. SLL    L. CLR. PWR
 G              G             G                G
+5VDC    +12VDC    +15VDC    -12VDC    -5VDC    -15VDC    -20VDC    -40VDC
  G        G         G         G         G        G         G         G

PANEL LIGHT STATUS:
NORML   AUTO. SHDN   AUTO. SHDN. OVRD   DPSK. CD   DPSK. PWR   FREQ   SBPWR   ANGCD
ON      OFF          OFF                OFF        OFF         OFF    OFF     OFF
LRU LIGHTS:
TRANS   ANT. SW      CONTROL            PHASERS    D. C. PWR   UPS    FLDMON  INTMON
OFF     OFF          OFF                OFF        OFF         OFF    OFF     OFF
END OF MESSAGE


*START ADDR-STOP ADDR
*2009-219A
2009 00 00 00 00 00 08 00
2010 00 00 7F C5 7B 7B C5 7B C1 7A 00 00 00 00 00 00
2020 00 00 00 65 03 00 00 00 00 00 00 0B 12 3F 00 00
2030 00 00 00 E6 01 00 00 01 00 01 00 00 00 5F 65 50
2040 00 00 00 75 1A 00 00 00 00 01 00 00 00 FE FE 00
2050 00 00 00 00 FE 02 00 FF 00 05 00 02 00 FE 00 00
2060 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
2070 00 00 00 05 03 0B 00 57 20 07 00 02 01 01 1A 0F
2080 00 00 00 01 00 FF FF 03 00 07 00 01 00 00 00 FF
2090 FF 04 00 00 00 FF FF 03 00 07 00 02 00 01 00 00
20A0 00 05 00 01 00 FE FF 03 00 07 00 01 00 01 00 00
20B0 00 05 00 00 00 03 00 00 00 FF FF 03 00 07 00 02
20C0 00 01 00 00 00 03 00 00 00 FE FF 04 00 07 00 01
20D0 00 00 00 00 00 05 00 02 00 FE FF 04 00 06 00 01
20E0 00 00 00 00 00 05 00 02 00 FE FF 03 00 07 00 01
20F0 00 00 00 00 00 04 00 02 00 FE FF 03 00 07 00 02
2100 00 00 00 00 00 04 00 01 00 FF FF 02 00 06 00 02
2110 00 06 00 01 00 01 00 00 00 05 00 00 00 FE FF 03
2120 00 07 00 01 00 01 00 00 00 05 00 02 00 FE FF 03
2130 00 07 00 03 00 00 00 00 00 05 00 02 00 FE FF 00
2140 00 00 00 00 00 00 00 00 00 00 00 00 00 16 01 94
2150 00 25 21 BB 00 FE 00 FF FF 00 00 00 00 00 00 00
2160 D4 E4 46 6D 00 00 00 00 75 00 ED 1A B0 0D 00 00
2170 FE 00 00 00 00 00 00 00 00 00 00 00 00 00 0F 05
2180 00 00 00 00 00 00 13 CF 12 00 00 00 E1 00 6B 1A
2190 68 1B 00 19 00 14 00 6F 00 00 00

*START ADDR-STOP ADDR
*
```

Table #1. PDP-11/34 Data Collection Commands

Command Letter	Message to Terminal	Description
D	"Site # = "	Requests specific site # to be dialed. Selects telephone number and protocol to be used.
E	None	Ends execution of data collection program. Closes open data files storage disk, disconnects auto-dial modem, and prints out rest of printer buffer.
F	"Output RT-11 File Name, Max. 10 Chars. XXXXX X.XXX"	Opens a data file on the storage disk for incoming data. File is assigned name typed in by the user.
G	None	Outputs contents of printer buffer to line printer.
J	None	Closes all open data files. Prevents any unwanted data from being stored on that file.
Q	None	Commands auto-dial modem to disconnect from telco line.
R	"Site Request # "	Request data transfer code to be sent to the MRP.

Table #2. Washington MLS Measured Parameters

Azimuth Equipment		Elevation Equipment	
Number	Parameter	Number	Parameter
00	Beam Accuracy	00	Beam Accuracy
01	Test Pulse Accuracy		
02	Beam ERP	02	Beam ERP
03	Ident ERP	03	Ident ERP
		04	SLS, Upper ERP
05	SLS Left ERP		
06	SLS Right ERP		
07	Preamble	07	Preamble
		08	Sustem Timing
09	Frequency	09	Frequency
10	Antenna Switch	10	Antenna Switch
11	Scan Modulation	11	Scan Modulation
12	Scan Continuity	12	Scan Continuity
13	DME Reply		
14	Monitor Timing	14	Monitor Timing
15	Basic Data 1		
		16	Small Community AZ
17	Aux. Data		
18	Power Out TWTA	18	Power Out TWTA
19	Power Out EXCTR	19	Power Out EXCTR
20	Data Input		
		21	Small Community EL
22	Phase Modulation	22	Phase Modulation
23	AM Modulation	23	AM Modulation
27	Temp. Electronics	27	Temp. Electronics
28	Temp. Antenna	28	Temp. Antenna
29	Data Link	29	Data Link
30	Local Control Panel	30	Local Control Panel
31	Antenna +5 Volts	31	Antenna +5 Volts
32	Antenna -40 Volts	32	Antenna -40 Volts
33	Antenna +24 Volts	33	Antenna +24 Volts
34	Electronics +5 Volts	34	Electronics +5 Volts
35	Electronics +15 Volts	35	Electronics +15 Volts
36	Electronics -15 Volts	36	Electronics -15 Volts
37	Electronics +20 Volts	37	Electronics +20 Volts
38	Monitor +5 Volts (1)	38	Monitor +5 Volts (1)
39	Monitor +5 Volts (2)	39	Monitor +5 Volts (2)
40	Monitor +15 Volts	40	Monitor +15 Volts
41	Monitor -15 Volts	41	Monitor +15 Volts
88	Parameter List	88	Parameter List
99	All Parameters and Limits	99	All Parameters and Limits

Table #3. Philadelphia MRP Commands

Command Code	Operation
?	Print list of functions
ALL	Dump Alarm Parameters and Measured parameter values
INT	Dump Alarm Parameters
MON	Dump Measured Parameter values
DC	Dump Parameter Limits
PER	Execute Commands in PER buffer at HH,MM,SS interval
OCR	Dump Alarm Parameters that have changed since last dump
SET	Set time and date
RESET	Clear Alarm buffer
PEROFF	Cancel PER function
OCROFF	Cancel OCR function
//	Insert command into PER buffer
PB	Print PER buffer
PMSET	Set Alarm Limits
MASK	Mask Alarm parameters from history
PMASK	Print Active Alarm parameters
UNMASK	Restore Alarm parameters to history
SS	Output System Status

Table #4. Philadelphia MLS Measured Parameters

Azimuth Equipment		Elevation Equipment	
Number	Parameter	Number	Parameter
00	EXCTR. PWR. Monitor	00	EXCTR. PWR. Monitor
01	MOD. PWR. Monitor	01	MOD. PWR. Monitor
02	0/180 PWR. Diff.	03	0/180 PWR. Diff.
03	*SPARE*		
04	Scan Antenna FWD. PWR.	04	Scan Antenna FWD. PWR.
05	ID Ant. Forward PWR.	05	ID. Ant. Forward PWR.
06	ID Ant. FWD/REV PWR. Diff.	06	ID. Ant. FWD/REV PWR. Diff.
07	RT. CL. Ant. Forward PWR.		
08	RT. CL. FWD/REV PWR. Diff.		
09	LT. CL. Ant. Forward PWR.		
10	LT. CL. FWD/REV PWR. Diff.		
11	LT. CL/SLS FWD. PWR. Diff.		
12	Back SLS Ant. Forward PWR.		
13	Back SLS FWD/REV PWR. Diff.		
14	Single Point Monitor PWR.	14	Single Point Monitor PWR.
15	Eff. Radiated PWR. TO Scan	15	Eff. Radiated PWR. TO Scan
16	Eff. Radiated PWR. FRO Scan	16	Eff. Radiated PWR. FRO Scan
17	Data ACQ Ref. Volt. #3	17	Data ACQ Ref. Volt. #3
18	Data ACQ Ref. Volt. #2	18	Data ACQ Ref. Volt. #2
19	Data ACQ Ref. Volt. #1	19	Data ACQ Ref. Volt. #1
20	Blanked Scan Forward PWR. Mon.	20	Blanked Scan Forward PWR. Mon.
21	Blanked ID. Forward PWR. Mon.	21	Blanked ID. Forward PWR. Mon.
22	Blanked ID. Reverse PWR. Mon.	22	Blanked ID. Reverse PWR. Mon
23	Blanked RT. CL. Forward PWR. Mon.		
24	Blanked RT. CL. Reverse PWR. Mon.		
25	Blanked LT. CL. Forward PWR. Mon.		
26	Blanked LT. CL. Reverse PWR. Mon.		
27	Blanked BACK SLS Forward PWR. Mon.		
28	Blanked BACK SLS Reverse PWR. Mon.		
29	Blanked LT. SLS Reverse PWR. Mon.		
30	Blanked Modulator PWR. Mon.	30	Blanked Modulator PWR. Mon.
31	+5V. Power Supply A	31	+5V. Power Supply A
32	+5V. Power Supply B	32	+5V. Power Supply B
33	+5V. Power Supply C	33	+5V. Power Supply C
34	+20V. Power Supply A	34	+20V. Power Supply A
35	+20V. Power Supply B	35	+20V. Power Supply B
36	+28V. Power Supply A	36	+28V. Power Supply A
37	+28V. Power Supply B	37	+28V. Power Supply B
38	-20V. Power Supply A	38	-20V. Power Supply A
39	-20V. Power Supppy B	39	-20V. Power Supply B
40	Channel Frequency Error	40	Channel Frequency Error
41	FM Prealarm Angle Error	41	FM Prealarm Angle Error
42	FM Alarm Angle Error	42	FM Alarm Angle Error

Table #5. Clarksburg Measured Parameters and Conversion Factors

Elevation Equipment

	Data	Memory Location	Actual Limits		Data Scale Factor	
1.	PFE	2166	+/-.15 deg.		Unity	LSB=.01 deg.
2.	CMN	2009	+/-.03 deg.		Unity	LSB=.01 deg.
3.	Power Supplies					LSB=.0391 V.
	+5V	2013	5.5	4.5	1	
	+12V	2014	13.0	11.0	.6677	
	+15V	2015	16.0	14.0	.3333	
	-5V	200E	-5.5	-4.5	1	
	-12V	200F	-13.0	-11.0	.6677	
	-15V	2010	-16.0	-14.0	.3333	
	-20V	2011	-21.7	-18.5	.24938	
	-40V	2012	-44.9	-35.9	.1992	
4.	SBM ERP	2190	-5 dB		GO/NOGO	
5.	SID ERP	204A	-5 dB		1=NOGO	
		204B				
6.	Up. Clr. Pulse	204E	-5 dB			
7.	Xmtr. Pwr.	21B9	-3 dB			
8.	Frequency	2036-2038	+/-20 Khz		.001041833 LSB=1 Hz.	

Azimuth Equipment

	Data	Memory Location	Actual Limits		Data Scale Factor	
1.	PFE	214E	+/-.20 deg.		Unity	LSB=.01 deg.
2.	CMN	2009	+/-.03 deg.		Unity	LSB=.01 deg.
3.	Power Supplies					LSB=.0391 V.
	+5V	2017	+5.5	+4.5	1	
	+12V	2018	+13.0	+11.0	.6677	
	+15V	2019	+16.0	+14.0	.3333	
	-5V	2012	-5.5	-4.5	1	
	-12V	2013	-13.0	-11.0	.6677	
	-15V	2014	-16.0	-14.0	.3333	
	-20V	2015	-21.7	-18.5	.24938	
	-40V	2016	-44.9	-35.9	.1992	
4.	SBM ERP	2177	-5 dB		GO/NOGO	
5.	SID ERP	204D	-5 dB		1=NOGO	
		204E				
6.	Rt. Clr. Pulse	2170	-5 dB			
	Up. Clr. Pulse	204E	-5 dB			
7.	Lt. Clr. Pulse	2054	-5 dB			
8.	Xmtr. Pwr.	219A	-3 dB			
9.	Frequency	2036-2039	+/-20 kHz		.001041833 LSB=1 Hz.	

Table #6. Data Collection Errors

Washington Elevation Site

Error #	July 1981	Aug. 1981	Sep. 1981	Oct. 1981	Nov. 1981	Dec. 1981	Jan. 1982	Feb. 1982	Mar. 1982	Apr. 1982	May 1982	June 1982	Total
1		4	4		12	13	2	5		16	7	6	69
2		9				1			4	1	2	6	23
3		1	1					2				8	12
# of Collections	41	32	41	41	36	42	36	37	39	44	39	27	525

Washington Azimuth Site

1		4	2	4	1	13		3	7	14	7	3	58
2		4	8	6	12	2	18	9	8	13	14	10	94
3	2		2		10	2	5	6	3			11	41
# of Collections	42	36	28	31	12	38	14	27	36	33	23	20	340

Clarksburg Elevation Site

3					2	5	15	1		1	1	1	26
# of Collections					35	42	38	34	44	42	38	43	316

Clarksburg Azimuth Site

3					1	11	13		3				28
# of Collections					34	40	38	34	43	43	37	43	312

Error Legend:

1 -> When site connects, MRP sends "REPEAT REQUEST" message
2 -> Site does not respond to any requests
3 -> Site does not connect

APPENDIX A

The following is a sample of the man/machine communications between the user and the PDP-11/34 data collection software. The central processors operating system prompt is a "." and the data collection programs prompt is a "?". The name of the program used to collect the data is "MLS". All user input is underlined. Refer to Table #1 for a description of the data collection functions.

The sample run in this example was taken in the afternoon on July 6, 1982. Each data file is designated in the following manner:

S MM DD T.M YY

where

S = Site Code
- W = Washington
- P = Philadelphia
- C = Clarksburg

MM = 2-digit representation of the month ex: 07 -> July

DD = 2-digit representation of the day

T = Time-of-Day ex: A -> A.M. P -> P.M.

YY = 2-digit representation of the year ex: 82 -> 1982

for example: W0706A.M82 would be the file name for the elevation site data taken on the morning of July 6, 1982.

(Note: At the time of this sample run, a problem with the Washington sites was discovered. A checksum error was being detected when one of the parameters was transmitted. This error led to the request for parameter #41 to be collected into a separate data file. Also, the elevation site data and azimuth site data were being stored in separate files. The elevation data files have the time-of-day in the position indicated in the above example. The azimuth data files have the time-of data after the site code.)

```
.R MLS

?F

OUTPUT RT-11 FILE NAME, MAX.  10 CHARS. , XXXXXX. XXX
W0706F. M82

?D
SITE # = 1

?R
SITE REQUEST # 99

?J

?F
OUTPUT RT-11 FILE NAME, MAX.  10 CHARS. , XXXXXX. XXX
W20706. M82

?D
SITE # = 1

?R
SITE REQUEST # 41

?Q

?J

?F
OUTPUT RT-11 FILE NAME, MAX.  10 CHARS. , XXXXXX. XXX
WP0706. M82

?D
SITE # = 2

?R
SITE REQUEST = 99

?J

?F
OUTPUT RT-11 FILE NAME, MAX.  10 CHARS. , XXXXXX. XXX
W60706. M82

?D
SITE # = 2

?R
SITE REQUEST # 41

?Q

?J
```

```
?F
OUTPUT RT-11 FILE NAME, MAX.  10 CHARS. , XXXXXX. XXX
P0706F M82

?D
SITE # = 3

?

**RMMS Terminal On.   07/06/82/187   12:33:44

?R
SITE REQUEST # INT

?

**DONE

?R
SITE REUQEST # MON

?R
SITE REQUEST # **MSG: HAVE A NICE DAY

?

