AUTOMATIC MESSAGE ACCOUNTING RECORDING CENTER NO. 1A AMARC (PHASE III) DEC DIAGNOSTIC PROGRAM DESCRIPTION

CONTENTS

1. GENERAL INFORMATION

1.1 The purpose of this section is to describe the minimum DEC Diagnostic programs to be performed in order to verify the operation of the processor cabinet, tape cabinet, memory cabinet, disk drive and asynchronous channel cabinet as a subsystem. Both subsystems are to be verified separately using the tests described in this section (or equivalent tests). The Western Electric Installer and the supplier representative will jointly perform the verification. Successful completion of the DEC diagnostics given in this section (or equivalent DEC programs)can be used as a basis for acceptance of each subsystem. It is advisable that the WECo installer use this testing to become familiarized with the operational procedures of DEC diagnostics since at a later date these tests may have to be re-performed. This section will describe the nature of each DEC Diagnostic program (or equivalent) to be performed and the expected results of successful testing. At a later time when a specific device in the subsystem is suspected to be faulty, this section can be used as a guide to what DEC Diagnostic program is to be used for isolating failures.

1.2 Dec Diagnostic programs function similiarly to Installation test programs for No. 2 ESS (e.g., X-RAYS). Upon start of execution, the program will keep testing until the end has been reached or a fault has been detected. A number of options are present to handle error reporting. The following paragraph describes the general method of DEC Diagnostics. If any particular Diagnostic operates in a special or abnormally fixed manner, this manner will be described in Paragraph 4.

1.3 Since the AMARC minicomputer configuration is fully duplicated, the tests listed in Paragraph 4 will be repeated for each central processor and its associated peripheral devices (TTY), manetic tape drive, etc.).

1.4 Do not alter or modify any DEC circuitry until after acceptance of equipment has been made. Do not make any cable connections to the WECo cabinets until DEC diagnostic tests have been completed.

1.5 The programs listed in Paragraph 4 are not necessarily in the order to be performed.

2. EQUIPMENT REQUIRED

2.1 All material required when performing the DEC Diagnostic tests is either shipped with the equipment or brought by the Supplier representative. All printed material (schematics, program listings, DEC handbooks, and magnetic tapes) and miscellaneous small hardware received with the DEC equipment should be stored conveniently near the minicomputer.

3. TRDP PACKAGE

3.1 TRDP Description

The TRDP package provides the PDP-11 family diagnostic programs. They can be loaded via the M9301-SN Bootstrap module. Refer to TRDP User Manual for diagnostic package media.

3.2 TRDP CONTENTS

3.21 MONITOR

The monitor provides the means to load programs under keyboard control, to obtain a directory of contents of the TRDP medium, and to make up "Chains" of programs to be run sequentially under "Chain Mode".

3.22 PDP-11/70 Family Diagnostic Programs

The TRDP package contains all diagnostics that are needed for the No. 1A AMARC system configuration.

4. PDP-11/70 STAND ALONE DIAGNOSTICS

4.1 CPU Tests

4.11 Basic Instruction Test

This test consists of a logically sequenced set of instruction tests designed to verify the integrity of those instructions and logic operations.

4.12 Adavanced Instruction and Miscellaneous Logic Test

This test consists of a logically sequenced set of instruction tests followed by a set of miscellaneous logic tests. The instruction tests complete the test of the PDP 11/70 instruction repertoire. The logic tests verify:

a) the internal registers
b) register set 1
c) internal interrupts
d) bus request levels 4, 5, 6
e) internal traps and aborts
f) other mode selection
g) external traps and aborts

4.13 Cache Diagnostic Parts I and II

The aim of this test is to detect and report failing components of the CACHE unit. Part I is designed to test the Cache Control Board and the Cache Data Paths Board; Part II is designed to test the Cache Address Memory Board and the Cache Data Memory Board. Both programs should be run, Part I before Part II.

4.14 Memory Management Diagnostic

This program will test all of the Memory Management logic.

4.15 Unibus Map Diagnostic

This program will detect all errors that originate with the Unibus Map.

4.16 Power-fail Test

This program is made up of 16 subtests to check out the power fail on the 11/70. The 2 msec. power down and power up time is checked on each power fail.

4.17 11/70 Instruction Exerciser

This program executes each instruction in all address modes and includes tests for traps and the TTY interrupt sequence.

4.2 PDP-11/70 Memory Test

This test verifies that each address is unique and that each memory location can be read/written under worst case noise tests.

