

CHAPTER 4 MAINTENANCE

This chapter contains information pertinent to preventive maintenance, corrective maintenance, and troubleshooting techniques of the PDP-8/E.

SECTION 1 - PREPARATION FOR MAINTENANCE

4.1 EQUIPMENT

Table 4-1 lists the equipment and relevant specifications needed for maintenance of the basic PDP-8/E. Also included in the list is the equivalent equipment used by DEC Field Service personnel.

4.2 PROGRAMS

Table 2-4 in Chapter 2 lists the maintenance programs supplied by DEC for ascertaining proper PDP-8/E operation. To supplement these programs, there are eight short test routines detailed in the following paragraphs. These routines can be used, as needed, to perform the required maintenance.

NOTE

All diagnostics require a Programmer's Console, a working Teletype and at least 4K memory with the basic system.

4.2.1 TTY Receiver Test

Perform the following test to display a character (any character depressed on keyboard or read from paper tape) in the ac. Load address 0000 and deposit the following test routine in sequence:

Location	Contents
0000	6032
0001	6031
0002	5001
0003	6036
0004	5001

Load address 0000 and press CONT.

**Table 4-1
Maintenance Equipment**

Equipment	Specifications	Equivalent
Multimeter	10kΩ/V minimum	Triplet Model 310
Oscilloscope	dc to 50 Hz with calibrated deflection factors from 5 mV to 10V/div. Maximum horizontal sweep rate of 0.1 μs/div. Delaying sweep is desirable and dual trace is a necessity.	Tektronix Type 453
Probes	X10 with response characteristics matched to oscilloscope.	Tektronix Type P6010
Recessed Probe Tip (2)		Tektronix
Ground Leads (for each probe)		Tektronix
Integrated Circuit Pin Extender	AP Inc	DEC 29-10246
Double-Height Extender (2)		W984
Edge Connector Extender Cables (2)		BC08M-OM
Light Bulb Extractor		DEC 12-9151
Tool Kit		DEC Type 142
Black Spray Paint		DEC 120-68
White Spray Paint		DEC 120-94
Jumper Wire		30-Gauge with TERMINAL Connections
Silicone Grease		Dow Corning Compound
1/16 in. Allen Wrench		Hunter 4Z 035
Single-Height Extender Module (1)		W980

4.2.2 TTY Transmitter Test

Perform the following test to print the character in the Switch Register (bits 04—11). Load address 0000 and deposit the following test routine in sequence:

Location	Contents
0000	7604
0001	6046
0002	6041
0003	5002
0004	5000

Load address 0000 and press CONT. To print a different character, change the contents of the Switch Register.

4.2.3 Echo Test

Perform the following test to type a character on the keyboard. Load address 0000 and deposit the following test routine in sequence:

Location	Contents
0000	6032
0001	6031
0002	5001
0003	6036
0004	6046
0005	6041
0006	5005
0007	5001

Load address 0000 and press CONT. Type any character on the keyboard and observe a corresponding echo return on the printer.

4.2.4 Print Test

Perform the following test to print all characters. Load address 0000 and deposit the following test routine in sequence:

Location	Contents
0000	7001 /Increment ac
0001	6046 /Load buffer and print
0002	6041 /Skip if flag is set
0003	5002 /JMP .- 1
0004	5000 /JMP 0

Load address 0000 and press CONT.

4.2.5 Deposit SR into Corresponding Address

Perform the following test to deposit the contents of the Switch Register into the corresponding address. Load address 0000 and deposit the following test routine in sequence:

Location	Contents
0000	7604
0001	3005
0002	1005
0003	3405
0004	5000

Load address 0000, change SR to any number equal to or greater than 5, and press CONT.

4.2.6 4K Core Transfer (8K or more systems only)

Perform the following test to test the relocation process. Load address 7600 and deposit the following routine in sequence:

Location	Contents
7600	6201 /Change data field to 0 (specifies source field)
7601	1670 /TAD I 7670
7602	6211 /Change data field to 1 (specifies destination field)
7603	3670 /DCA I 7670
7604	2270 /Increment LOC 7670
7605	5300 /JMP .-5
7606	7402 /Halt when transfer complete
7670	0000

Load address 7600 and press CONT. This routine can also be used to relocate diagnostic programs from one field to the other.

4.2.7 Write All Zeros

Perform the following test to write 0s in all address locations except some locations already occupied by the program. Load address 0004 and deposit the following test routine in sequence:

Location	Contents
0004	1007
0005	3410
0006	5004
0007	0000
0010	0011

Load address 0004 and press CONT. Computer will hang-up and all addresses will contain 0s, except locations occupied by the program. Note: addresses 0004 and 0005 will contain 0s after one program pass.

To write any other word, repeat the same procedures but change address 0007 to the desired word.

SECTION 2 - PREVENTIVE MAINTENANCE

4.3 PREVENTIVE MAINTENANCE INSPECTIONS

This section provides information for performing preventive maintenance inspections. This information consists of visual, static, and dynamic tests that provide better equipment reliability. Preventive maintenance consists of procedures that are performed prior to the initial operation of the computer and periodically during its operating life. These procedures include visual inspections, cleaning, mechanical checks, and operational testing. A log should be kept to record specific data that indicates the performance history and rate of deterioration; such a record can be used to determine the need and time for performing corrective maintenance on the system.

Scheduling of computer usage should always include specific time intervals that are set aside for scheduled maintenance purposes. Careful diagnostic testing programs can then reveal problems which may only occur intermittently during on-line operation.

4.4 SCHEDULED MAINTENANCE

The PDP-8/E must receive certain routine maintenance attention to ensure maximum life and reliability. Digital Equipment Corporation suggests the maintenance schedule defined in Table 4-2.

Table 4-2
Processor Preventive Maintenance Schedule
(3 months or 500 hours)

Type	Action
Cleaning	<ul style="list-style-type: none">a. Clean the exterior and interior of the computer cabinet, using a vacuum cleaner and/or clean cloths moistened in nonflammable solvent.b. Clean the air filter. Use a vacuum cleaner to remove accumulated dirt and dust, or wash with clean hot water and thoroughly dry before using.
Lubricate	<ul style="list-style-type: none">a. Lubricate slide mechanisms and casters with a light machine oil or powdered graphite. Wipe off excess oil.
Inspect	<ul style="list-style-type: none">a. Visually inspect equipment for general condition. Repaint any scratched areas.b. Inspect all wiring and cables for cuts, breaks, fraying, wear, deterioration, kinks, strains, and mechanical security. Tape, solder, or replace any defective wiring or cable covering.c. Inspect the following for mechanical security: key switches, control knobs, lamps, connectors, transformers, fans, capacitors, etc. Tighten or replace as required.d. Inspect all module mounting panels to ensure that each module is securely seated in its connector. Remove and clean any module that may have collected excess dirt or dust.