** COMMAND OK.

** DELIVERED

?Q

?J
```

```
?F
OUTPUT RT-11 FILE NAME, MAX  10 CHARS , XXXXXX. XXX
COT06P M82

?D
SITE # = 4

?G

?R
SITE REQUEST # *

?R
SITE REQUEST * 1

?G

?D
SITE # = 5

?G

?R
SITE REQUEST # *

?R
SITE REQUEST # 2

?G

?E
```

APPENDIX E

This appendix contains representative samples of the daily and monthly listings and samples of the parameter plots as requested by ARD-320.

WE0007-MAY-8215:35:27	127	1533:07	ON	OPER	000	000	+0.012	-0.071	+0.071	+0.012	BEAM ACCURACY
WE0207-MAY-8215:35:27	127	1533:07	ON	OPER	000	000	+ 0.2	- 3.0		+ 0.4	BEAM ERP
WE0307-MAY-8215:35:27	127	1533:07	ON	OPER	000	000	- 0.3	- 3.0		- 0.3	IDENT ERP
WE0407-MAY-8215:35:27	127	1533:07	ON	OPER	000	000	- 0.3	- 3.0		- 0.3	SLS, UPPER ERP
WE0707-MAY-8215:35:34	127	1533:07	ON	OPER	000	000	GO			GO	PREAMBLE
WE0807-MAY-8215:35:34	127	1533:07	ON	OPER	000	000	0.	100.		0.	SYSTEM TIMING
WE0907-MAY-8215:35:34	127	1533:07	ON	OPER	000	000	- 4.	- 10.	+ 10.	+ 2.	FREQUENCY
WE1007-MAY-8215:35:34	127	1533:07	ON	OPER	000	000	GO			GO	ANTENNA SWITCH
WE1107-MAY-8215:35:38	127	1533:07	ON	OPER	000	000	GO			GO	SCAN MOD
WE1207-MAY-8215:35:38	127	1533:07	ON	OPER	000	000	GO			GO	SCAN CONT
WE1407-MAY-8215:35:38	127	1533:07	ON	OPER	000	000	GO			GO	MONITOR TIMING
WE1607-MAY-8215:35:41	127	1533:07	ON	OPER	000	000	GO			GO	BASIC DATA 2
WE1807-MAY-8215:35:41	127	1533:07	ON	OPER	000	000	- 0.5	- 2.0		- 0.5	PWR OUT, TWTA
WE1907-MAY-8215:35:41	127	1533:07	ON	OPER	000	000	+ 0.0	- 2.0		+ 0.0	PWR OUT, EXCTR
WE2107-MAY-8215:35:41	127	1533:07	ON	OPER	000	000	GO			GO	SYNC SIGNAL PRESENCE
WE2207-MAY-8215:35:45	127	1533:07	ON	OPER	000	000	GO			GO	PHASE MOD
WE2307-MAY-8215:35:45	127	1533:07	ON	OPER	000	000	GO			GO	AM. MOD
WE2707-MAY-8215:35:45	127	1533:07	ON	OPER	000	000	+ 27.	- 10.	+ 50.	+ 27.	TEMP ELECTRONICS
WE2807-MAY-8215:35:45	127	1533:07	ON	OPER	000	000	+ 37.	- 10.	+ 50.	+ 37.	TEMP ANTENNA
WE2907-MAY-8215:35:49	127	1533:07	ON	OPER	000	000	GO			GO	DATA LINK
WE3007-MAY-8215:35:49	127	1533:07	ON	OPER	000	000	GO			GO	LOCAL CONTROL PANEL
WE3107-MAY-8215:35:49	127	1533:07	ON	OPER	000	000	+4.91	+4.75	+5.25	+4.91	ANTENNA +5 VOLTS
WE3207-MAY-8215:35:49	127	1533:07	ON	OPER	000	000	-39.6	-35.0	-45.0	-39.6	ANTENNA -40 VOLTS
WE3307-MAY-8215:35:53	127	1533:07	ON	OPER	000	000	+23.9	+20.0	+28.0	+23.5	ANTENNA +24 VOLTS
WE3407-MAY-8215:35:53	127	1533:07	ON	OPER	000	000	+4.96	+4.75	+5.25	+4.91	ELECTRONICS +5 VOLTS
WE3507-MAY-8215:35:53	127	1533:07	ON	OPER	000	000	+14.9	+14.3	+15.8	+14.9	ELECTRONICS +15 VOLTS
WE3607-MAY-8215:35:53	127	1533:07	ON	OPER	000	000	-14.7	-14.3	-15.8	-14.7	ELECTRONICS -15 VOLTS
WE3707-MAY-8215:35:57	127	1533:07	ON	OPER	000	000	+19.8	+19.0	+21.0	+19.8	ELECTRONICS +20 VOLTS
WE3807-MAY-8215:35:57	127	1533:07	ON	OPER	000	000	+4.91	+4.75	+5.25	+4.91	MONITOR +5 VOLTS (1)
WE3907-MAY-8215:35:58	127	1533:07	ON	OPER	000	000	+4.85	+4.75	+5.25	+4.85	MONITOR +5 VOLTS (2)
WE4007-MAY-8215:35:58	127	1533:07	ON	OPER	000	000	+15.0	+14.3	+15.8	+15.0	MONITOR +15 VOLTS
WE4107-MAY-8215:36:01	127	1533:07	ON	OPER	000	000	-15.0	-14.7	-15.3	-15.0	MONITOR -15 VOLTS

WA00	07-MAY-82	15:39:34	127	1537:39	ON	OPER	005	000	-0.016	-0.130	+0.130	-0.014	BEAM ACCURACY
WA02	07-MAY-82	15:39:39	127	1537:39	ON	OPER	005	000	+ 0.5	- 3.0		+ 0.5	BEAM ERP
WA03	07-MAY-82	15:39:39	127	1537:39	ON	OPER	005	000	- 0.6	- 3.0		- 0.6	IDENT ERP
WA05	07-MAY-82	15:39:39	127	1537:39	ON	OPER	005	000	- 0.7	- 3.0		- 0.7	SLS LEFT ERP
WA06	07-MAY-82	15:39:39	127	1537:39	ON	OPER	005	000	- 0.9	- 3.0		- 0.9	SLS RIGHT ERP
WA07	07-MAY-82	15:39:43	127	1537:39	ON	OPER	005	000	GO			GO	PREAMBLE
WA09	07-MAY-82	15:39:43	127	1537:39	ON	OPER	005	000	+ 6.	- 10.	+ 10.	+ 6.	FREQUENCY
WA10	07-MAY-82	15:39:43	127	1537:39	ON	OPER	005	000	GO			GO	ANTENNA SWITCH
WA11	07-MAY-82	15:39:44	127	1537:39	ON	OPER	005	000	GO			GO	SCAN MOD
WA12	07-MAY-82	15:39:47	127	1537:39	ON	OPER	005	000	GO			GO	SCAN CONT
WA13	07-MAY-82	15:39:48	127	1537:39	ON	OPER	005	000	GO			GO	DME REPLY
WA14	07-MAY-82	15:39:48	127	1537:39	ON	OPER	005	000	GO			GO	MONITOR TIMING
WA15	07-MAY-82	15:39:48	127	1537:39	ON	OPER	005	000	GO			GO	BASIC DATA 1
WA17	07-MAY-82	15:39:52	127	1537:39	ON	OPER	005	000	GO			NOGO	AUX DATA
WA18	07-MAY-82	15:39:52	127	1537:39	ON	OPER	005	000	- 0.5	- 2.0		- 0.5	PWR OUT TWTA
WA19	07-MAY-82	15:39:52	127	1537:39	ON	OPER	005	000	- 1.5	- 2.0		- 1.5	PWR OUT EXCTR
WA20	07-MAY-82	15:39:55	127	1537:39	ON	OPER	005	000	GO			GO	DATA INPUT
WA22	07-MAY-82	15:39:55	127	1537:39	ON	OPER	005	000	GO			GO	PHASE MOD
WA23	07-MAY-82	15:39:55	127	1537:39	ON	OPER	005	000	GO			GO	AM MOD
WA27	07-MAY-82	15:39:55	127	1537:39	ON	OPER	005	000	+ 23.	- 10.	+ 50.	+ 23.	TEMP ELECTRONICS
WA28	07-MAY-82	15:39:59	127	1537:39	ON	OPER	005	000	+ 31.	- 10.	+ 50.	+ 31.	TEMP ANTENNA
WA29	07-MAY-82	15:39:59	127	1537:39	ON	OPER	005	000	GO			GO	DATA LINK
WA30	07-MAY-82	15:39:59	127	1537:39	ON	OPER	005	000	GO			GO	LOCAL CONTROL PANEL
WA31	07-MAY-82	15:39:59	127	1537:39	ON	OPER	005	000	+4.91	+4.75	+5.25	+4.91	ANTENNA +5 VOLTS
WA32	07-MAY-82	15:40:03	127	1537:39	ON	OPER	005	000	-40.4	-35.0	-45.0	-40.4	ANTENNA -40 VOLTS
WA33	07-MAY-82	15:40:03	127	1537:39	ON	OPER	005	000	+24.5	+20.0	+28.0	+24.5	ANTENNA +24 VOLTS
WA34	07-MAY-82	15:40:03	127	1537:39	ON	OPER	005	000	+5.01	+4.75	+5.25	+5.01	ELECTRONICS +5 VOLTS
WA35	07-MAY-82	15:40:03	127	1537:39	ON	OPER	005	000	+15.0	+14.3	+15.8	+15.0	ELECTRONICS +15 VOLTS
WA36	07-MAY-82	15:40:07	127	1537:39	ON	OPER	005	000	-14.9	-14.3	-15.8	-14.9	ELECTRONICS -15 VOLTS
WA37	07-MAY-82	15:40:07	127	1537:39	ON	OPER	005	000	+20.0	+19.0	+21.0	+20.0	ELECTRONICS +20 VOLTS
WA38	07-MAY-82	15:40:07	127	1537:39	ON	OPER	005	000	+4.91	+4.75	+5.25	+4.91	MONITOR +5 VOLTS (1)
WA39	07-MAY-82	15:40:07	127	1537:39	ON	OPER	005	000	+5.01	+4.75	+5.25	+5.06	MONITOR +5 VOLTS (2)
WA40	07-MAY-82	15:40:11	127	1537:39	ON	OPER	005	000	+15.0	+14.7	+15.3	+15.0	MONITOR +15 VOLTS
WA41	07-MAY-82	15:40:11	127	1537:39	ON	OPER	005	000	-15.0	-14.7	-15.3	-15.0	MONITOR -15 VOLTS

PA00807-APR-8215:50:0309715:51:40NORMAMAINT	IDR	000			04/07/82ANALOG MULTIPLEX COMPARATO		001
PE00807-APR-8215:50:1009715:51:45SHUTD	1A	003			04/07/82ANALOG MULTIPLEX COMPARATO		001
PA00 07-APR-8215:53:2909715:52:20NORMAMAINT	F	13.4	11.5	---	EXCITER POWER MONITOR		001
PE00 07-APR-8215:53:2909715:52:20SHUTD	F	13.9	11.5	---	EXCITER POWER MONITOR		001
PA01 07-APR-8215:53:3309715:52:20NORMAMAINT	F	9.1	5.0	12.0	MODULATOR POWER MONITOR		001
PE01 07-APR-8215:53:3309715:52:20SHUTD	F	7.2	5.0	12.0	MODULATOR POWER MONITOR		001
PA02 07-APR-8215:53:3309715:52:20NORMAMAINT	F	0.0	0.5	0.5	0/180 POWER DIFFERENCE		001
PE02 07-APR-8215:53:3309715:52:20SHUTD	F	0.0	0.5	0.5	0/180 POWER DIFFERENCE		001
PA04 07-APR-8215:53:3709715:52:20NORMAMAINT	F	41.4	39.2	---	SCAN ANTENNA FWD POWER		001
PE04 07-APR-8215:53:3709715:52:20SHUTD	F	44.3	39.2	---	SCAN ANTENNA FWD POWER		001
PA05 07-APR-8215:53:3709715:52:20NORMAMAINT	F	41.9	39.2	---	ID ANT FORWARD POWER		001
PE05 07-APR-8215:53:3709715:52:20SHUTD	F	42.4	39.2	---	ID ANT FORWARD POWER		001
PA06 07-APR-8215:53:4109715:52:20NORMAMAINT	F	21.2	9.5	---	ID ANT FWD/REV PWR DIFF.		001
PE06 07-APR-8215:53:4109715:52:20SHUTD	F	21.1	9.5	---	ID ANT FWD/REV PWR DIFF.		001
PA07 07-APR-8215:53:4109715:52:20NORMAMAINT	F	40.0	38.3	---	RT CL ANTENNA FWD POWER		001
PA08 07-APR-8215:53:4109715:52:20NORMAMAINT	F	19.4	9.5	---	RT CL FWD/REV POWER DIFF.		001
PA09 07-APR-8215:53:4509715:52:20NORMAMAINT	F	40.0	38.3	---	LT CL ANTENNA FWD POWER		001
PA10 07-APR-8215:53:4509715:52:20NORMAMAINT	F	15.9	9.5	---	LT CL FWD/REV POWER DIFF.		001
PA11 07-APR-8215:53:4509715:52:20NORMAMAINT	F	3.0	1.0	5.0	LT CL/SLS FWD POWER DIFF.		001
PA12 07-APR-8215:53:4809715:52:20NORMAMAINT	F	41.3	38.6	---	BACK SLS ANT FWD POWER		001
PA13 07-APR-8215:53:4809715:52:20NORMAMAINT	F	13.0	9.5	---	BACK SLS FWD/REV PWR DIFF		001
PA14 07-APR-8215:53:4809715:52:20NORMAMAINT	F	6.8	0.1	---	SINGLE POINT MON POWER		001
PE14 07-APR-8215:53:4809715:52:20SHUTD	F	6.1	2.3	---	SINGLE POINT MON POWER		001
PA15 07-APR-8215:53:5209715:52:20NORMAMAINT	F	1181	266	---	EFF RADIATED PWR TO SCAN		001
PE15 07-APR-8215:53:5209715:52:20SHUTD	F	1122	216	---	EFF RADIATED PWR TO SCAN		001
PA16 07-APR-8215:53:5209715:52:20NORMAMAINT	F	1198	266	---	EFF RADIATED PWR FRO SCAN		001
PE16 07-APR-8215:53:5309715:52:20SHUTD	F	1102	216	---	EFF RADIATED PWR FRO SCAN		001
PA17 07-APR-8215:53:5609715:52:20NORMAMAINT	F	4.72	4.66	4.74	DATA ACQ REFERENCE VOLT #3		001
PE17 07-APR-8215:53:5609715:52:20SHUTD	F	4.72	4.66	4.74	DATA ACQ REFERENCE VOLT #3		001
PA18 07-APR-8215:53:5709715:52:20NORMAMAINT	F	3.66	3.62	3.70	DATA ACQ REFERENCE VOLT #2		001
PE18 07-APR-8215:53:5709715:52:20SHUTD	F	3.68	3.62	3.70	DATA ACQ REFERENCE VOLT #2		001
PA19 07-APR-8215:54:0109715:52:20NORMAMAINT	F	1.02	1.00	1.08	DATA ACQ REFERENCE VOLT #1		001
PE19 07-APR-8215:54:0109715:52:20SHUTD	F	1.02	1.00	1.08	DATA ACQ REFERENCE VOLT #1		001
PA20 07-APR-8215:54:0109715:52:20NORMAMAINT	F	0.00	---	1.20	BLANKED SCAN FWD POWER MON		001
PE20 07-APR-8215:54:0109715:52:20SHUTD	F	0.00	---	1.20	BLANKED SCAN FWD POWER MON		001
PA21 07-APR-8215:54:0509715:52:20NORMAMAINT	F	0.00	---	1.20	BLANKED ID FWD POWER MON.		001
PE21 07-APR-8215:54:0509715:52:20SHUTD	F	0.00	---	1.20	BLANKED ID FWD POWER MON.		001
PA22 07-APR-8215:54:0509715:52:20NORMAMAINT	F	0.00	---	0.30	BLANKED ID REV POWER MON.		001
PE22 07-APR-8215:54:0509715:52:20SHUTD	F	0.28	---	0.30	BLANKED ID REV POWER MON.		001
PA23 07-APR-8215:54:0909715:52:20NORMAMAINT	F	0.00	---	1.20	BLANKED RT CL FWD PWR MON		001
PA24 07-APR-8215:54:0909715:52:20NORMAMAINT	F	0.00	---	0.30	BLANKED RT CL REV PWR MON		001
PA25 07-APR-8215:54:0909715:52:20NORMAMAINT	F	0.00	---	1.20	BLANKED LT CL FWD PWR MON		001
PA26 07-APR-8215:54:0909715:52:20NORMAMAINT	F	0.00	---	0.30	BLANKED LT CL REV PWR MON		001
PA27 07-APR-8215:54:1309715:52:20NORMAMAINT	F	0.00	---	1.20	BLANKED BK SLS FWD PWR MON		001
PA28 07-APR-8215:54:1309715:52:20NORMAMAINT	F	0.00	---	0.30	BLANKED BK SLS REV PWR MON		001
PA29 07-APR-8215:54:1309715:52:20NORMAMAINT	F	0.00	---	0.30	BLANKED LT SLS REV PWR MON		001
PA30 07-APR-8215:54:1309715:52:20NORMAMAINT	F	0.08	---	2.00	BLANKED MODULATOR PWR MON		001
PE30 07-APR-8215:54:1709715:52:20SHUTD	F	0.00	---	2.00	BLANKED MODULATOR PWR MON		001
PA31 07-APR-8215:54:1709715:52:20NORMAMAINT	F	5.36	---	---	+5V POWER SUPPLY A		001
PE31 07-APR-8215:54:1709715:52:20SHUTD	F	5.20	---	---	+5V POWER SUPPLY A		001
PA32 07-APR-8215:54:2009715:52:20NORMAMAINT	F	5.32	---	---	+5V POWER SUPPLY B		001
PE32 07-APR-8215:54:2009715:52:20SHUTD	F	5.44	---	---	+5V POWER SUPPLY B		001
PA33 07-APR-8215:54:2009715:52:20NORMAMAINT	F	5.36	---	---	+5V POWER SUPPLY C		001
PE33 07-APR-8215:54:2009715:52:20SHUTD	F	5.04	---	---	+5V POWER SUPPLY C		001
PA34 07-APR-8215:54:2409715:52:20NORMAMAINT	F	20.02	---	---	+20V POWER SUPPLY A		001
PE34 07-APR-8215:54:2409715:52:20SHUTD	F	20.44	---	---	+20V POWER SUPPLY A		001
PA35 07-APR-8215:54:2409715:52:20NORMAMAINT	F	20.30	---	---	+20V POWER SUPPLY B		001
PA36 07-APR-8215:54:2509715:52:20NORMAMAINT	F	28.64	---	---	+28V POWER SUPPLY A		001
PE36 07-APR-8215:54:2809715:52:20SHUTD	F	30.24	---	---	+28V POWER SUPPLY A		001
PA37 07-APR-8215:54:2809715:52:20NORMAMAINT	F	0.00	---	---	+28V POWER SUPPLY B		001
PE37 07-APR-8215:54:2909715:52:20SHUTD	F	0.00	---	---	+28V POWER SUPPLY B		001

PA38	07-APR-8215:54:2909715:52:20NORMAMAINT	P -20.44	---	---	-20V POWER SUPPLY A	001
PE38	07-APR-8215:54:3309715:52:20SHUTD	P -20.58	---	---	-20V POWER SUPPLY A	001
PA39	07-APR-8215:54:3309715:52:20NORMAMAINT	P -17.92	---	---	-20V POWER SUPPLY B	001
PA40	07-APR-8215:54:3309715:52:20NORMAMAINT	P -1406	10547	10547	CHANNEL FREQUENCY ERROR	001
PE40	07-APR-8215:54:3309715:52:20SHUTD	P 3516	10547	10547	CHANNEL FREQUENCY ERROR	001
PA41	07-APR-8215:54:3709715:52:20NORMAMAINT	P0.00456	0.05729	0.05729	FM PREALARM ANGLE ERROR	001
PE41	07-APR-8215:54:3709715:52:20SHUTD	P0.00456	0.04427	0.04427	FM PREALARM ANGLE ERROR	001
PA42	07-APR-8215:54:3709715:52:20NORMAMAINT	P0.01042	0.08724	0.08724	FM ALARM ANGLE ERROR	001
PE42	07-APR-8215:54:3709715:52:20SHUTD	P0.01172	0.05599	0.05599	FM ALARM ANGLE ERROR	001

```
CEH  07-APR-8215:56:43ELEVATION STATION00101101000011000000000 00011101011110000110000011000010
CEP  07-APR-8215:56:48FFE                  + .00  13     0
CEP  07-APR-8215:56:48CMN                    .00  13     0
CEP  07-APR-8215:56:48OUTLIER                      4     0
CEP  07-APR-8215:56:48DPSK PHASE           0       10     0
CEP  07-APR-8215:56:52FREQ            5268827      10     0
CED  07-APR-8215:56:52DPSK.PWR         G
CED  07-APR-8215:56:52TX.PWR           G
CED  07-APR-8215:56:55DPSK.CD.CK       G
CED  07-APR-8215:56:55S.B.PWR          G
CED  07-APR-8215:56:55BSU.CK           G
CED  07-APR-8215:56:55S.B.PK.SLL       G
CED  07-APR-8215:56:59UP SLS PWR       G
CED  07-APR-8215:56:59+5VDC             G
CED  07-APR-8215:56:59+12VDC            G
CED  07-APR-8215:56:59+15VDC            G
CED  07-APR-8215:57:03-12VDC            G
CED  07-APR-8215:57:03-5VDC             G
CED  07-APR-8215:57:03-15VDC            G
CED  07-APR-8215:57:03-20VDC            G
CED  07-APR-8215:57:07-40VDC            G
CEPL 07-APR-8215:57:07NORML          ON
CEPL 07-APR-8215:57:07AUTO.SHDN      OFF
CEPL 07-APR-8215:57:07AUTO.SHDN.OVRDOFF
CEPL 07-APR-8215:57:11DPSK.CD        OFF
CEPL 07-APR-8215:57:11DPSK.PWR       OFF
CEPL 07-APR-8215:57:11FREQ           OFF
CEPL 07-APR-8215:57:11SBPWR          OFF
CEPL 07-APR-8215:57:15ANGCD          OFF
CEPL 07-APR-8215:57:15SYNC           OFF
CELL 07-APR-8215:57:15TRANS          OFF
CELL 07-APR-8215:57:15ANT.SW         OFF
CELL 07-APR-8215:57:19CONTROL        OFF
CELL 07-APR-8215:57:19PHASERS        OFF
CELL 07-APR-8215:57:19D.C.PWR        OFF
CELL 07-APR-8215:57:20BSU            OFF
CELL 07-APR-8215:57:23FLDMON         OFF
CELL 07-APR-8215:57:23INTMON         OFF
CE  107-APR-8215:58:29FFE (DEG.)              0.00000      -0.150   0.150
CE  207-APR-8215:58:30CMN (DEG.)              0.00000      -0.030   0.030
CE  307-APR-8215:58:33+5V                     5.20030       5.500   4.500
CE  407-APR-8215:58:34+12V                   12.06194      13.000  11.000
CE  507-APR-8215:58:34+15V                   15.60246      16.000  14.000
CE  607-APR-8215:58:37-5V                    -5.16120      -5.500  -4.500
CE  707-APR-8215:58:37-12V                  -12.17904     -13.000 -11.000
CE  807-APR-8215:58:37-15V                  -15.60246     -16.000 -14.000
CE  907-APR-8215:58:37-20V                  -20.22576     -21.500 -18.500
CE 1007-APR-8215:58:41-40V                  -40.63102     -44.900 -35.500
CE 1107-APR-8215:58:41ESN ERP (DB)         GO              -5.000
CE 1207-APR-8215:58:41ESD ERP (DB)         NOGO            -5.000
CE 1307-APR-8215:58:41UPPER CLR PULSE (DB) NOGO            -5.000
CE 1407-APR-8215:58:45MTR PWR (DB)         NOGO            -3.000
CE 1507-APR-8215:58:45FREQUENCY (HZ)        6172.0018     -20000.  20000.
```

```
CAH  07-APR-8216:00:26MCKB AZ          00101100010011110100 0000111010101000101110000101000000
CAP  07-APR-8216:00:26PFE                + .03  13     0
CAP  07-APR-8216:00:30CMN                  .00  13     0
CAP  07-APR-8216:00:30OUTLIER                    4     0
CAP  07-APR-8216:00:30DPSK PHASE          0      10     0
CAP  07-APR-8216:00:33FREQ            5268833    10     0
CAD  07-APR-8216:00:34DPSK.PWR        G
CAD  07-APR-8216:00:34TX.PWR          G
CAD  07-APR-8216:00:34DPSK.CD.CK      G
CAD  07-APR-8216:00:38R.CLR.PWR       G
CAD  07-APR-8216:00:38S.B.PWR         G
CAD  07-APR-8216:00:38BSU.CK          G
CAD  07-APR-8216:00:38S.B.PK.SLL      G
CAD  07-APR-8216:00:42L.CLR.PWR       G
CAD  07-APR-8216:00:42+5VDC            G
CAD  07-APR-8216:00:42+12VDC           G
CAD  07-APR-8216:00:42+15VDC           G
CAD  07-APR-8216:00:46-12VDC           G
CAD  07-APR-8216:00:46-5VDC            G
CAD  07-APR-8216:00:46-15VDC           G
CAD  07-APR-8216:00:46-20VDC           G
CAD  07-APR-8216:00:50-40VDC           G
CAPL 07-APR-8216:00:50NORML           ON
CAPL 07-APR-8216:00:50AUTO.SHDN       OFF
CAPL 07-APR-8216:00:50AUTO.SHDN.OVRDOFF
CAPL 07-APR-8216:00:54DPSK.CD         OFF
CAPL 07-APR-8216:00:54DPSK.PWR        OFF
CAPL 07-APR-8216:00:54FREQ            OFF
CAPL 07-APR-8216:00:54SBPWR           OFF
CAPL 07-APR-8216:00:58ANGCD           OFF
CALL 07-APR-8216:00:58TRANS           OFF
CALL 07-APR-8216:00:58ANT.SW          OFF
CALL 07-APR-8216:00:58CONTROL         OFF
CALL 07-APR-8216:01:02PHASERS         OFF
CALL 07-APR-8216:01:02D.C.PWR         OFF
CALL 07-APR-8216:01:02UPS             OFF
CALL 07-APR-8216:01:02FLDMON          OFF
CALL 07-APR-8216:01:06INTMON          OFF
CA  107-APR-8216:02:24PFE (DEG.)              0.03000      -0.200   0.200
CA  207-APR-8216:02:24CMN (DEG.)              0.00000      -0.030   0.030
CA  307-APR-8216:02:27+5V                     4.80930       5.500   4.500
CA  407-APR-8216:02:27+12V                   11.30075      13.000  11.000
CA  507-APR-8216:02:27+15V                   14.42934      16.000  14.000
CA  607-APR-8216:02:27-5V                    -4.96570      -5.500  -4.500
CA  707-APR-8216:02:31-12V                  -11.53496     -13.000 -11.000
CA  807-APR-8216:02:31-15V                  -14.42934     -16.000 -14.000
CA  907-APR-8216:02:31-20V                  -19.28503     -21.700 -18.500
CA 1007-APR-8216:02:31-40V                  -38.66817     -44.900 -35.900
CA 1107-APR-8216:02:35SBM ERR (DB)         GO              -5.000
CA 1207-APR-8216:02:35SID ERR (DB)         NOGO            -5.000
CA 1307-APR-8216:02:35RGHT CLR PULSE (DB)  NOGO            -5.000
CA 1407-APR-8216:02:35UPPER CLR PULSE (DB) NOGO            -5.000
CA 1507-APR-8216:02:39LFT CLR PULSE (DB)   NOGO            -5.000
CA 1607-APR-8216:02:39XMTR PWR (DB)        GO              -3.000
CA 1707-APR-8216:02:39FREQUENCY (HZ)           1.3335     -20000.  20000.
```

HIPSTON ELEVATION SITE
ITOR DATE 146 MONITOR TIME 1534:27
TEM IS ON AND IN OPER

DATA RECORDED AND PROCESSED BY THE
FAA TECHNICAL CENTER
ATLANTIC CITY AIRPORT,N.J. 08405

EM	HEADER	DATE COL.	TIME COL.	MEAN/MEAS	LOW LIMIT	HIGH LIMIT	PREV. MEAN/MEAS
0	BEAM ACCURACY	28-MAY-92	15:38:22	+0.012	-0.071	+0.071	+0.012
2	BEAM ERR	28-MAY-92	15:38:22	+ 0.2	- 3.0		+ 0.2
3	IDENT ERR	28-MAY-92	15:38:22	- 0.4	- 3.0		- 0.4
4	SLS, UPPER ERR	28-MAY-92	15:38:28	- 0.2	- 3.0		- 0.3
7	PREAMBLE	28-MAY-92	15:38:28	GO			GO
8	SYSTEM TIMING	28-MAY-92	15:38:28	0.	TOD.		0.
9	FREQUENCY	28-MAY-92	15:38:29	- 4.	- 10.	+ 10.	- 6.
0	ANTENNA SWITCH	28-MAY-92	15:38:32	GO			GO
1	SCAN MOD	28-MAY-92	15:38:33	GO			GO
2	SCAN CONT	28-MAY-92	15:38:33	GO			GO
4	MONITOR TIMING	28-MAY-92	15:38:36	GO			GO
5	BASIC DATA 2	28-MAY-92	15:38:36	GO			GO
8	PWR OUT, TWTA	28-MAY-92	15:38:36	+ 0.0	- 2.0		+ 0.0
9	PWR OUT, EXCTR	28-MAY-92	15:38:36	+ 0.0	- 2.0		+ 0.0
1	SYNC SIGNAL PRESENCE	28-MAY-92	15:38:40	GO			GO
2	PHASE MOD	28-MAY-92	15:38:40	GO			GO
5	AM MOD	28-MAY-92	15:38:40	GO			GO
7	TEMP ELECTRONICS	28-MAY-92	15:38:40	+ 30.	- 10.	+ 50.	+ 30.
1	TEMP ANTENNA	28-MAY-92	15:38:44	+ 27.	- 10.	+ 50.	+ 27.
9	DATA LINK	28-MAY-92	15:38:44	GO			GO
0	LOCAL CONTROL PANEL	28-MAY-92	15:38:44	GO			GO
	ANTENNA +5 VOLTS	28-MAY-92	15:38:44	+4.91	+4.75	+5.25	+4.91
	ANTENNA -40 VOLTS	28-MAY-92	15:38:48	-39.6	-35.0	-45.0	-39.6
	ANTENNA +24 VOLTS	28-MAY-92	15:38:48	+23.5	+20.0	+28.0	+23.5
	ELECTRONICS +5 VOLTS	28-MAY-92	15:38:48	+4.91	+4.75	+5.25	+4.91
	ELECTRONICS +15 VOLTS	28-MAY-92	15:38:48	+14.9	+14.3	+15.8	+15.0
	ELECTRONICS -15 VOLTS	28-MAY-92	15:38:52	-14.7	-14.3	-15.8	-14.9
	ELECTRONICS +20 VOLTS	28-MAY-92	15:38:52	+19.8	+19.0	+21.0	+19.9
	MONITOR +5 VOLTS (1)	28-MAY-92	15:38:52	+4.85	+4.75	+5.25	+4.91
	MONITOR +5 VOLTS (2)	28-MAY-92	15:38:52	+4.85	+4.75	+5.25	+4.85
	MONITOR +15 VOLTS	28-MAY-92	15:38:56	+15.0	+14.3	+15.8	+15.0
	MONITOR -15 VOLTS	28-MAY-92	15:38:56	-15.0	-14.7	-15.3	-14.8

WASHINGTON AZIMUTH SITE
MONITOR DATE 146 MONITOR TIME 1532:50
SYSTEM IS ON AND IN OPER

DATA RECORDED AND PROCESSED BY THE
FAA TECHNICAL CENTER
ATLANTIC CITY AIRPORT,N.J. 08405

ITEM	HEADER	DATE COL.	TIME COL.	MEAN/MEAS	LOW LIMIT	HIGH LIMIT	PREV. MEAN/MEAS
0	BEAM ACCURACY	28-MAY-82	15:41:54	-0.036	-0.133	+0.133	-0.036
2	BEAM ERR	28-MAY-82	15:41:54	+ 0.7	- 3.0		+ 0.7
3	IDENT ERR	28-MAY-82	15:41:54	- 0.6	- 3.0		- 0.6
5	SLS LEFT ERR	28-MAY-82	15:41:54	- 0.7	- 3.0		- 0.7
6	SLS RIGHT ERR	28-MAY-82	15:41:58	- 0.7	- 3.0		- 0.7
7	PREAMBLE	28-MAY-82	15:41:58	GO			GO
9	FREQUENCY	28-MAY-82	15:41:58	+ 6.	- 10.	+ 10.	+ 6.
10	ANTENNA SWITCH	28-MAY-82	15:41:58	GO			GO
11	SCAN MOD	28-MAY-82	15:42:02	GO			GO
12	SCAN CONT	28-MAY-82	15:42:02	GO			GO
13	DME REPLY	28-MAY-82	15:42:02	GO			GO
14	MONITOR TIMING	28-MAY-82	15:42:02	GO			GO
15	BASIC DATA 1	28-MAY-82	15:42:06	GO			GO
17	AUX DATA	28-MAY-82	15:42:06	GO			GO
18	PWR OUT TWTA	28-MAY-82	15:42:06	- 0.5	- 2.0		- 0.5
19	PWR OUT EXCTR	28-MAY-82	15:42:06	- 1.5	- 2.0		- 1.5
20	DATA INPUT	28-MAY-82	15:42:10	GO			GO
22	PHASE MOD	28-MAY-82	15:42:10	GO			GO
23	AM MOD	28-MAY-82	15:42:10	GO			GO
27	TEMP ELECTRONICS	28-MAY-82	15:42:10	+ 19.	- 10.	+ 50.	+ 19.
28	TEMP ANTENNA	28-MAY-82	15:42:14	+ 31.	- 10.	+ 50.	+ 31.
29	DATA LINK	28-MAY-82	15:42:14	GO			GO
30	LOCAL CONTROL PANEL	28-MAY-82	15:42:14	GO			GO
31	ANTENNA +5 VOLTS	28-MAY-82	15:42:15	+4.91	+4.75	+5.25	+4.91
32	ANTENNA -40 VOLTS	28-MAY-82	15:42:18	-40.4	-35.0	-45.0	-40.4
33	ANTENNA +24 VOLTS	28-MAY-82	15:42:19	+24.5	+20.0	+23.0	+24.5
34	ELECTRONICS +5 VOLTS	28-MAY-82	15:42:19	+5.01	+4.75	+5.25	+5.01
35	ELECTRONICS +15 VOLTS	28-MAY-82	15:42:22	+15.0	+14.3	+15.3	+15.0
36	ELECTRONICS -15 VOLTS	28-MAY-82	15:42:22	-14.7	-14.3	-15.8	-14.7
37	ELECTRONICS +20 VOLTS	28-MAY-82	15:42:22	+20.0	+19.0	+21.0	+20.0
38	MONITOR +5 VOLTS (1)	28-MAY-82	15:42:22	+4.91	+4.75	+5.25	+4.91
39	MONITOR +5 VOLTS (2)	28-MAY-82	15:42:26	+5.01	+4.75	+5.25	+5.01
40	MONITOR +15 VOLTS	28-MAY-82	15:42:26	+15.0	+14.7	+15.3	+15.0
41	MONITOR -15 VOLTS	28-MAY-82	15:42:26	-15.0	-14.7	-15.3	-15.0

[illegible]

MONITOR DATE 85

[illegible]

BAD PAR. - BAD PARITY

[illegible]

FAA TECHNICAL CENTER

[illegible]

ITEM	HEADER	DATE COL.	TIME COL.	MON. TIME	VALUE	LOW LIMIT	HIGH LIMIT	CAT
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
1	MODULATOR POWER MONITOR	05-APR-82	08:25:10	08:26:42	7.1	5.0	12.0	
2	D/ISO POWER DIFFERENCE	05-APR-82	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
4	SCAN ANTENNA FWD POWER	05-APR-82	08:25:14	08:26:42	44.2	39.2	---	
5	ID ANT FORWARD POWER	05-APR-82	08:25:14	08:26:42	42.7	39.2	---	
6	ID ANT FWD/REV PWR DIFF.	05-APR-82	08:25:18	08:26:42	22.4	9.5	---	
14	SINGLE POINT MON. POWER	05-APR-82	[illegible]	[illegible]	[illegible]	2.3	---	
15	EFF RADIATED PWR TO SCAN	05-APR-82	08:27:46	08:26:42	1143	216	---	
16	EFF RADIATED PWR FRO SCAN	05-APR-82	[illegible]	[illegible]	1133	216	---	
17	DATA ACQ REFERENCE VOLT #3	05-APR-82	08:27:50	08:26:42	4.70	4.66	4.74	
18	DATA ACQ REFERENCE VOLT #2	05-APR-82	08:27:54	08:26:42	3.68	3.62	3.70	
19	DATA ACQ REFERENCE VOLT #1	05-APR-82	08:27:54	08:26:42	1.04	1.00	1.08	
20	BLANKED SCAN FWD POWER MON	05-APR-82	08:27:56	08:26:42	0.00	---	1.20	
21	BLANKED ID FWD POWER MON.	05-APR-82	08:27:58	08:26:42	0.00	---	1.20	
22	BLANKED ID REV POWER MON.	05-APR-82	08:28:02	08:26:42	0.39	---	0.30	
30	BLANKED MODULATOR PWR MON	05-APR-82	08:28:10	08:26:42	0.00	---	2.00	
31	+5V POWER SUPPLY A	05-APR-82	08:28:14	08:26:42	5.16	---	---	
32	+5V POWER SUPPLY B	05-APR-82	08:28:14	08:26:42	5.40	---	---	
33	+5V POWER SUPPLY C	05-APR-82	08:28:15	08:26:42	4.48	---	---	
34	+20V POWER SUPPLY A	05-APR-82	08:28:18	08:26:42	20.32	---	---	
36	+28V POWER SUPPLY A	05-APR-82	08:28:22	08:26:42	30.24	---	---	
37	+28V POWER SUPPLY B	05-APR-82	08:28:26	08:26:42	0.00	---	---	
38	-20V POWER SUPPLY A	05-APR-82	08:28:26	08:26:42	-20.72	---	---	
40	CHANNEL FREQUENCY ERROR	05-APR-82	08:28:30	08:26:42	3516	10547	10547	
41	FM PREALARM ANGLE ERROR	05-APR-82	08:28:30	08:26:42	0.00346	0.04427	0.04427	
42	FM ALARM ANGLE ERROR	05-APR-82	08:28:34	08:26:42	0.00716	0.05599	0.05599	

[illegible] DATA RECORDED AND PROCESSED BY THE
MONITOR DATE [illegible] FOR TECHNICAL CENTER
SUBSYSTEM [illegible] MAINFRAME [illegible] AT ANTI-C [illegible] ALBUQUERQUE
BAD PAR. - BAD PARITY

ITEM	HEADER	DATE COL.	TIME COL.	MON. TIME	VALUE	LOW LIMIT	HIGH LIMIT	CNT
[illegible]	EXCITER POWER MONITOR	01-APR-82	08:38:[illegible]	08:37:[illegible]	[illegible]	[illegible]	---	
1	MODULATOR POWER MONITOR	01-APR-82	08:38:07	08:37:10	9.1	5.0	12.0	
2	G/130 POWER DIFFERENCE	01-APR-82	08:39:37	08:37:10	[illegible]	0.5	0.5	
4	SCAN ANTENNA FWD POWER	01-APR-82	08:38:30	08:37:10	41.3	35.2	---	
5	ID ANT FORWARD POWER	01-APR-82	08:39:36	08:37:10	[illegible]	35.2	---	
6	ID ANT FWD/REV PWR DIFF.	01-APR-82	08:39:39	08:37:10	15.4	9.5	---	
7	RT CL ANTENNA FWD POWER	01-APR-82	08:39:38	08:37:10	[illegible]	35.3	---	
8	RT CL FWD/REV POWER DIFF.	01-APR-82	08:39:39	08:37:10	15.4	9.5	---	
9	LT CL ANTENNA FWD POWER	01-APR-82	08:39:42	08:37:10	41.5	35.3	---	
10	LT CL FWD/REV POWER DIFF.	01-APR-82	08:39:43	08:37:10	15.0	9.5	---	
11	LT CL/SLS FWD POWER DIFF.	01-APR-82	08:39:43	08:37:10	3.0	1.0	5.0	
12	BACK SLS ANT FWD POWER	01-APR-82	08:39:43	08:37:10	41.3	38.6	---	
13	BACK SLS FWD/REV PWR DIFF	01-APR-82	08:39:43	08:37:10	18.2	5.5	---	
14	SINGLE POINT MON POWER	01-APR-82	08:39:47	08:37:10	6.3	0.1	---	
15	EFF RADIATED PWR TO SCAN	01-APR-82	08:39:48	08:37:10	1173	266	---	
16	EFF RADIATED PWR FRO SCAN	01-APR-82	08:39:52	08:37:10	1148	266	---	
17	DATA ACQ REFERENCE VOLT #3	01-APR-82	08:39:52	08:37:10	4.70	4.66	4.74	
18	DATA ACQ REFERENCE VOLT #2	01-APR-82	08:39:56	08:37:10	3.66	3.62	3.70	
19	DATA ACQ REFERENCE VOLT #1	01-APR-82	08:39:56	08:37:10	1.02	1.00	1.08	
20	BLANKED SCAN FWD POWER MON	01-APR-82	08:39:00	08:37:10	0.00	---	1.20	
21	BLANKED ID FWD POWER MON.	01-APR-82	08:39:00	08:37:10	0.00	---	1.20	
22	BLANKED ID REV POWER MON.	01-APR-82	08:39:04	08:37:10	0.00	---	0.30	
23	BLANKED RT CL FWD PWR MON	01-APR-82	08:39:04	08:37:10	0.00	---	1.20	
24	BLANKED RT CL REV PWR MON	01-APR-82	08:39:08	08:37:10	0.00	---	0.30	
25	BLANKED LT CL FWD PWR MON	01-APR-82	08:39:08	08:37:10	0.00	---	1.20	
26	BLANKED LT CL REV PWR MON	01-APR-82	08:39:08	08:37:10	0.00	---	0.30	
27	BLANKED BK SLS FWD PWR MON	01-APR-82	08:39:11	08:37:10	0.00	---	1.20	
28	BLANKED BK SLS REV PWR MON	01-APR-82	08:39:11	08:37:10	0.00	---	0.30	
29	BLANKED LT SLS REV PWR MON	01-APR-82	08:39:11	08:37:10	0.00	---	0.30	
30	BLANKED MODULATOR PWR MON	01-APR-82	08:39:11	08:37:10	0.10	---	2.00	
31	+5V POWER SUPPLY A	01-APR-82	08:39:15	08:37:10	5.36	---	---	
32	+5V POWER SUPPLY B	01-APR-82	08:39:15	08:37:10	5.32	---	---	
33	+5V POWER SUPPLY C	01-APR-82	08:39:19	08:37:10	5.40	---	---	
34	+20V POWER SUPPLY A	01-APR-82	08:39:20	08:37:10	19.88	---	---	
35	+20V POWER SUPPLY B	01-APR-82	08:39:23	08:37:10	20.44	---	---	
36	+25V POWER SUPPLY A	01-APR-82	08:39:24	08:37:10	28.70	---	---	
37	+25V POWER SUPPLY B	01-APR-82	08:39:27	08:37:10	0.00	---	---	
38	-20V POWER SUPPLY A	01-APR-82	08:39:28	08:37:10	-20.44	---	---	
39	-20V POWER SUPPLY B	01-APR-82	08:39:32	08:37:10	-20.02	---	---	
40	CHANNEL FREQUENCY ERROR	01-APR-82	08:39:32	08:37:10	-703	10547	10547	
41	FM PREALARM ANGLE ERROR	01-APR-82	08:39:32	08:37:10	0.04753	0.05729	0.05729	
42	FM ALARM ANGLE ERROR	01-APR-82	08:39:36	08:37:10	0.05208	0.08724	0.08724	

[illegible]

STATION [illegible] ELEVATION STATION

FREQUENCY [illegible]

DATA RECORDED FOR PROCESSING BY THE
FAA TECHNICAL CENTER
ATLANTIC CITY AIRPORT, N.J. 08405

ITEM	ORDER	DATE CODE	TIME CODE	[illegible]	LOW LIMIT	HIGH LIMIT	THRESHOLD	OVER-OVER-TOL. CNT
	PFE	01-APR-82	08:41:26	-.02			13	0
	CMN	01-APR-82	08:41:26				13	0
	OUTLIER	01-APR-82	08:41:26				4	-
	[illegible]	01-APR-82	08:41:26				10	0
	FREQ	01-APR-82	08:41:30	[illegible]			10	0
	DPSK.PWR	01-APR-82	08:41:30	G				
	TX.PWR	01-APR-82	08:41:31	G				
	DPSK.CD.CK	01-APR-82	08:41:31	G				
	S.B.PWR	01-APR-82	08:41:34	G				
	WSU.CK	01-APR-82	08:41:35	G				
	S.B.PK.SLL	01-APR-82	08:41:35	G				
	UP SLS PWR	01-APR-82	08:41:35	G				
	+5VDC	01-APR-82	08:41:39	G				
	+12VDC	01-APR-82	08:41:39	G				
	+15VDC	01-APR-82	08:41:39	G				
	-12VDC	01-APR-82	08:41:39	G				
	-5VDC	01-APR-82	08:41:43	G				
	-15VDC	01-APR-82	08:41:43	G				
	-20VDC	01-APR-82	08:41:43	G				
	-40VDC	01-APR-82	08:41:43	G				
	NORML	01-APR-82	08:41:47	ON				
	AUTO.SHDN	01-APR-82	08:41:47	OFF				
	AUTO.SHDN.OVRD	01-APR-82	08:41:47	OFF				
	DPSK.CD	01-APR-82	08:41:47	OFF				
	DPSK.PWR	01-APR-82	08:41:51	OFF				
	FREQ	01-APR-82	08:41:51	OFF				
	SBPWR	01-APR-82	08:41:51	OFF				
	ANGCR	01-APR-82	08:41:51	OFF				
	SYNC	01-APR-82	08:41:55	OFF				
	TRANS	01-APR-82	08:41:55	OFF				
	ANT.SW	01-APR-82	08:41:55	OFF				
	CONTROL	01-APR-82	08:41:58	OFF				
	PHASERS	01-APR-82	08:41:58	OFF				
	D.C.PWR	01-APR-82	08:41:58	OFF				
	BSU	01-APR-82	08:41:58	OFF				
	ELDMON	01-APR-82	08:42:02	OFF				
	INTMON	01-APR-82	08:42:02	OFF				
1	PFE (DEG.)	01-APR-82	08:43:09	-0.02000	-0.150	0.150		
2	CMN (DEG.)	01-APR-82	08:43:09	0.00000	-0.030	0.030		
3	+5V	01-APR-82	08:43:13	5.20030	4.500	5.500		
4	+12V	01-APR-82	08:43:13	12.00338	11.000	13.000		
5	+15V	01-APR-82	08:43:13	15.60246	14.000	16.000		
6	-5V	01-APR-82	08:43:13	-5.12210	-5.500	-4.500		
7	-12V	01-APR-82	08:43:17	-12.17904	-13.000	-11.000		
8	-15V	01-APR-82	08:43:17	-15.60246	-16.000	-14.000		
9	-20V	01-APR-82	08:43:17	-20.22576	-21.700	-18.500		
10	-40V	01-APR-82	08:43:17	-40.43474	-44.900	-35.900		
11	SHA ERP (DB)	01-APR-82	08:43:21	GO	-5.000			
12	SID ERP (DB)	01-APR-82	08:43:21	NOGO	-5.000			
13	UPPER CLR PULSE (DB)	01-APR-82	08:43:21	NOGO	-5.000			
14	XMTR PWR (DB)	01-APR-82	08:43:21	NOGO	-3.000			
15	FREQUENCY (HZ)	01-APR-82	08:43:25	6240.2794	-20000.	20000.		

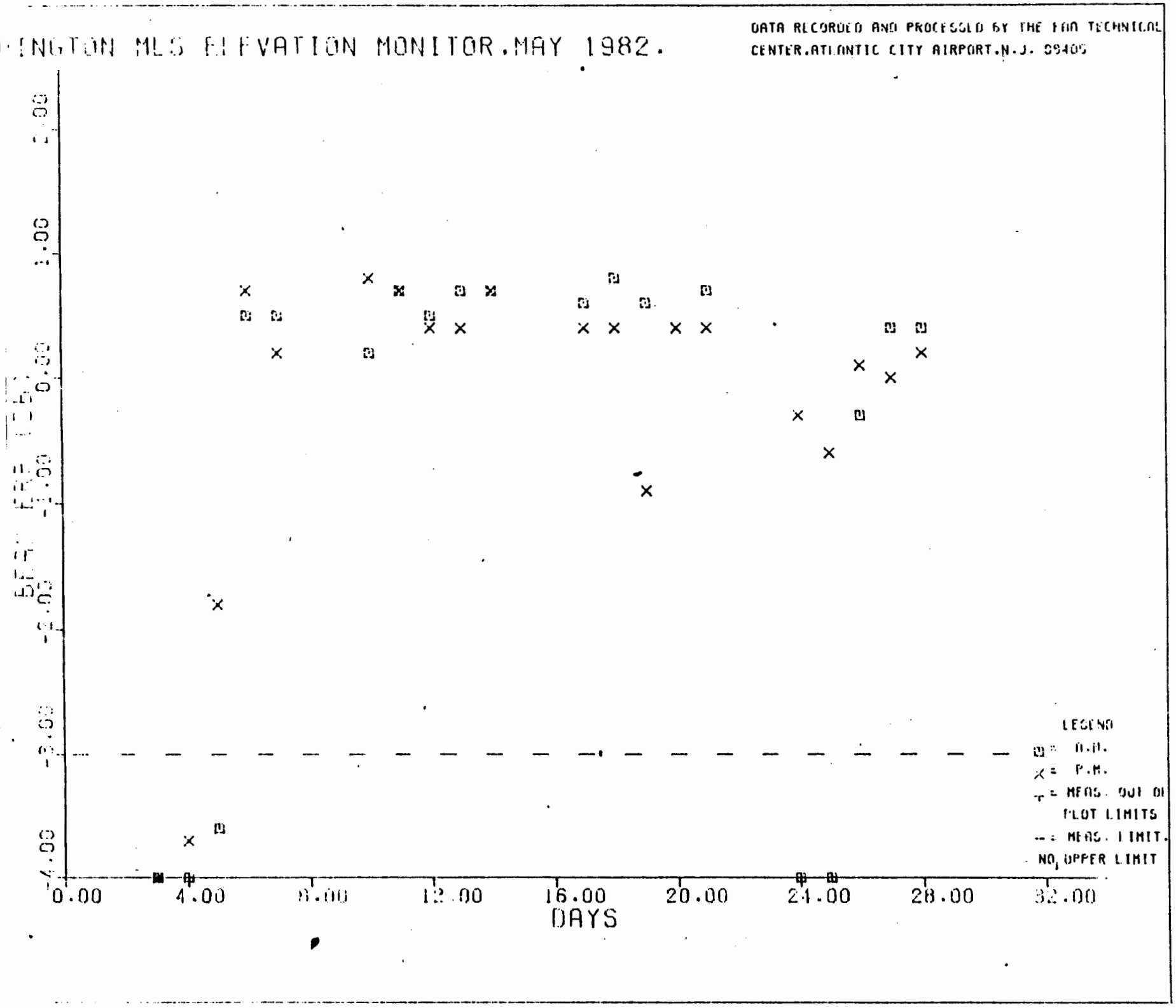
[illegible] DATE

STATION ID: [illegible] A2

[illegible]

DATA RECORDED AND PROCESSED BY THE
FAA TECHNICAL CENTER
ATLANTIC CITY AIRPORT, N.J. 08405

ITEM	HEADER	DATE COL.	TIME COL.	VALUE	LOW LIMIT	HIGH LIMIT	THRESHOLD	OUT-OF-TOL. CNT
	PFE	01-APR-82	08:45:12	+ .01			10	0
	CMN	01-APR-82	08:45:15	[illegible]			10	0
	OUTLIER	01-APR-82	08:45:15				[illegible]	0
	DPSK PHASE	01-APR-82	08:45:15				10	0
	FREQ	01-APR-82	08:45:15	5[illegible]			10	0
	DPSK.PWR	01-APR-82	08:45:19	G				
	TX.PWR	01-APR-82	08:45:19	G				
	DPSK.CE.CK	01-APR-82	08:45:19	G				
	R.CLR.PWR	01-APR-82	08:45:19	G				
	S.B.PWR	01-APR-82	08:45:23	G				
	BSJ.CK	01-APR-82	08:45:23	G				
	S.B.PK.SLL	01-APR-82	08:45:23	G				
	L.CLR.PWR	01-APR-82	08:45:24	G				
	+5VDC	01-APR-82	08:45:27	G				
	+12VDC	01-APR-82	08:45:27	G				
	+15VDC	01-APR-82	08:45:28	G				
	-12VDC	01-APR-82	08:45:28	G				
	-5VDC	01-APR-82	08:45:31	G				
	-15VDC	01-APR-82	08:45:31	G				
	-20VDC	01-APR-82	08:45:32	G				
	-40VDC	01-APR-82	08:45:32	G				
	NORML	01-APR-82	08:45:35	ON				
	AUTO.SHDW	01-APR-82	08:45:36	OFF				
	AUTO.SHDW.OVRD	01-APR-82	08:45:36	OFF				
	DPSK.CD	01-APR-82	08:45:36	OFF				
	DPSK.PWR	01-APR-82	08:45:40	OFF				
	FREQ	01-APR-82	08:45:40	OFF				
	SBPWR	01-APR-82	08:45:40	OFF				
	ANGCD	01-APR-82	08:45:43	OFF				
	TRANS	01-APR-82	08:45:43	OFF				
	ANT.SW	01-APR-82	08:45:43	OFF				
	CONTROL	01-APR-82	08:45:43	OFF				
	PHASERS	01-APR-82	08:45:47	OFF				
	D.C.PWR	01-APR-82	08:45:47	OFF				
	UPS	01-APR-82	08:45:47	OFF				
	ELDMON	01-APR-82	08:45:47	OFF				
	INTMON	01-APR-82	08:45:51	OFF				
1	PFE (DEG.)	01-APR-82	08:46:49	0.01000	-0.200	0.200		
2	CMN (DEG.)	01-APR-82	08:46:49	0.01000	-0.030	0.030		
3	+5V	01-APR-82	08:46:49	4.80930	4.500	5.500		
4	+12V	01-APR-82	08:46:53	11.18364	11.000	13.000		
5	+15V	01-APR-82	08:46:53	14.19472	14.000	16.000		
6	-5V	01-APR-82	08:46:53	-4.96570	-5.500	-4.500		
7	-12V	01-APR-82	08:46:53	-11.53496	-13.000	-11.000		
8	-15V	01-APR-82	08:46:57	-14.42934	-16.000	-14.000		
9	-20V	01-APR-82	08:46:57	-19.28503	-21.700	-18.500		
10	-40V	01-APR-82	08:46:57	-38.66817	-44.900	-35.900		
11	SBM ERP (DB)	01-APR-82	08:46:57	GO	-5.000			
12	SID ERP (DB)	01-APR-82	08:47:01	NOGO	-5.000			
13	RGHT CLR PULSE (DB)	01-APR-82	08:47:01	NOGO	-5.000			
14	UPPER CLR PULSE (DB)	01-APR-82	08:47:01	NOGO	-5.000			
15	LFT CLR PULSE (DB)	01-APR-82	08:47:01	NOGO	-5.000			
16	XMTR PWR (DB)	01-APR-82	08:47:05	GO	-3.000			
17	FREQUENCY (HZ)	01-APR-82	08:47:05	0.5524	-2000.	2000.		


ELEVATION MONITOR, MAY 1982.
DATA RECORDED AND PROCESSED BY THE FAA TECHNICAL
CENTER, ATLANTIC CITY AIRPORT, N.J. 08405
DEV FROM REF (DEG)
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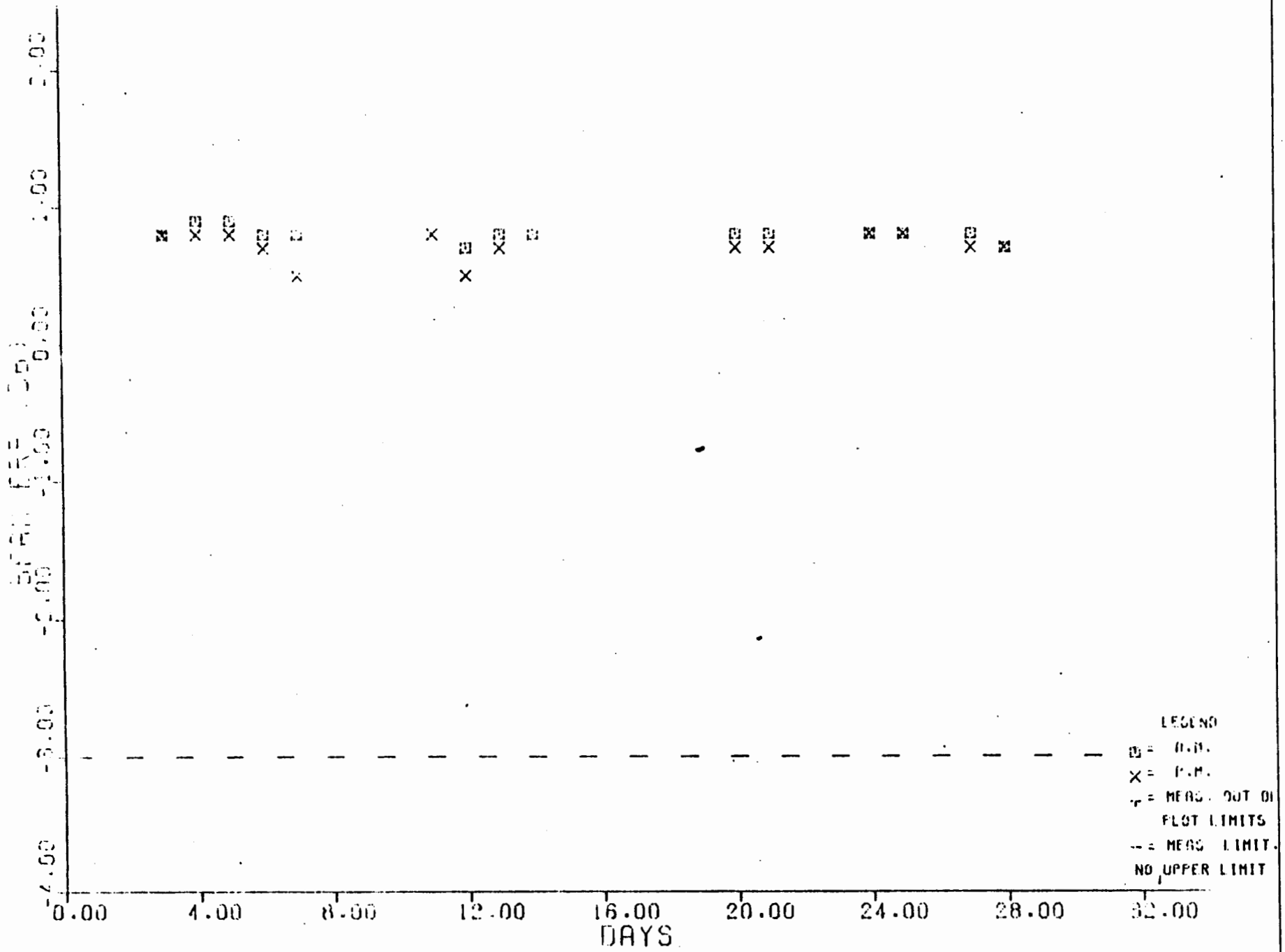
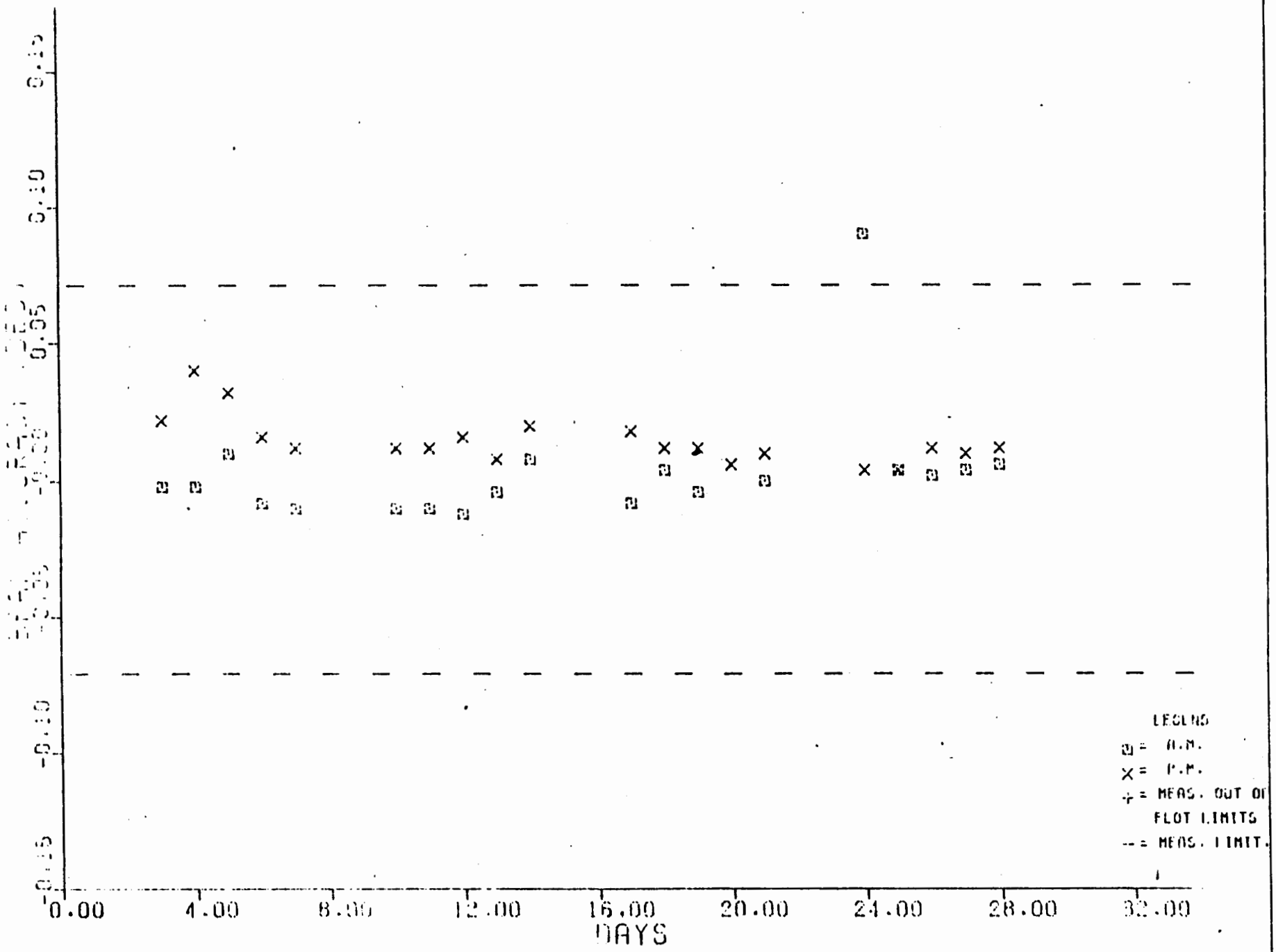
1.00
0.00
-1.00
-2.00
-3.00
-4.00
0.00
4.00
8.00
12.00
16.00
20.00
24.00
28.00
32.00
DAYS
LEGEND
A.M.
P.M.
MEAS. OUT OF PLOT LIMITS
MEAS. LIMIT. NO UPPER LIMIT

WASHINGTON MLS AZIMUTH MONITOR, MAY 1982.

DATA RECORDED AND PROCESSED BY THE FAA TECHNICAL CENTER, ATLANTIC CITY AIRPORT, N.J. 08405




WASHINGTON MLS ELEVATION MONITOR, MAY 1982.
DATA RECORDED AND PROCESSED BY THE FAA TECHNICAL CENTER, ATLANTIC CITY AIRPORT, N.J. 08405
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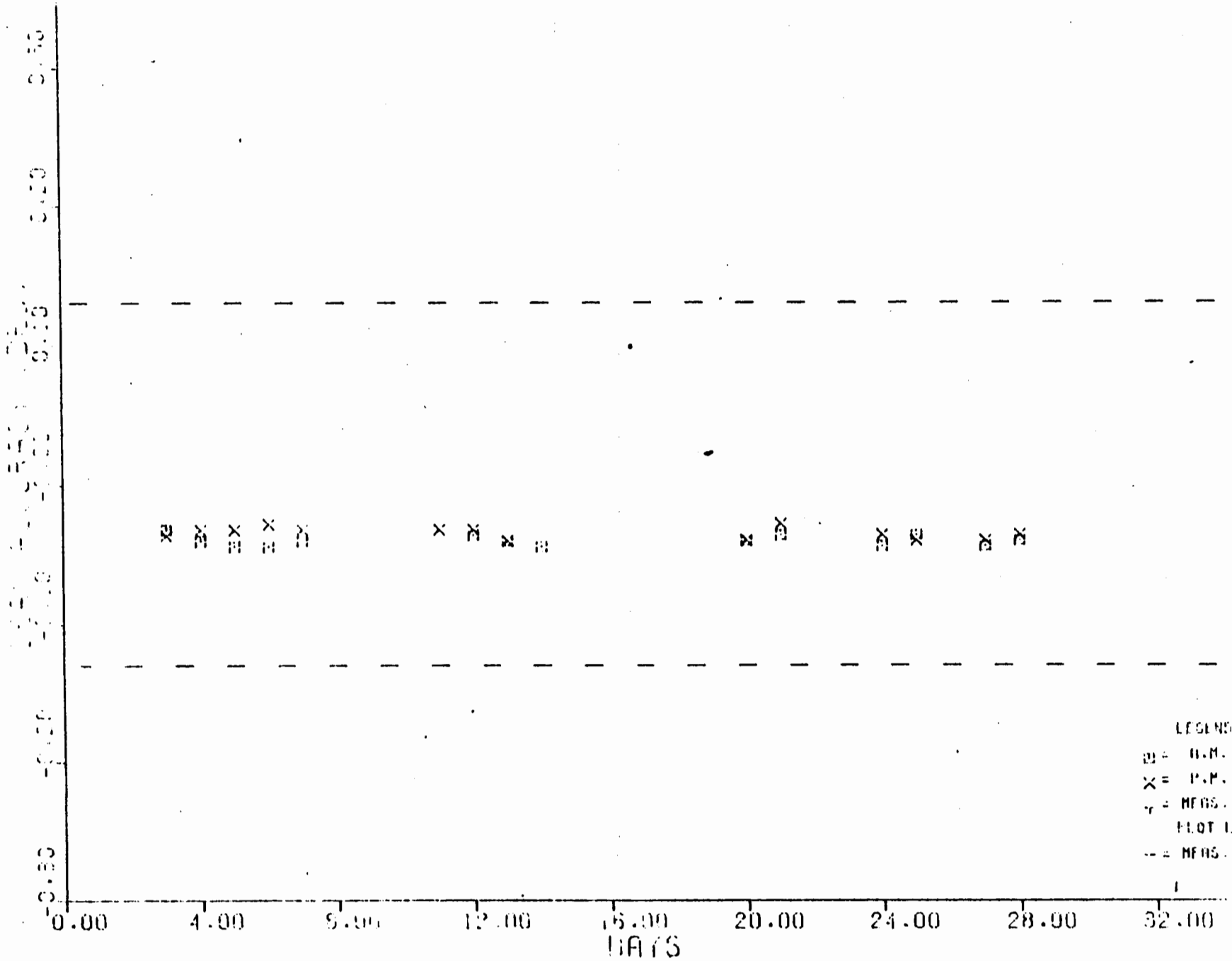
0.10
0.05
0.00
-0.05
-0.10
-0.15
0.00
4.00
8.00
12.00
16.00
20.00
24.00
28.00
32.00
DAYS
LEGEND
= A.M.
= P.M.
= MEAS. OUT OF PLOT LIMITS
-- = MEAS. LIMIT.

WASHINGTON MLS AZIMUTH MONITOR, MAY 1982.

DATA RECORDED AND PROCESSED BY THE FAA TECHNICAL CENTER, ATLANTIC CITY AIRPORT, N.J. 08405



WASHINGTON MLS ELEVATION MONITOR, MAY 1982.

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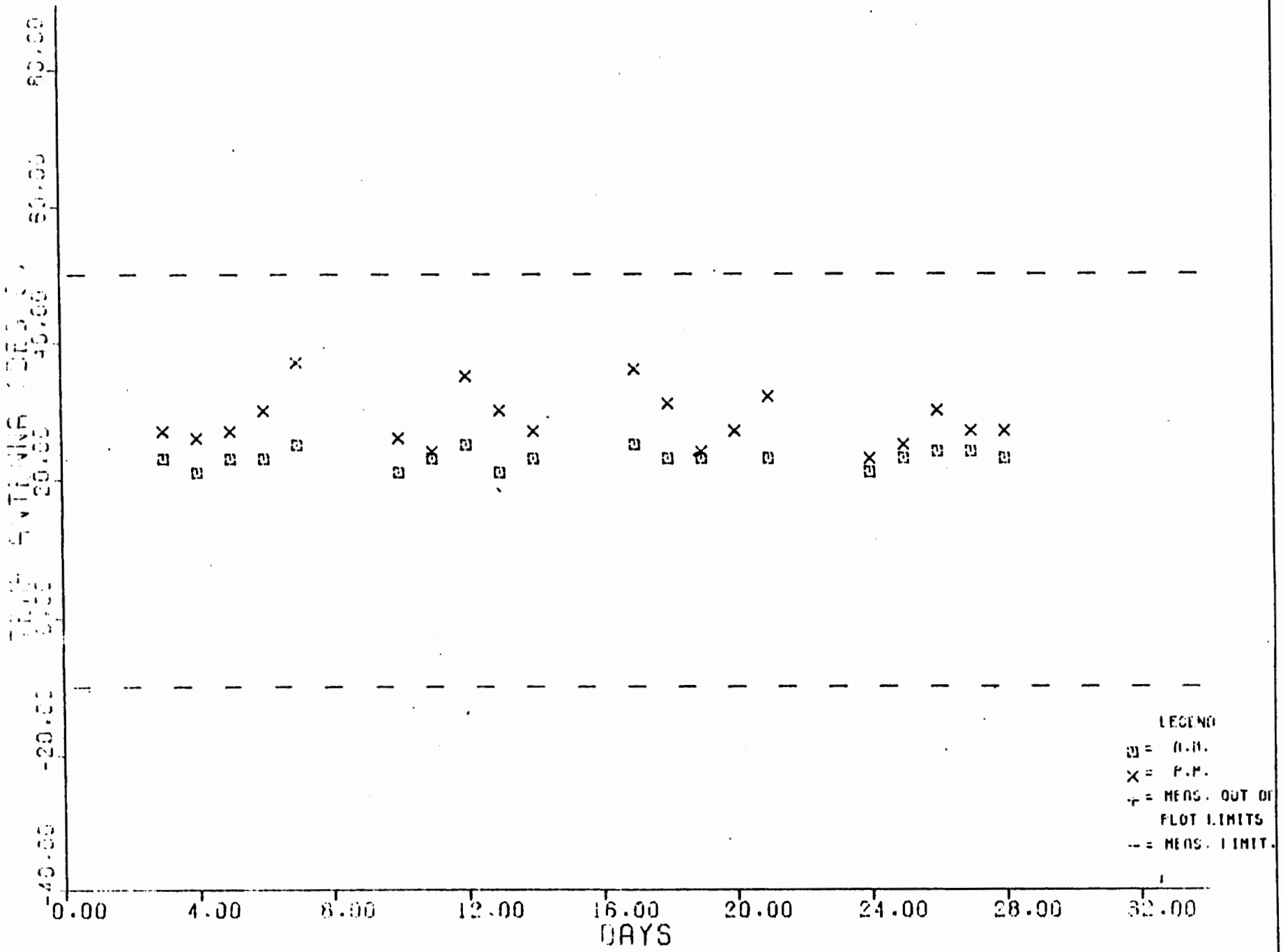
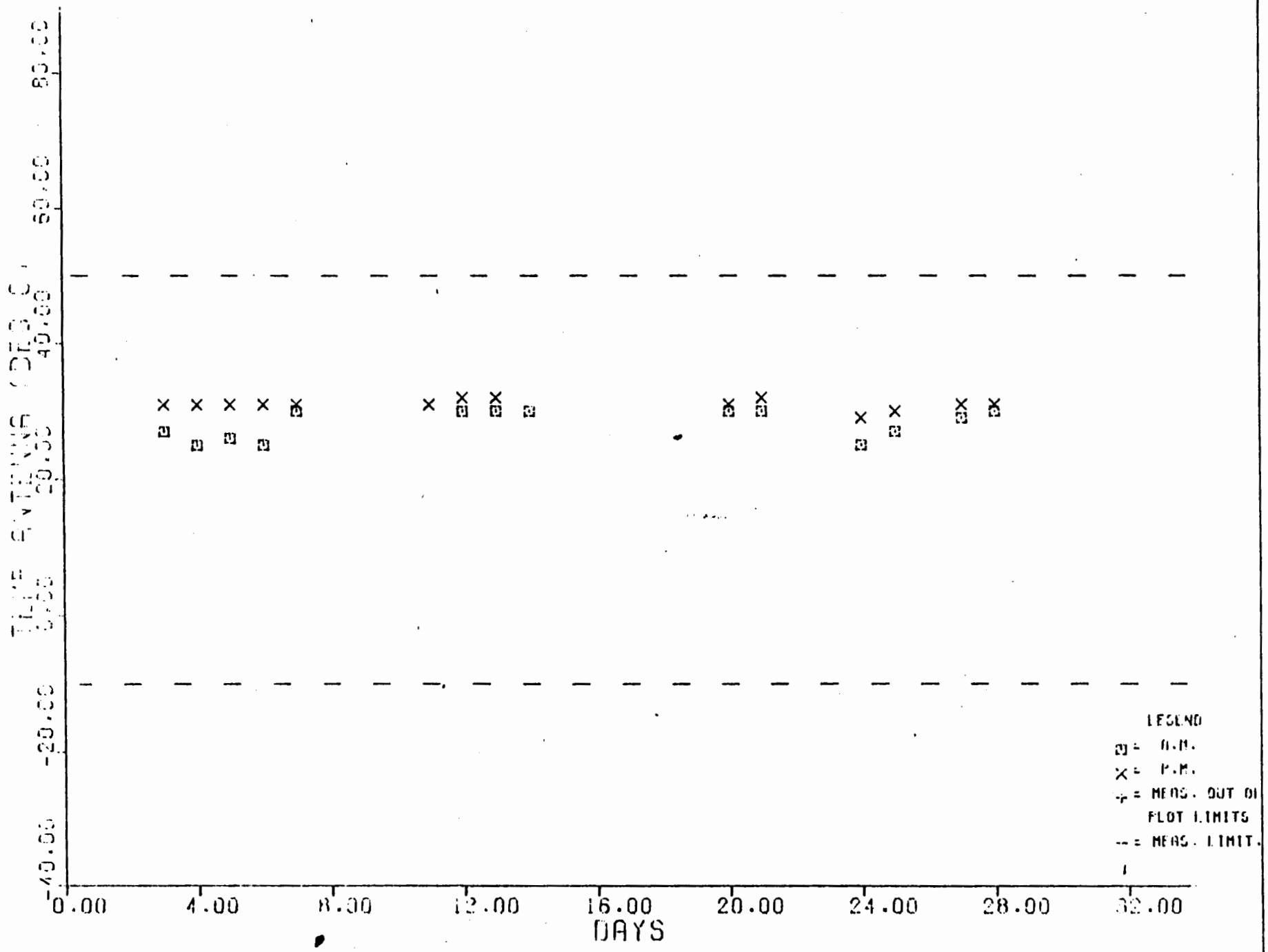
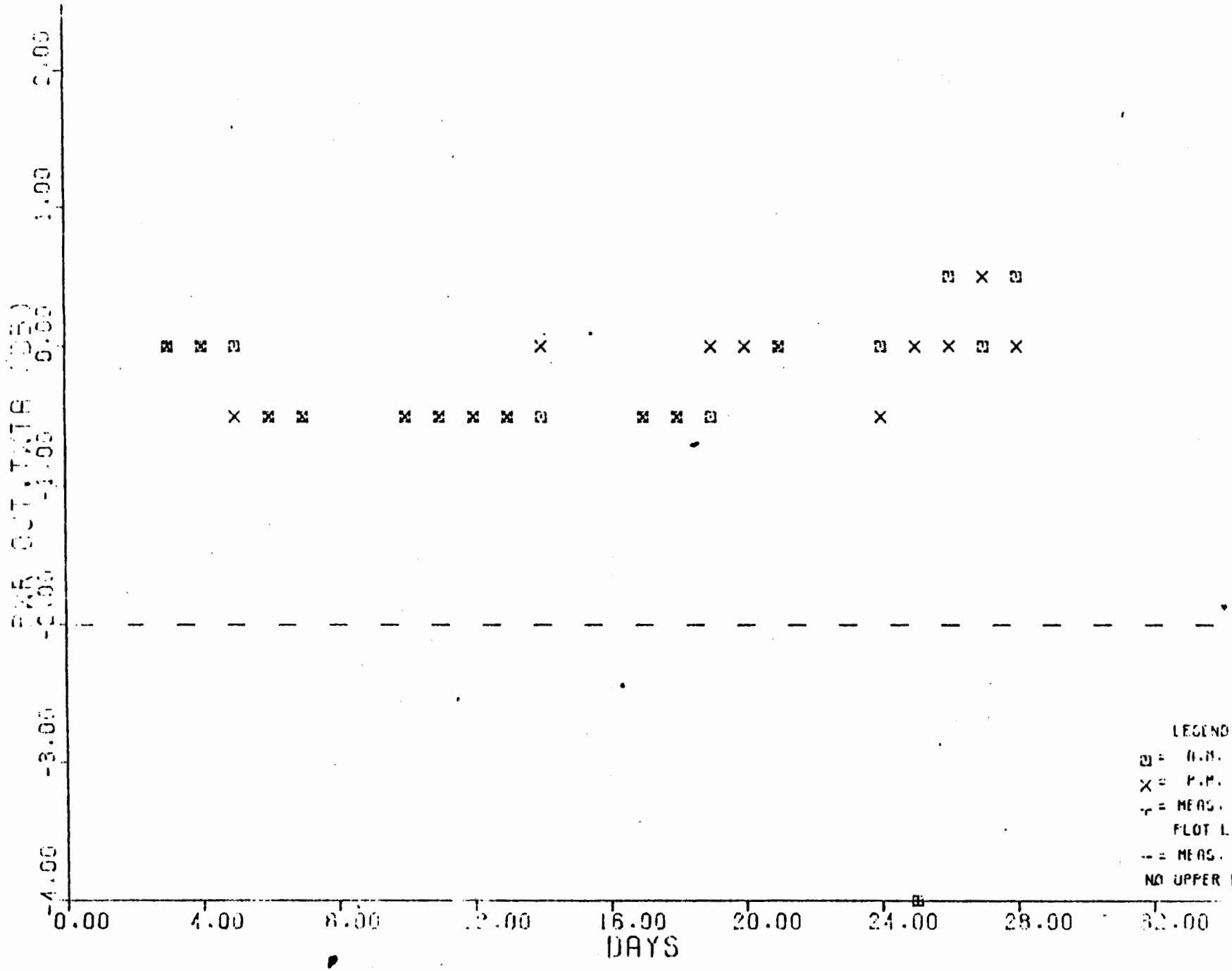


WASHINGTON MLS AZIMUTH MONITOR, MAY 1982.

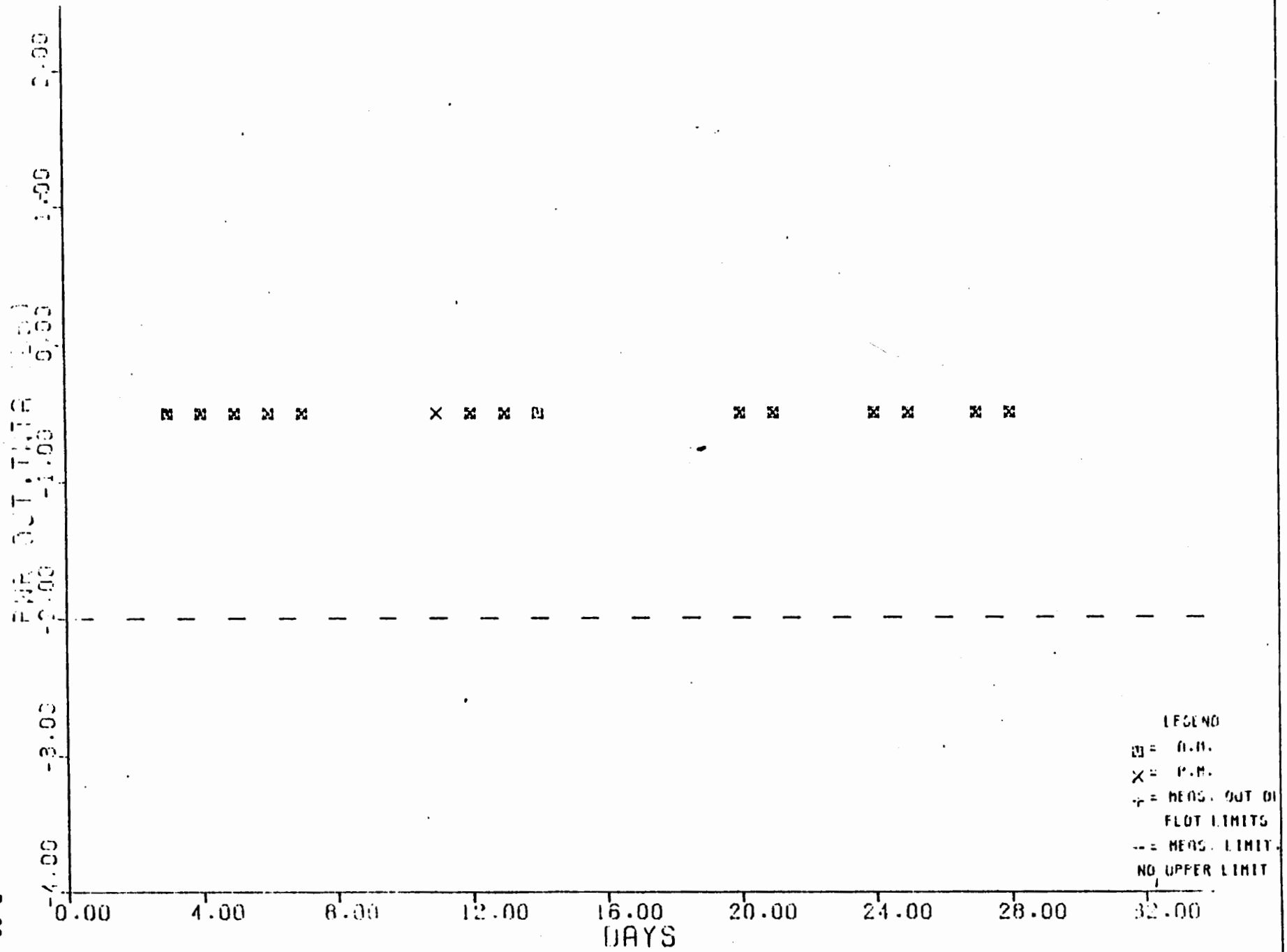
DATA RECORDED AND PROCESSED BY THE FAA TECHNICAL CENTER, ATLANTIC CITY AIRPORT, N.J. 08405




DATA RECORDED AND PROCESSED BY THE FAA TECHNICAL
CENTER,ATLANTIC CITY AIRPORT,N.J. 08405
MLS ELEVATION MONITOR,MAY 1982.
DAYS
LEGEND
A.M.
P.M.
MEAS. OUT OF
PLOT LIMITS
MEAS. LIMIT.
NO UPPER LIMIT

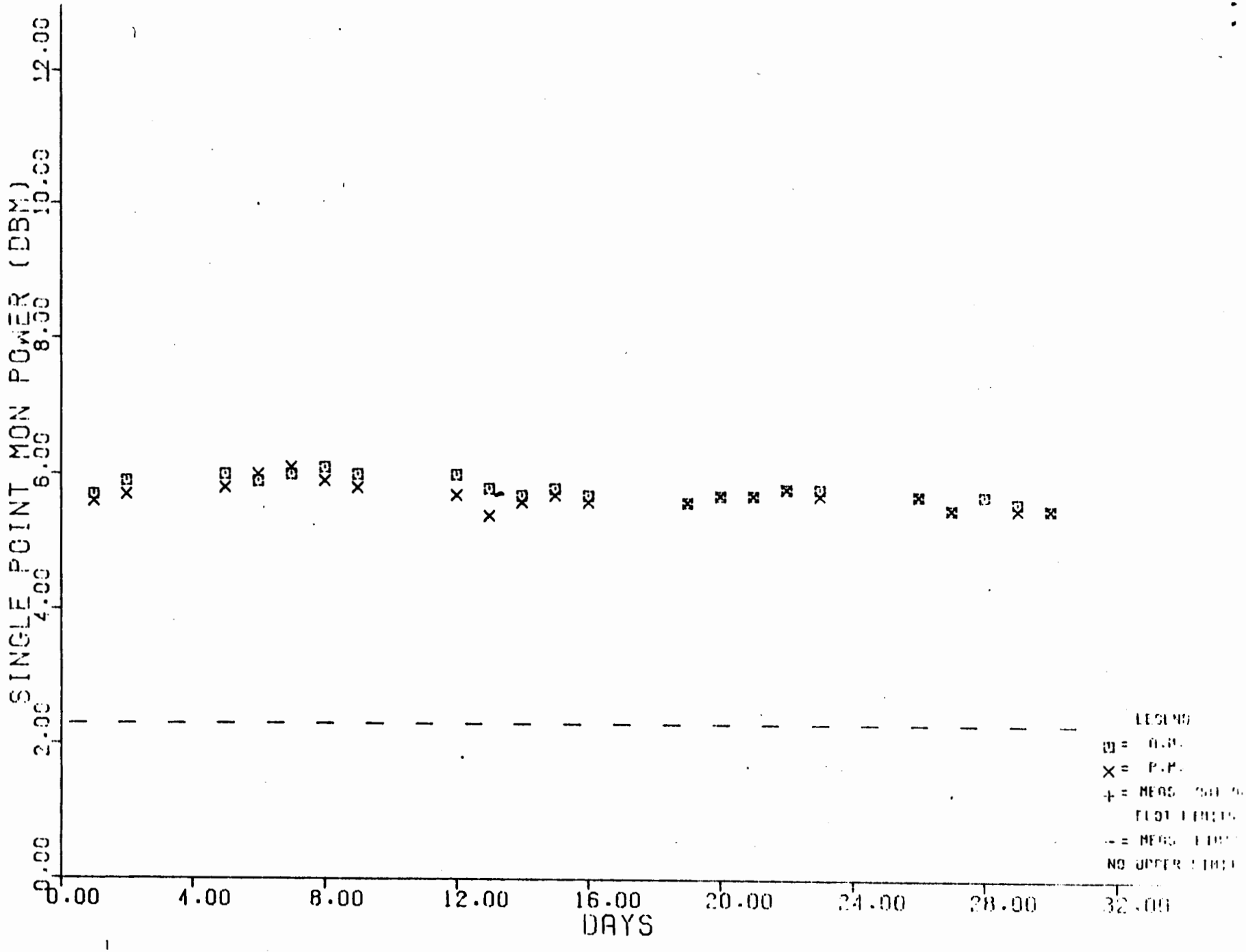
WASHINGTON MLS AZIMUTH MONITOR, MAY 1982.

DATA RECORDED AND PROCESSED BY THE FAA TECHNICAL CENTER, ATLANTIC CITY AIRPORT, N.J. 08405



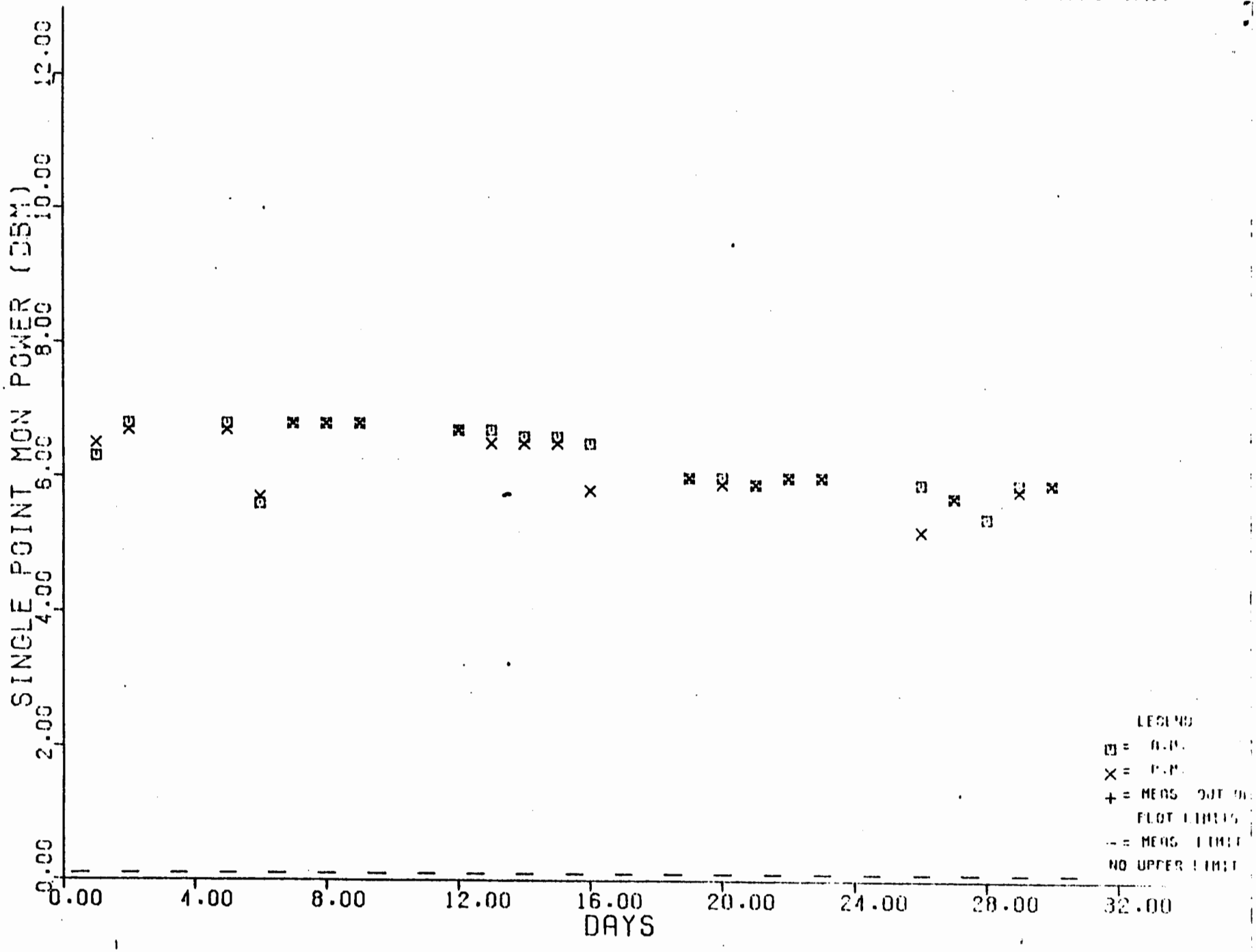
PHILADELPHIA MLS ELEVATION MONITOR, APR. 1982.

DATA RECORDED AND PROCESSED BY THE FAA TECHNICAL CENTER, ATLANTIC CITY AIRPORT, N.J. 08405



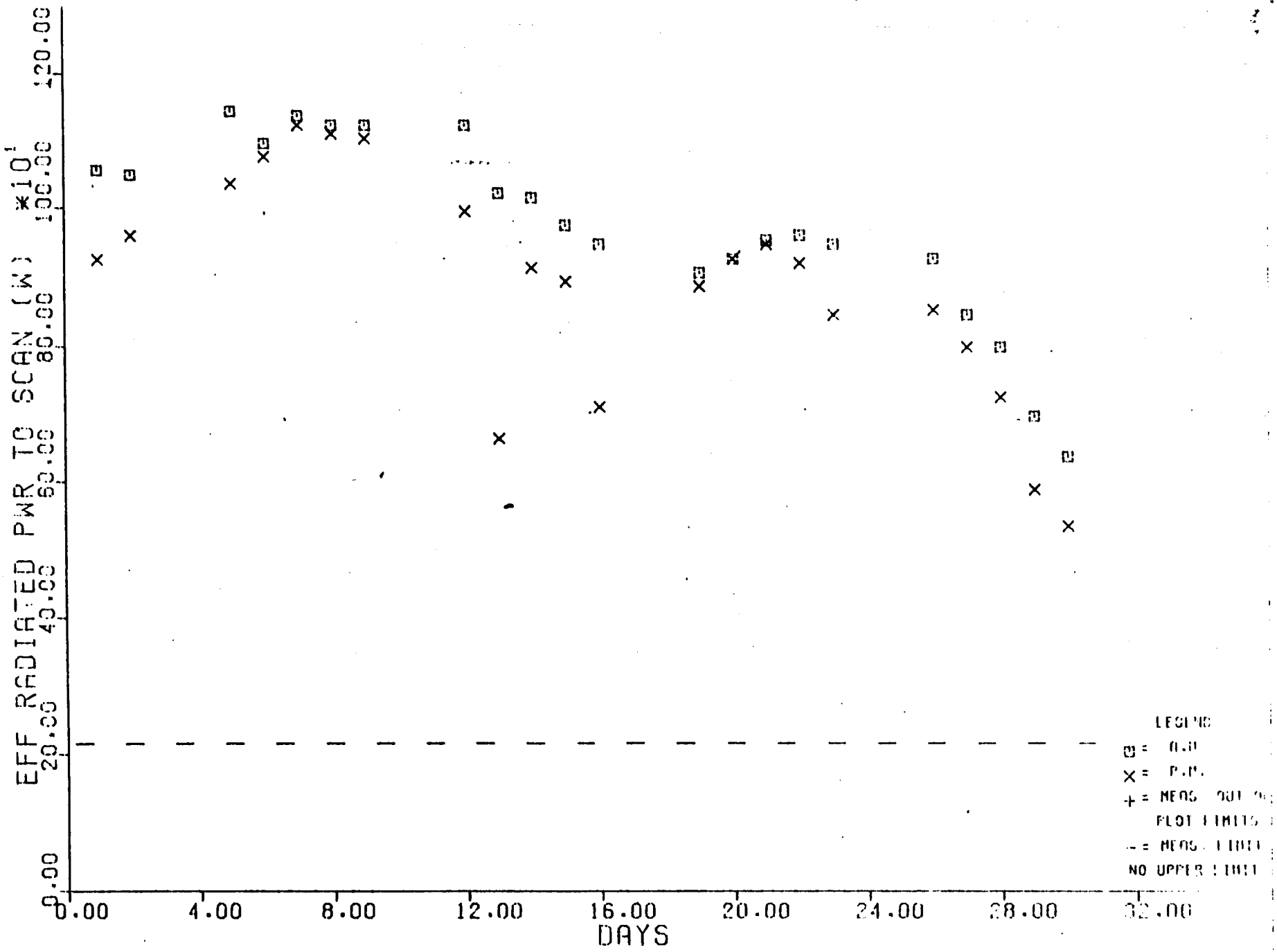
PHILADELPHIA MLS AZIMUTH MONITOR, APR. 1982.

DATA RECORDED AND PROCESSED BY THE FAA TECHNICAL CENTER, ATLANTIC CITY AIRPORT, N.J. 08405



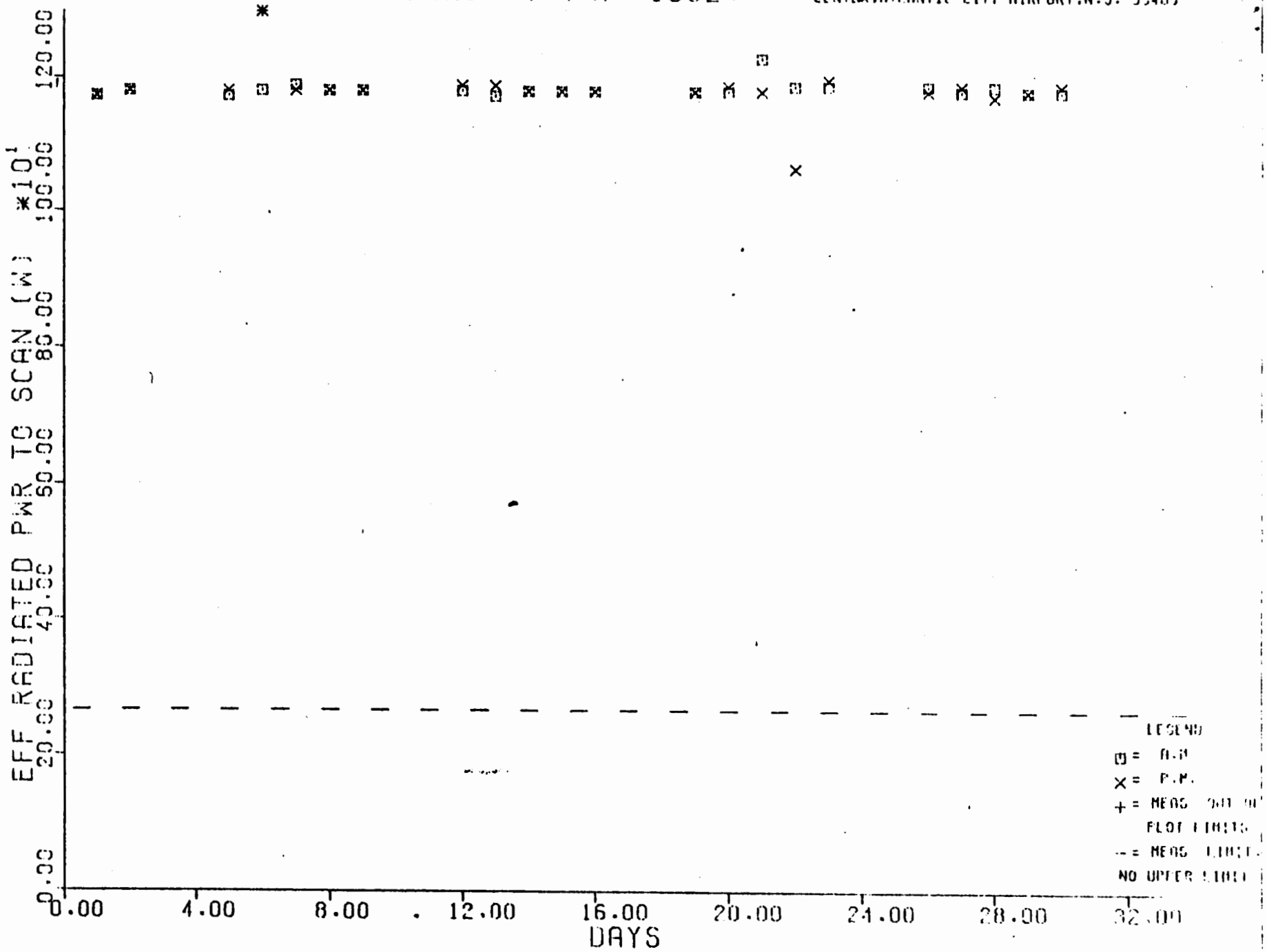
PHILADELPHIA MLS ELEVATION MONITOR.APR. 1982.

DATA RECORDED AND PROCESSED BY THE FAA TECHNICAL CENTER.ATLANTIC CITY AIRPORT.N.J. 08405



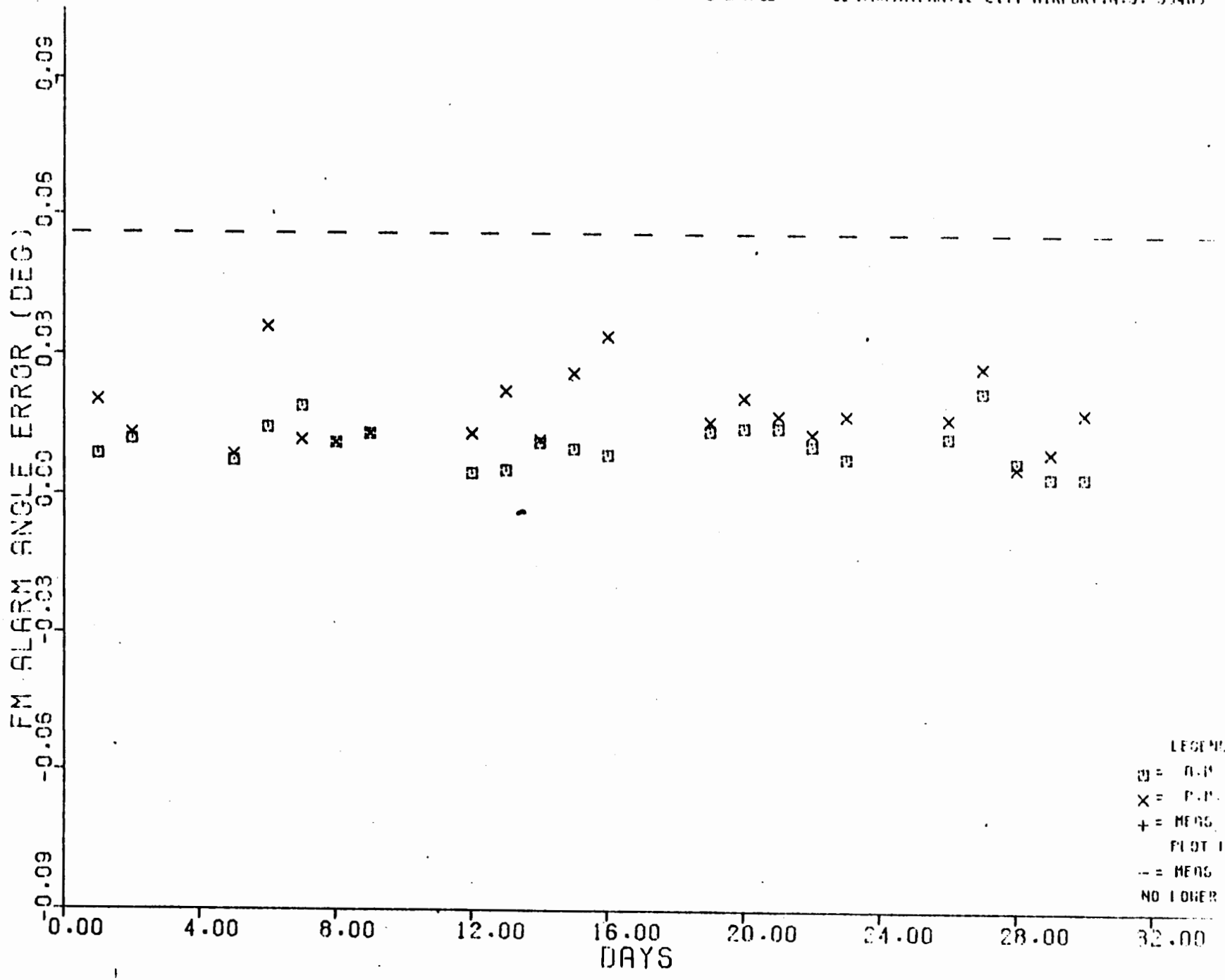
PHILADELPHIA MLS AZIMUTH MONITOR.APR. 1982.

DATA RECORDED AND PROCESSED BY THE FAA TECHNICAL CENTER,ATLANTIC CITY AIRPORT,N.J. 08405



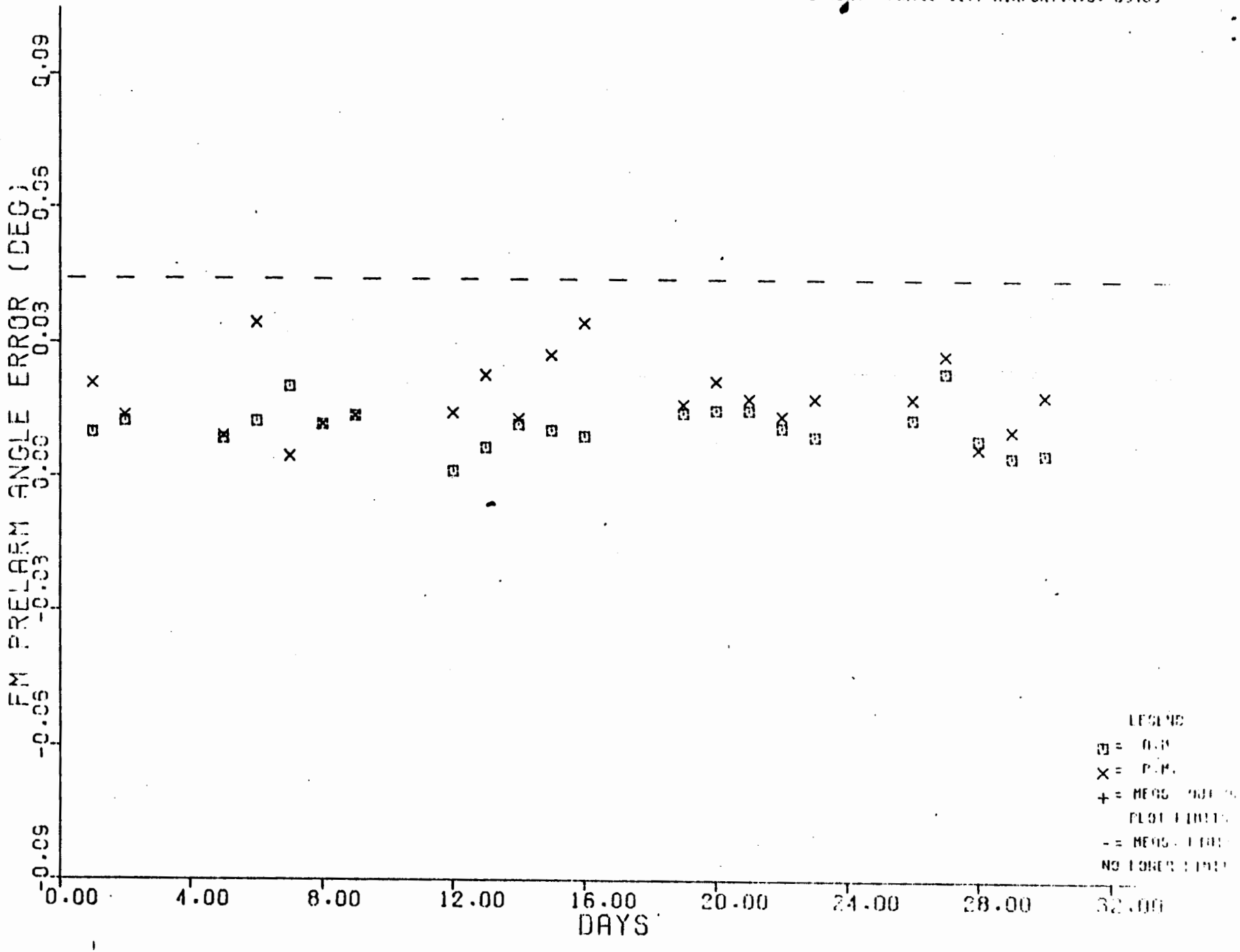
PHILADELPHIA MLS ELEVATION MONITOR.APR. 1982.

DATA RECORDED AND PROCESSED BY THE FAA TECHNICAL CENTER,ATLANTIC CITY AIRPORT,N.J. 08405



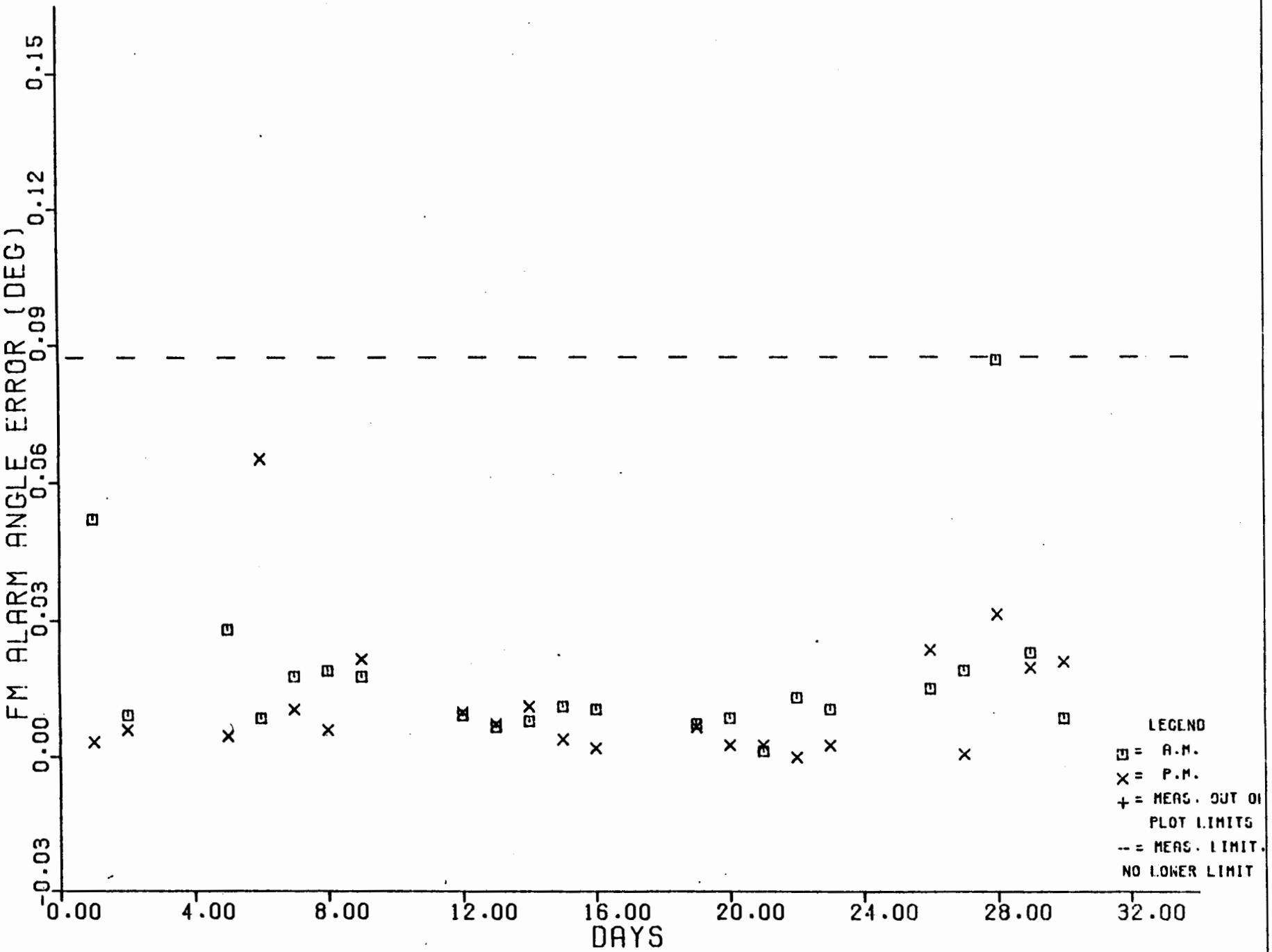
PHILADELPHIA MLS ELEVATION MONITOR.APR. 1982.

DATA RECORDED AND PROCESSED BY THE FAA TECHNICAL CENTER.ATLANTIC CITY AIRPORT.N.J. 08405



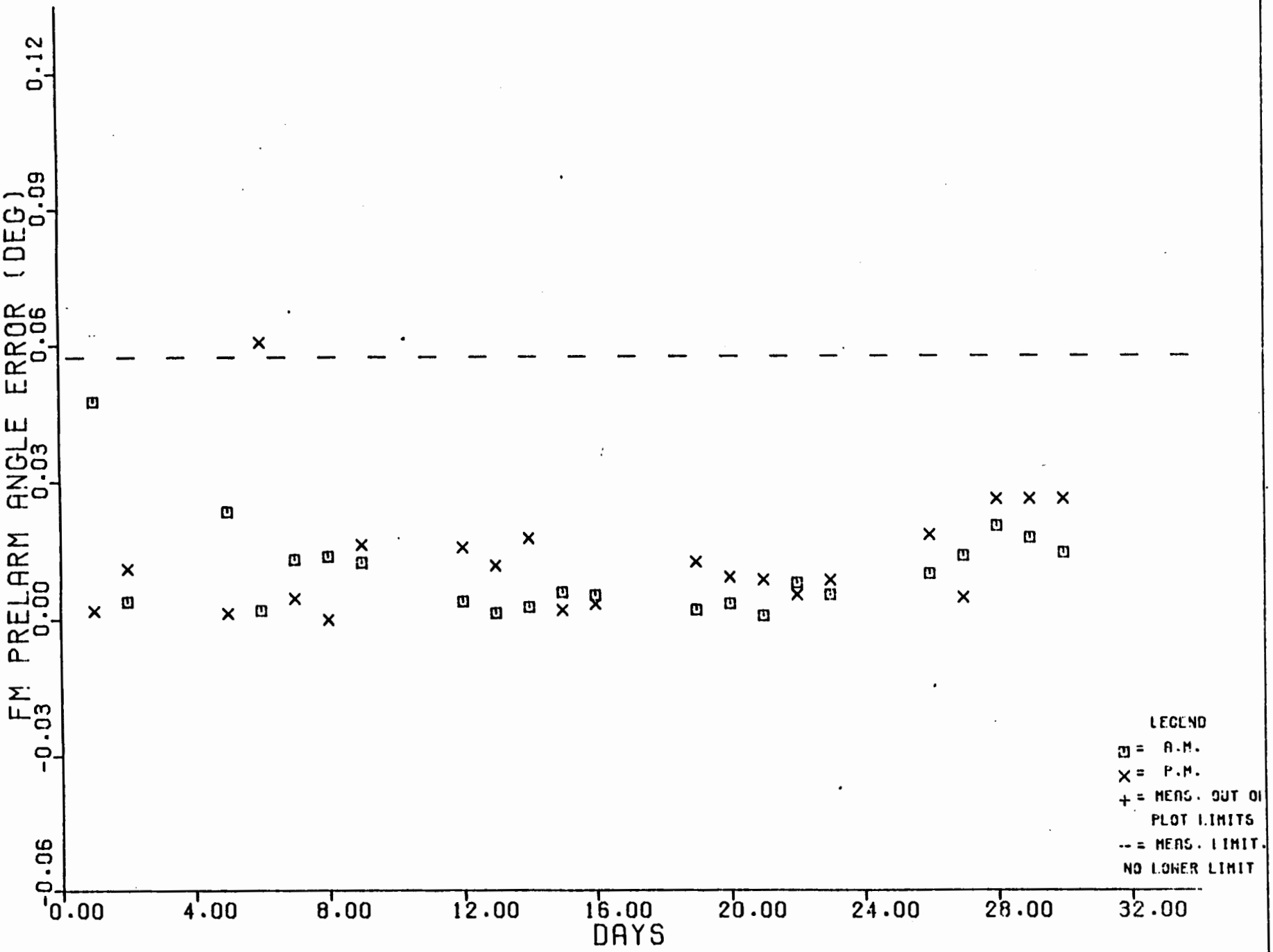
PHILADELPHIA MLS AZIMUTH MONITOR, APR. 1982.

DATA RECORDED AND PROCESSED BY THE FAA TECHNICAL CENTER, ATLANTIC CITY AIRPORT, N.J. 08405



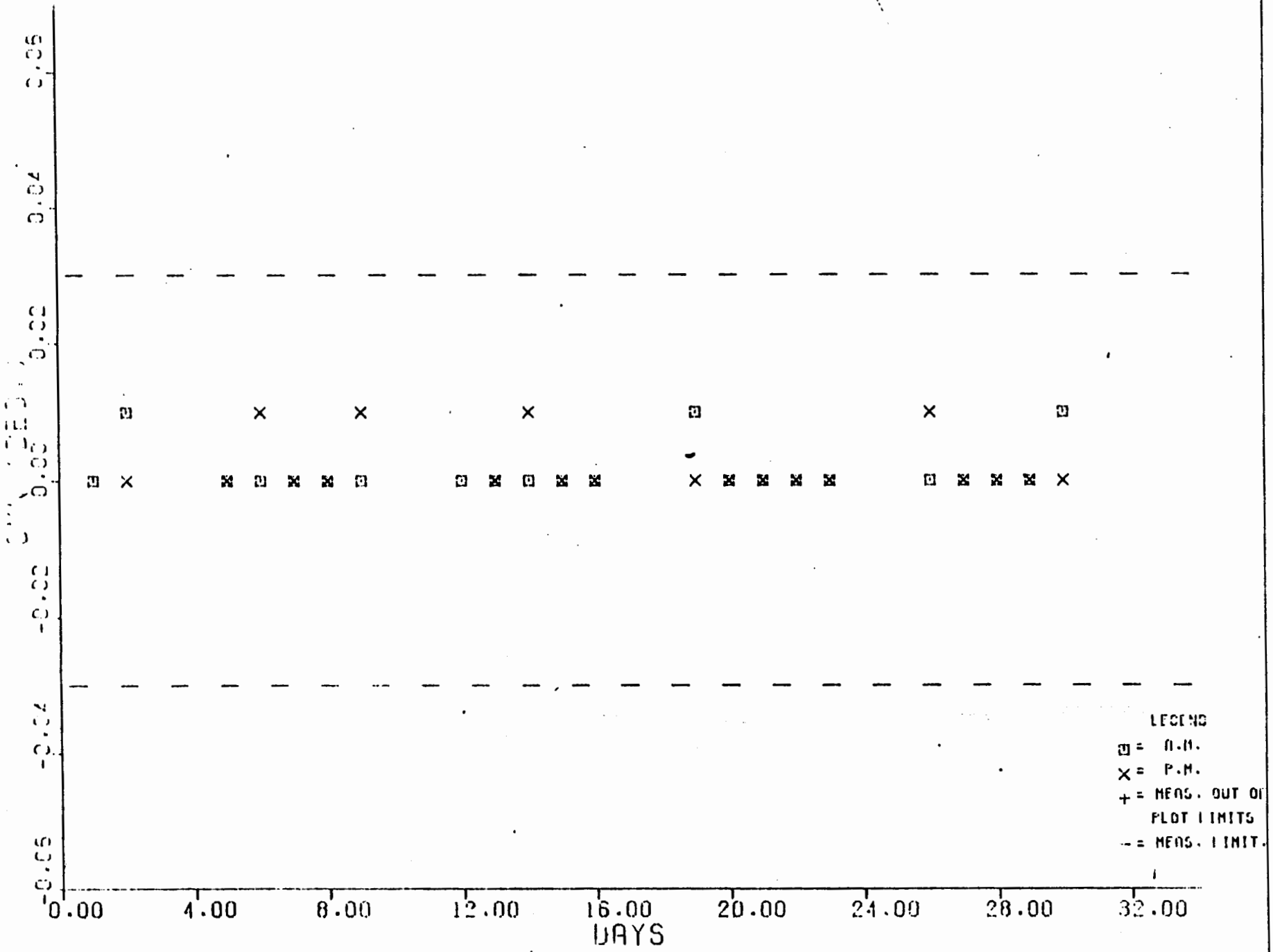
PHILADELPHIA MLS AZIMUTH MONITOR, APR. 1982.

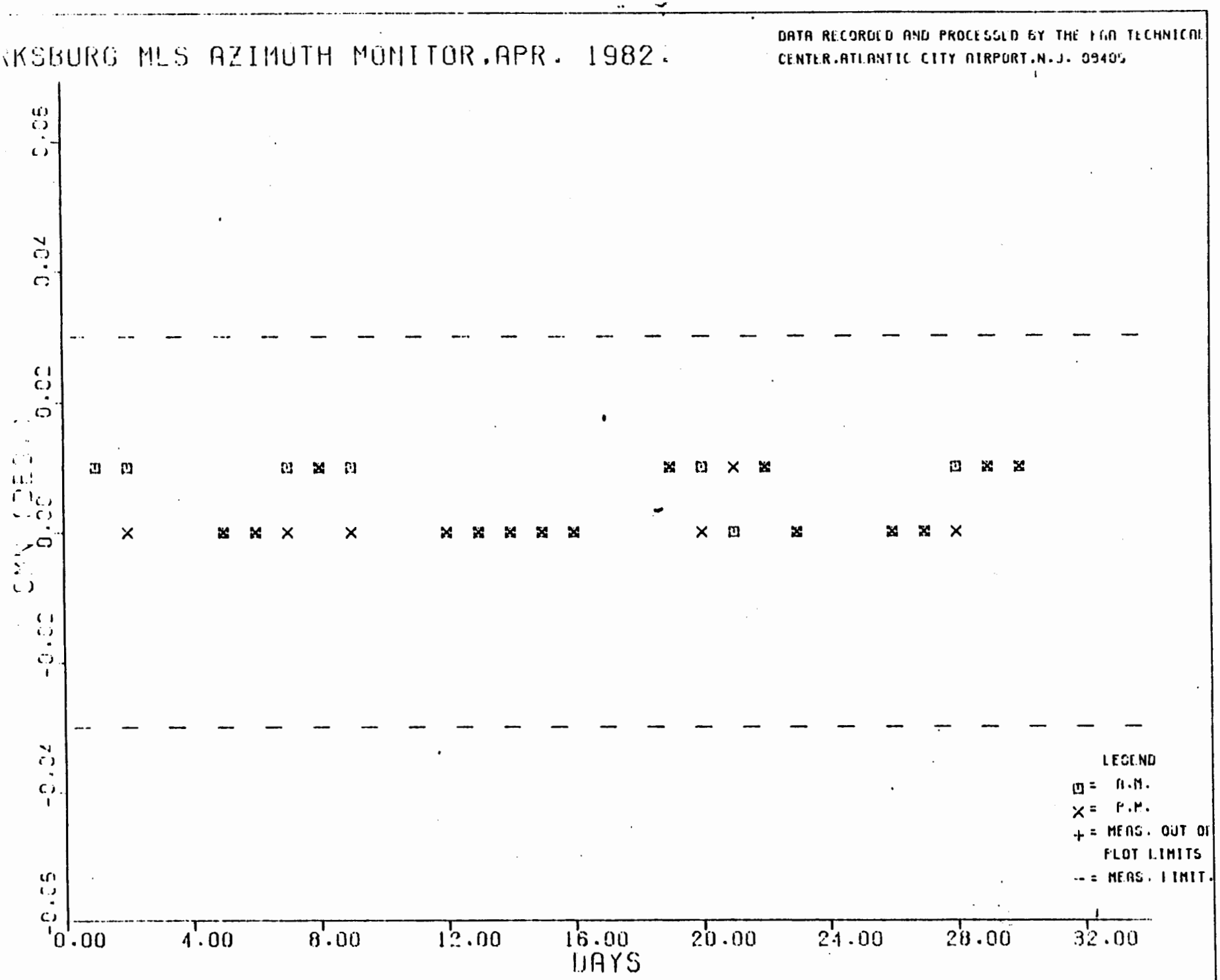
DATA RECORDED AND PROCESSED BY THE FAA TECHNICAL CENTER, ATLANTIC CITY AIRPORT, N.J. 08405



HARKSBURG MLS ELEVATION MONITOR, APR. 1982.

DATA RECORDED AND PROCESSED BY THE FAA TECHNICAL CENTER, ATLANTIC CITY AIRPORT, N.J. 08405




MARKSBURG MLS AZIMUTH MONITOR, APR. 1982.
DATA RECORDED AND PROCESSED BY THE FAA TECHNICAL CENTER, ATLANTIC CITY AIRPORT, N.J. 08405
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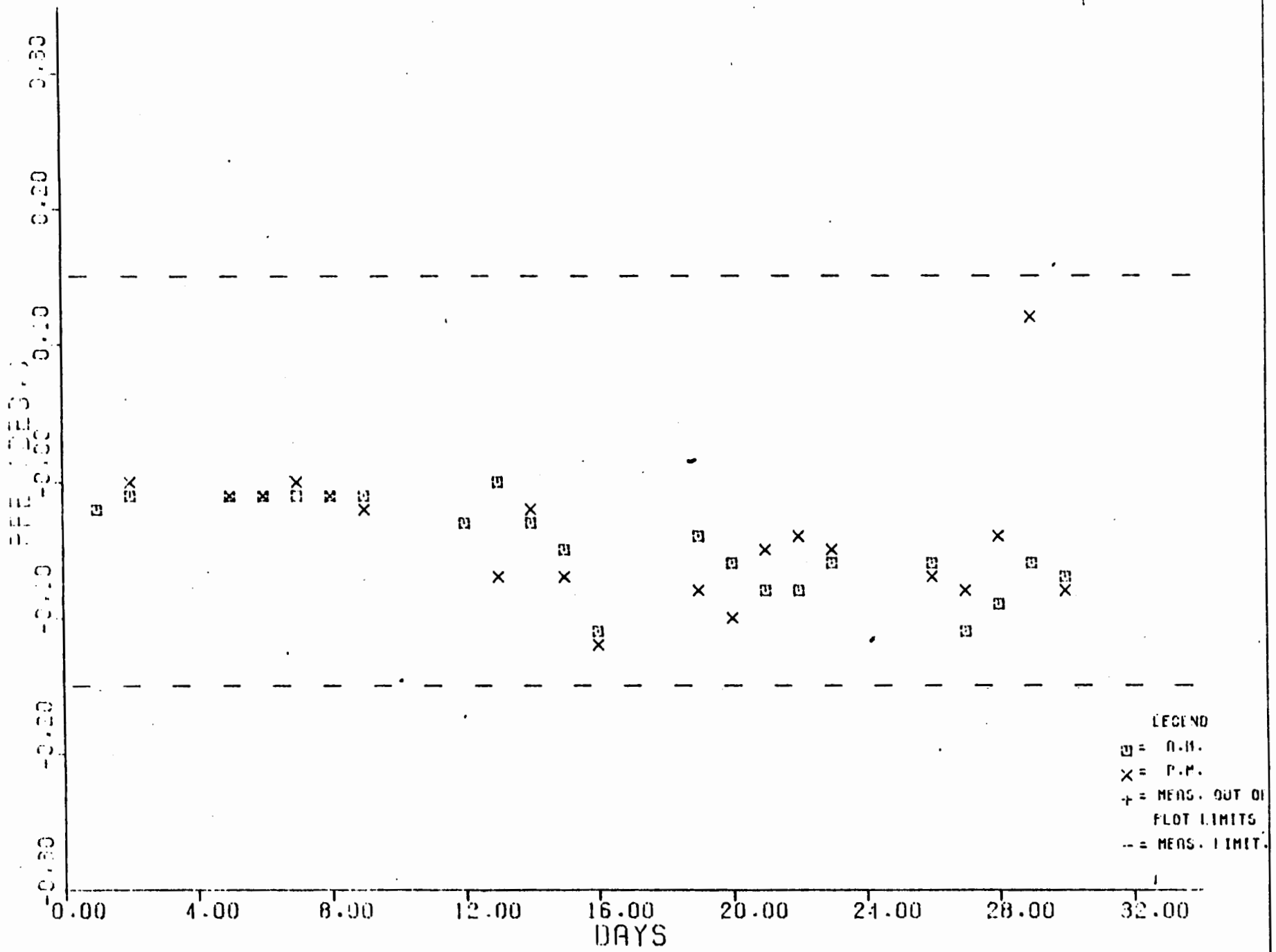
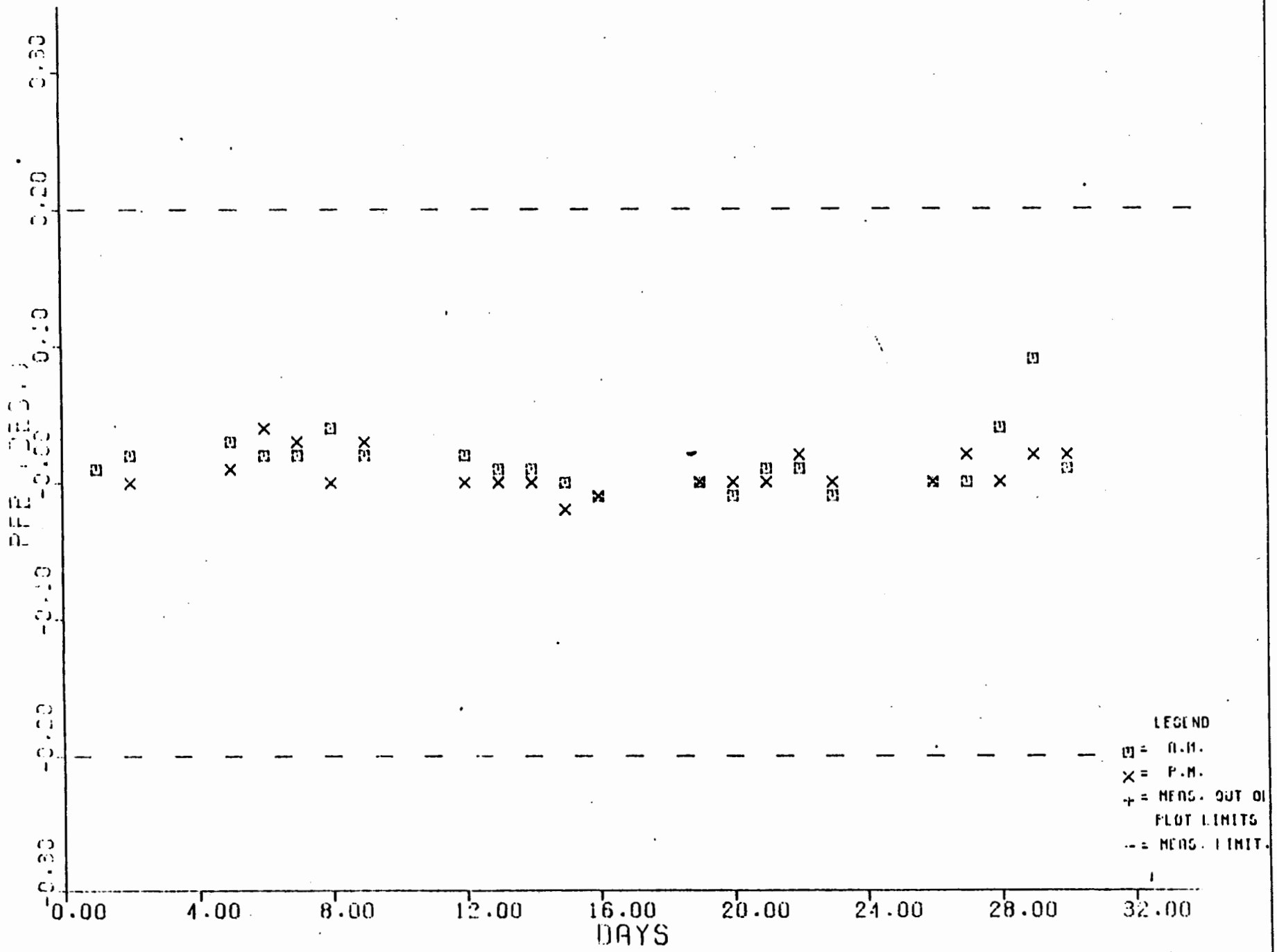
0.04
0.02
0.00
-0.02
-0.04
-0.06
0.00
4.00
8.00
12.00
16.00
20.00
24.00
28.00
32.00
DAYS
LEGEND
□ = A.M.
× = P.M.
+ = MEAS. OUT OF PLOT LIMITS
-- = MEAS. LIMIT.


DATA RECORDED AND PROCESSED BY THE FAA TECHNICAL
CENTER,ATLANTIC CITY AIRPORT,N.J. 08405
DRKSBURG MLS ELEVATION MONITOR,APR. 1982.
0.30
0.20
0.10
-0.10
-0.20
-0.30
0.00
4.00
8.00
12.00
16.00
20.00
24.00
28.00
32.00
DAYS
LEGEND
= A.M.
= P.M.
= MEAS. OUT OF PLOT LIMITS
-- = MEAS. LIMIT.

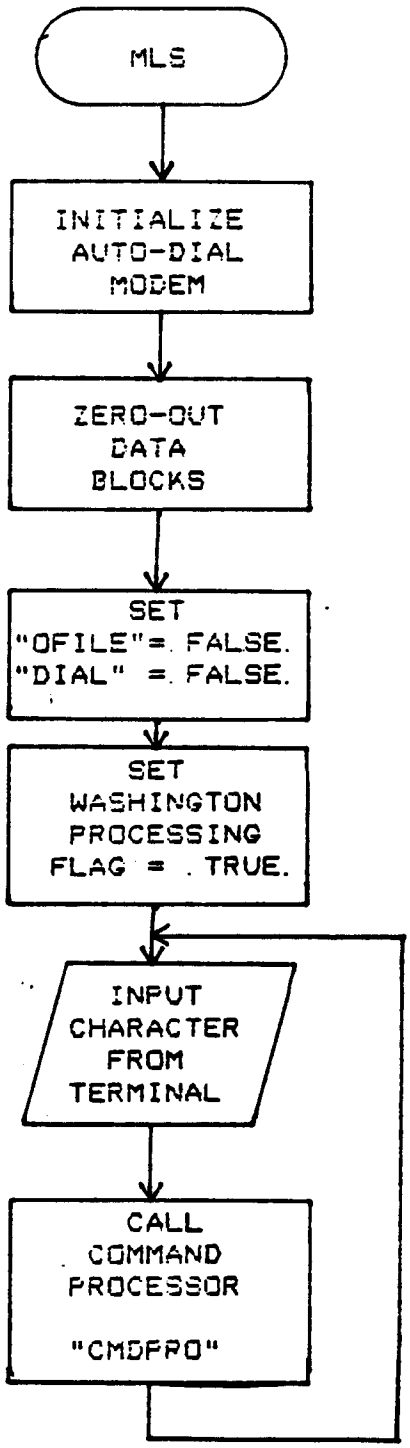
CLARKSBURG MLS AZIMUTH MONITOR, APR. 1982.

DATA RECORDED AND PROCESSED BY THE FAA TECHNICAL CENTER, ATLANTIC CITY AIRPORT, N.J. 08405



APPENDIX I

This appendix contains the flow charts of the data collection system software. The title of the program is "MLS".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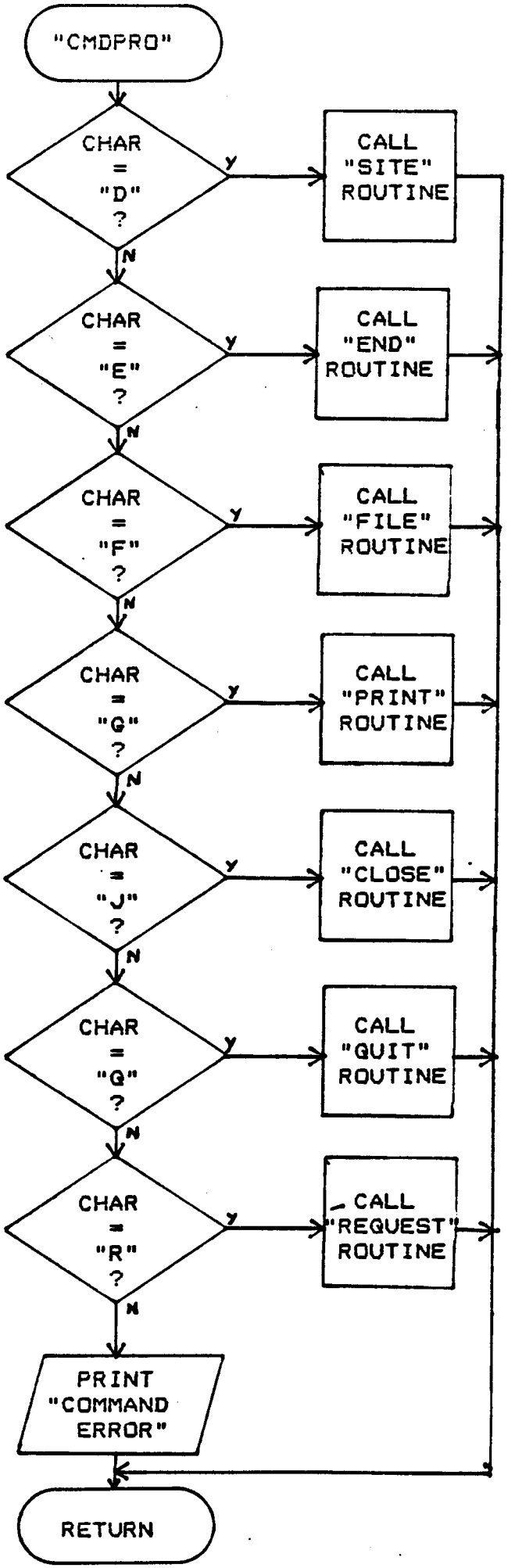
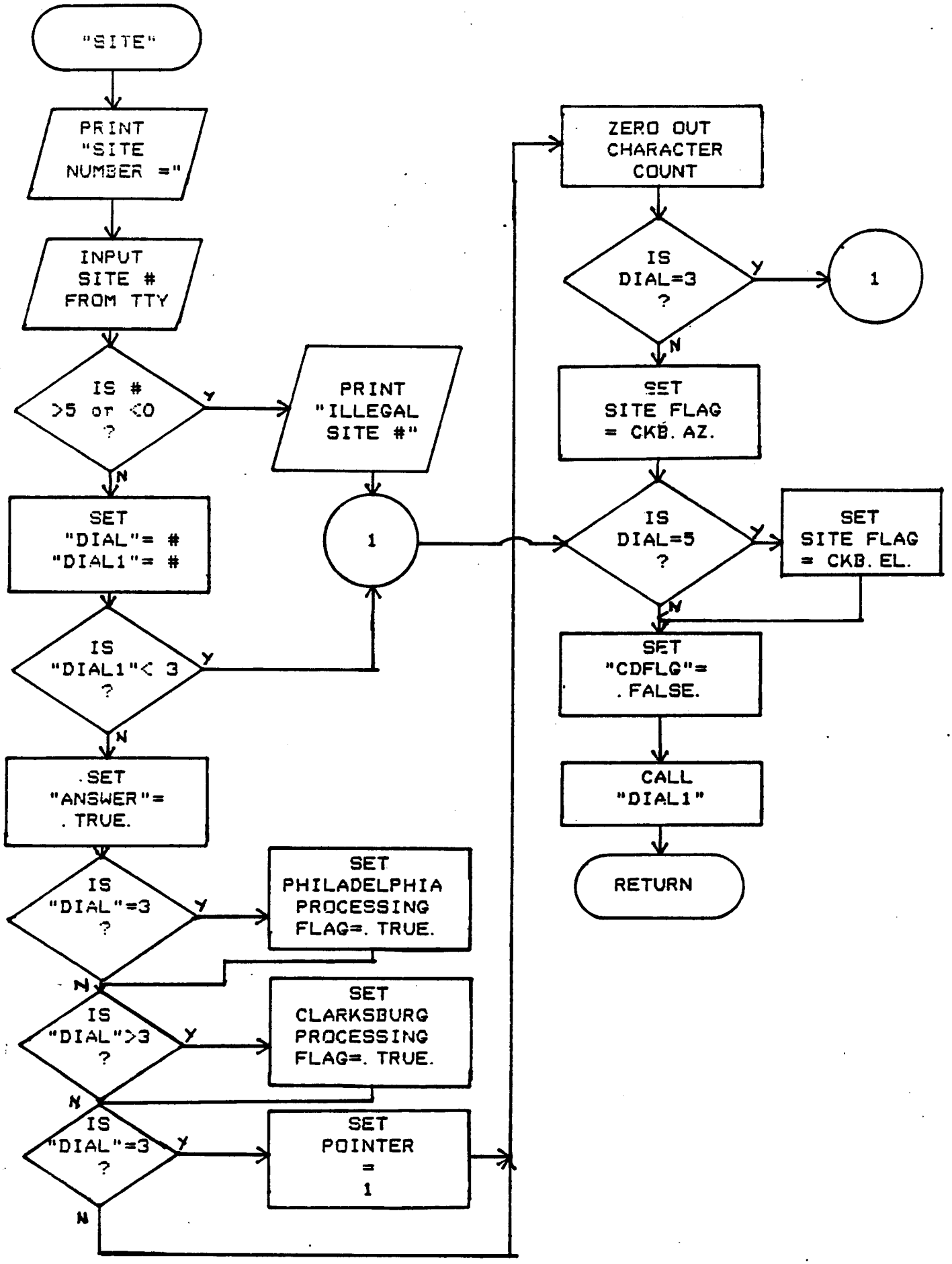
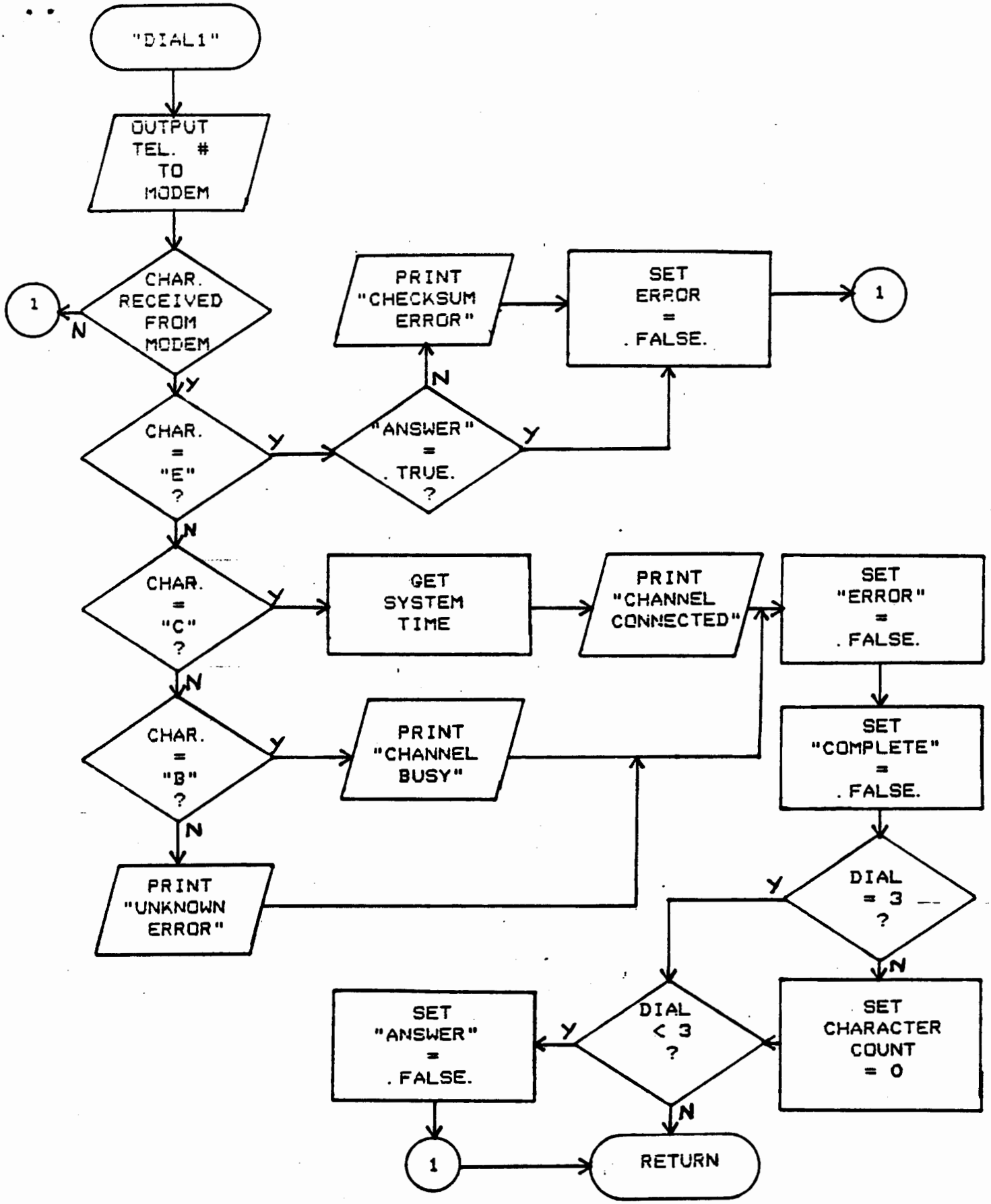
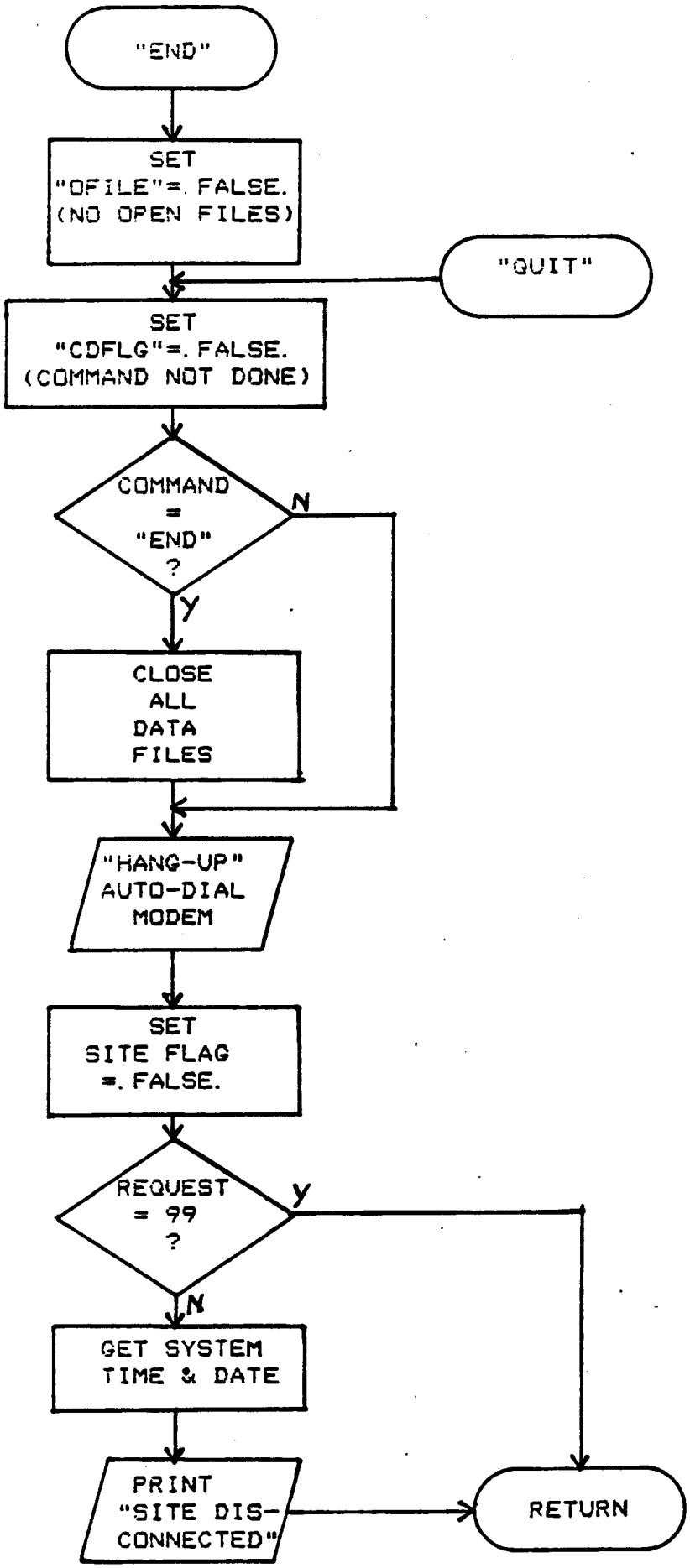
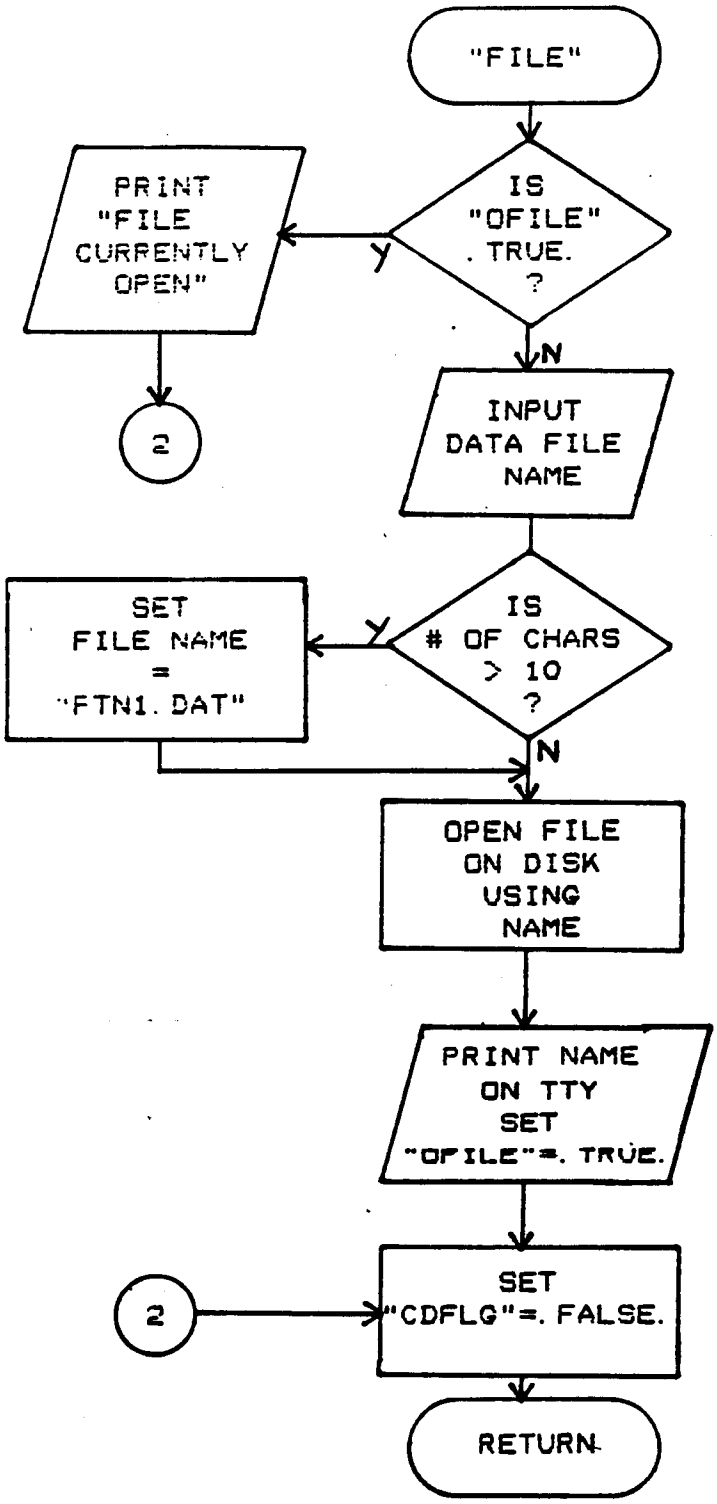
ZERO-OUT DATA BLOCKS
SET "OFILE"= .FALSE. "DIAL" = .FALSE.
SET WASHINGTON PROCESSING FLAG = .TRUE.
INPUT CHARACTER FROM TERMINAL
CALL COMMAND PROCESSOR "CMDPRO"

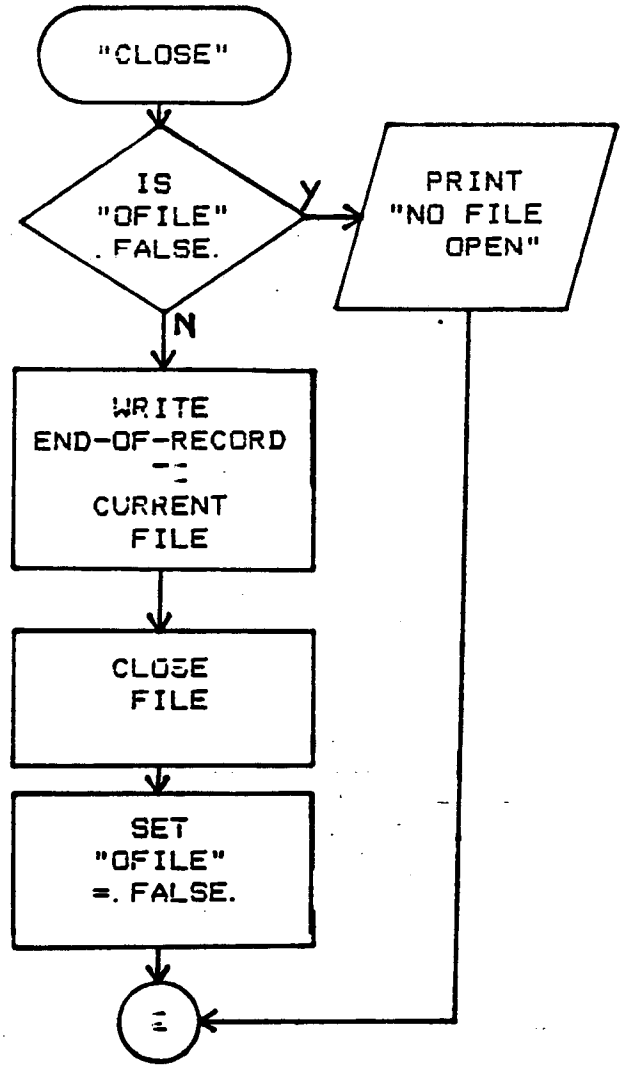

"CMDPRO"
CHAR = "D" ?
Y
CALL "SITE" ROUTINE
N
CHAR = "E" ?
Y
CALL "END" ROUTINE
N
CHAR = "F" ?
Y
CALL "FILE" ROUTINE
N
CHAR = "G" ?
Y
CALL "PRINT" ROUTINE
N
CHAR = "J" ?
Y
CALL "CLOSE" ROUTINE
N
CHAR = "Q" ?
Y
CALL "QUIT" ROUTINE
N
CHAR = "R" ?
Y
CALL "REQUEST" ROUTINE
N
PRINT "COMMAND ERROR"
RETURN

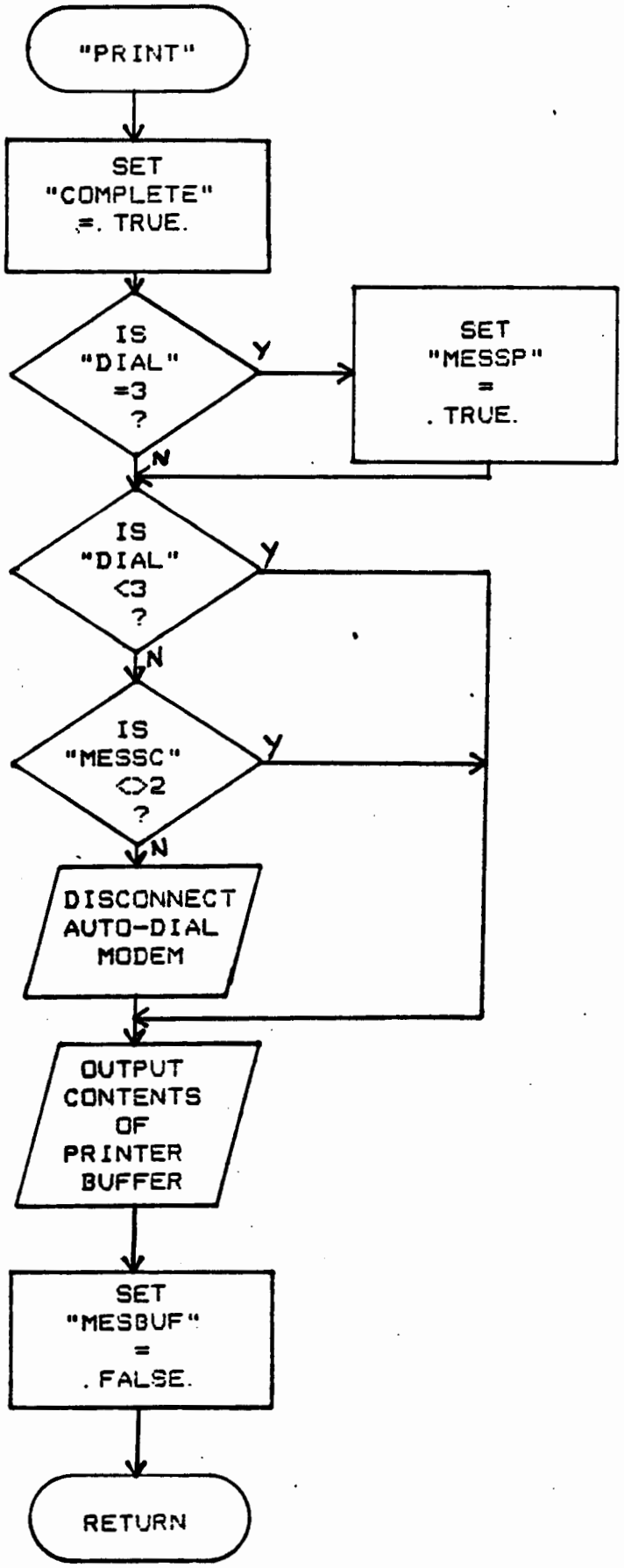

"SITE"
PRINT "SITE NUMBER ="
INPUT SITE # FROM TTY
IS # >5 or <0 ?
Y
PRINT "ILLEGAL SITE #"
1
N
SET "DIAL"= # "DIAL1"= #
IS "DIAL1"< 3 ?
Y
N
SET "ANSWER"= .TRUE.
IS "DIAL"=3 ?
Y
SET PHILADELPHIA PROCESSING FLAG=.TRUE.
N
IS "DIAL">3 ?
Y
SET CLARKSBURG PROCESSING FLAG=.TRUE.
N
IS "DIAL"=3 ?
Y
SET POINTER = 1
N
ZERO OUT CHARACTER COUNT
IS DIAL=3 ?
Y
1
N
SET SITE FLAG = CKB.AZ.
IS DIAL=5 ?
Y
SET SITE FLAG = CKB.EL.
N
SET "CDFLG"= .FALSE.
CALL "DIAL1"
RETURN

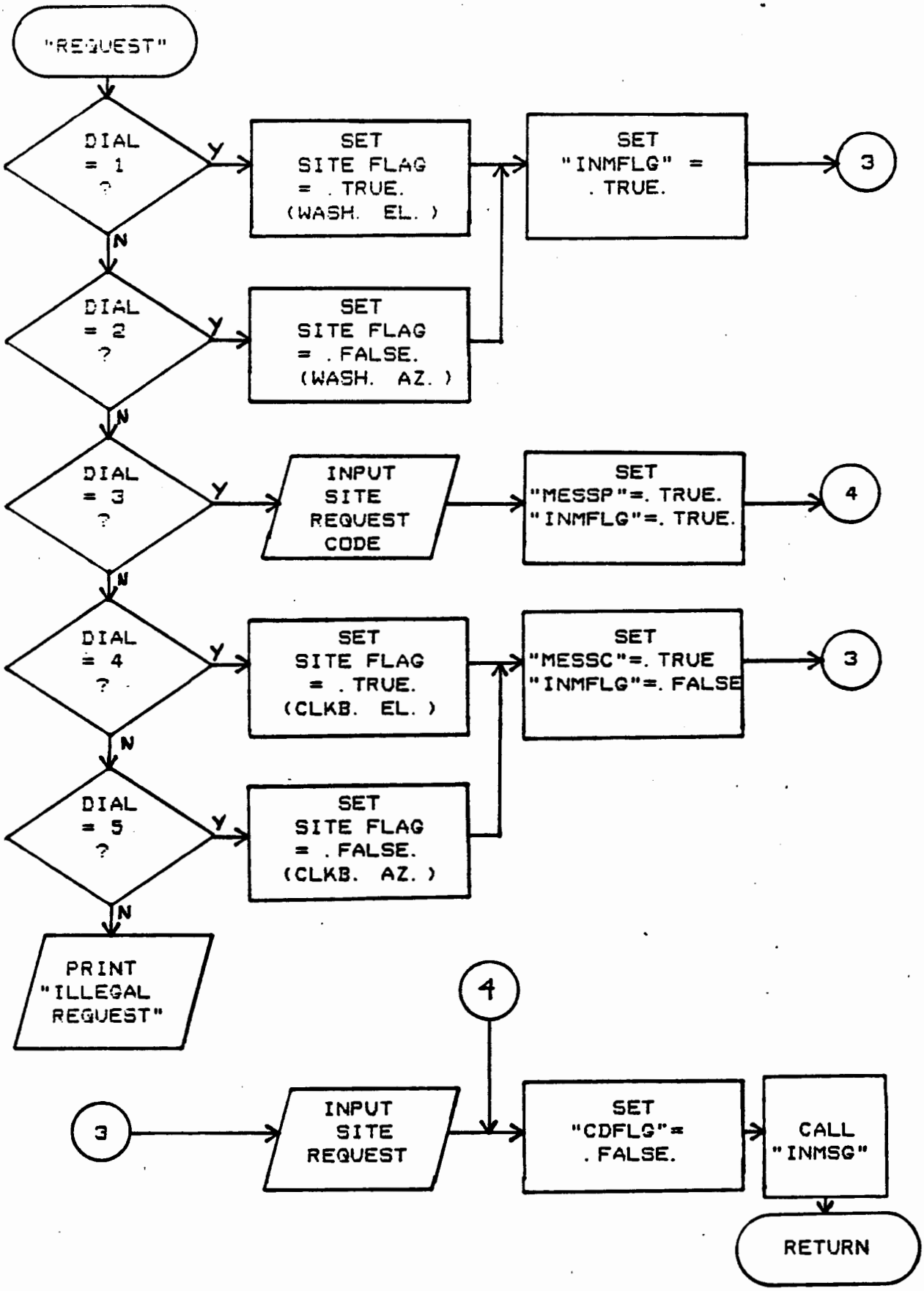

"DIAL1"
OUTPUT TEL. # TO MODEM
CHAR. RECEIVED FROM MODEM
1
N
Y
CHAR. = "E" ?
Y
"ANSWER" = . TRUE. ?
N
PRINT "CHECKSUM ERROR"
SET ERROR = . FALSE.
1
Y
N
CHAR. = "C" ?
Y
GET SYSTEM TIME
PRINT "CHANNEL CONNECTED"
SET "ERROR" = . FALSE.
SET "COMPLETE" = . FALSE.
N
CHAR. = "B" ?
Y
PRINT "CHANNEL BUSY"
N
PRINT "UNKNOWN ERROR"
DIAL = 3 ?
Y
N
SET CHARACTER COUNT = 0
DIAL < 3 ?
Y
N
SET "ANSWER" = . FALSE.
1
RETURN

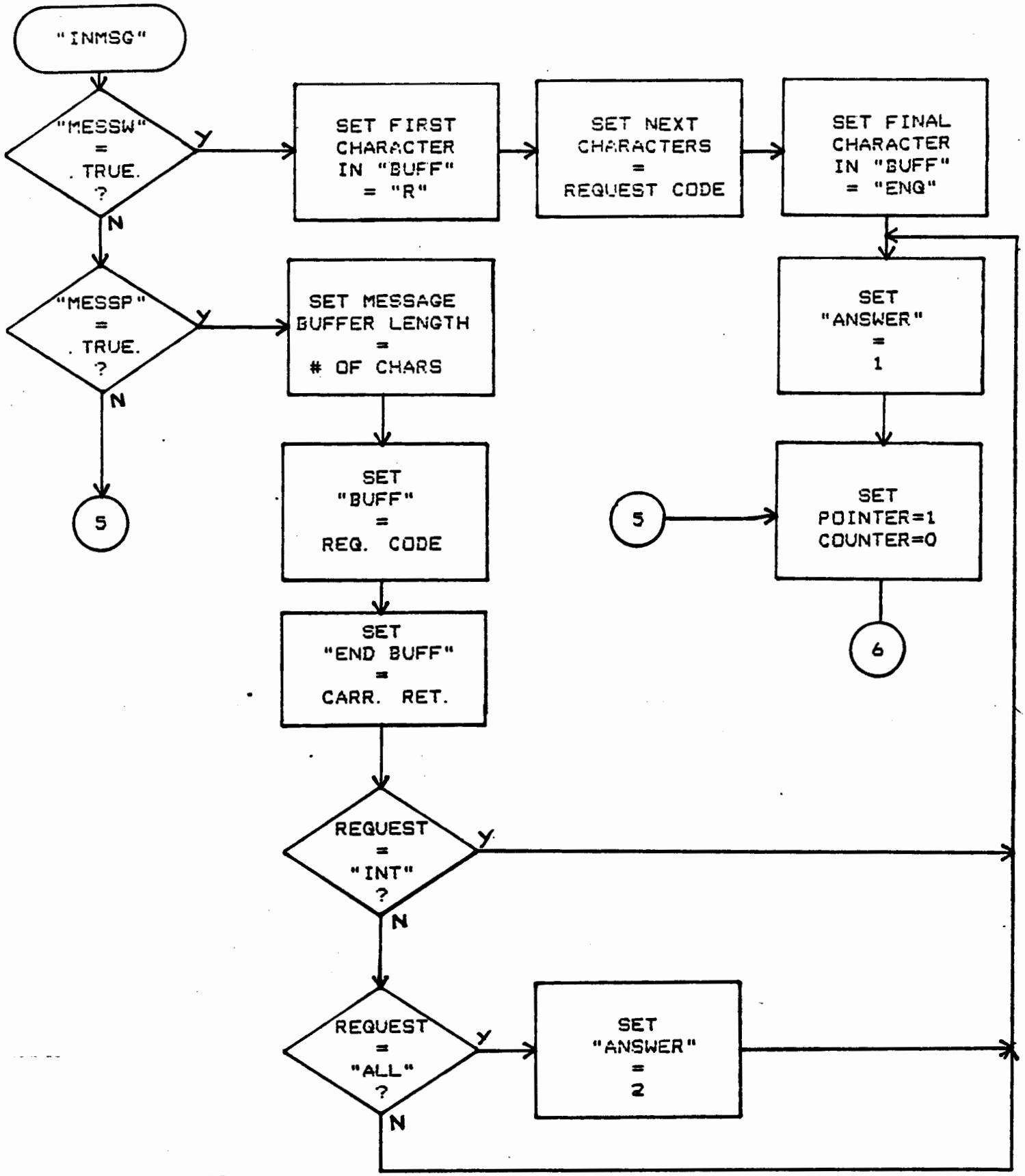

"END"
SET "OFILE"=.FALSE. (NO OPEN FILES)
"QUIT"
SET "CDFLG"=.FALSE. (COMMAND NOT DONE)
COMMAND = "END" ?
N
Y
CLOSE ALL DATA FILES
"HANG-UP" AUTO-DIAL MODEM
SET SITE FLAG =.FALSE.
REQUEST = 99 ?
Y
N
GET SYSTEM TIME & DATE
PRINT "SITE DIS-CONNECTED"
RETURN


"FILE"
IS "OFILE" .TRUE. ?
Y
PRINT "FILE CURRENTLY OPEN"
2
N
INPUT DATA FILE NAME
IS # OF CHARS > 10 ?
Y
SET FILE NAME = "FTN1.DAT"
N
OPEN FILE ON DISK USING NAME
PRINT NAME ON TTY SET "OFILE"=.TRUE.
2
SET "CDFLG"=.FALSE.
RETURN


"CLOSE"
IS "OFILE" .FALSE.
Y
PRINT "NO FILE OPEN"
N
WRITE END-OF-RECORD TO CURRENT FILE
CLOSE FILE
SET "OFILE" =.FALSE.
2


"PRINT"
SET "COMPLETE" =. TRUE.
IS "DIAL" =3 ?
Y
SET "MESSP" = . TRUE.
N
IS "DIAL" <3 ?
Y
N
IS "MESSC" <>2 ?
Y
N
DISCONNECT AUTO-DIAL MODEM
OUTPUT CONTENTS OF PRINTER BUFFER
SET "MESBUF" = . FALSE.
RETURN


"REQUEST"
DIAL = 1 ?
Y
SET SITE FLAG = .TRUE. (WASH. EL.)
SET "INMFLG" = .TRUE.
3
N
DIAL = 2 ?
Y
SET SITE FLAG = .FALSE. (WASH. AZ.)
N
DIAL = 3 ?
Y
INPUT SITE REQUEST CODE
SET "MESSP"=.TRUE. "INMFLG"=.TRUE.
4
N
DIAL = 4 ?
Y
SET SITE FLAG = .TRUE. (CLKB. EL.)
SET "MESSC"=.TRUE "INMFLG"=.FALSE
3
N
DIAL = 5 ?
Y
SET SITE FLAG = .FALSE. (CLKB. AZ.)
N
PRINT "ILLEGAL REQUEST"
4
3
INPUT SITE REQUEST
SET "CDFLG"= .FALSE.
CALL "INMSG"
RETURN


"INMSG"
"MESSW" = .TRUE. ?
Y
N
SET FIRST CHARACTER IN "BUFF" = "R"
SET NEXT CHARACTERS = REQUEST CODE
SET FINAL CHARACTER IN "BUFF" = "ENQ"
"MESSP" = .TRUE. ?
Y
N
SET MESSAGE BUFFER LENGTH = # OF CHARS
SET "ANSWER" = 1
5
SET "BUFF" = REQ. CODE
5
SET POINTER=1 COUNTER=0
6
SET "END BUFF" = CARR. RET.
REQUEST = "INT" ?
Y
N
REQUEST = "ALL" ?
Y
N
SET "ANSWER" = 2