4.3 Peripheral Tests

4.31 TR79F (C.S.S.) Diagnostic

This program was specially developed for the AMARC system. It will test the operation of the Hewlett Packard tape drive (H.P. 7970E) and Digital Equipment Corporation's tape drive controller (TR79F). The test is divided into six sections:

a) Manual operations

b) Logic test with minimum tape motion

c) Logic test with tape motion near load area

d) Reliability test with continuous tape motion over the entire tape area.

e) Read operation of data written in previous test (d).

f) Maintenance tests.

If errors occur in tests (d) and (e), quality of magnetic tape should be suspect. (Tape used should be certified for 1600 bpi.) Verify with the supplier's representative that the addresses, vector address, and priority assignments are properly wired per Table A.

4.32 RP06 Disk Drive

4.321 RH70 Controller Diagnostic

This test checks the controller.

4.322 RP06 Diskless Controller Test

This program tests the RH70 and the device control logic portion of the drive. The program does not use the disk surface or any signals from the mass device level interface.

4.323 RP06 Functional Controller Test

This tests the device control logic portion of the drive. It exercises the disk surface and the mechanics of the drive to prove proper operation of the subsystem.

4.324 RP06 Mechanical and Read/Write Test

Tests 0 through 6 use a Read Header and Data Command to read the cylinder, track, and sector information from the header; the tests then check the information for validity, ensuring that the seek operation functions properly. Tests 7 through 12 measure the rotational speed, the one-cylinder seek, the average seek, and the maximum seek times to ensure that they are all within the specified tolerances. Tests 13 and 14 ensure that the sector and track addressing circuitry is working properly. Test 15 ensures that the data storage and retrieval capabilities are operative. Test 16 is used to stress and check the read/write and servo system. Test 17 performs all possible seek operations and verifies that the cylinder difference calculation is correct for all possible combinations of cylinders. Test 20 verifies that the drives positioner is not drifting off cylinder after the on cylinder indication has been set. Test 21 performs a series of random seeks with the position verified immediately after the seek has completed.

4.325 RP06 Multidrive Exerciser

This exercises one to eight Disk Drives. All data transfer commands are used as well as Write-Check Data and Write-Check Header and Data Commands.

4.326 RP06 Formatter Program

This program is designed to write and verify header and data information on all possible disk pack addresses with the intention of testing the retention of the recording surfaces.

4.327 RP06 Head Alignment Verification Program

This program checks head alignment of the RP06 disk drives. The program requires the head alignment test box be connected to the drive under test and that the alignment disk pack be mounted.

4.33 DZ11 Diagnostic

The function of the DZ11 diagnostic is to verify operation according to specifications and for proper operation in its acutal environment. Test parameters can be supplied to the program by inputs from the user on the console. Switch 00 on the console must be set to enter user's parameters from the console. **Make sure the EIA driver test is run.

4.34 DMC11

4.341 Microprocessor Basic W/R and Up Test

The microprocessor is checked as a stand-alone module apart from the line unit.

4.342 Line unit DDCMP Test

This tests the line unit module in the DDCMP Protocol.

4.343 Line Unit Bit Stuff Test

This tests the line unit module under Bit Stuff protocol.

4.344 Jump and Free Running Test

This test verifies correct line unit/microprocessor operation. The diagnostic also tests the microcode and BRANCH instructions.

4.35 DR11-C Device Register Test

This test verifies the DR11-C. Jumpers are required to perform this test.

4.36 KG11-A Device Test

This test verifies the CRC computations are done properly.

4.37 KW11-P Test

The KW11-P test program is divided into two parts:

a) Basic test consisting of register, buffer and interrupt tests. The TTY bell will ring on completion of a pass and failures will be reported via TTY.

b) The Timing Test will ring the TTY bell every 10 seconds using all frequencies possible.

NOTE: The KW11-P Diagnostic does not check the crystal rate of this device. Faulty or wrong crystals may not be detected using this diagnostic. Since these crystals are used for system timing, verify with the supplier's representative that correct crystals were shipped and, if possible, verify signal rate from crystals. AMARC uses the 100KHZ crystal signal for all system timing.

4.38 DN11 Dialex

The DN11-DA's are interface circuitry to the Bell System's 801 Automatic Calling Units (ACU). These interfaces (one or two may be present) should be tested using DN11 Dialex program. Also verify with the supplier's representative that the addresses, vector address and priority assignment are properly wired per Table A. (Refer to J1P040 specifications.)

NOTE: The M970 board must have appropriate straps cut. (All straps cut except 301 and EIA).

4.39 DL11-WB

The DL11-WB is a single asynchronous serial line interface and real-time line frequency clock. The single asynchronous serial line interface diagnostic tests exercise the Teletypewriter. The real-time line frequency clock diagnostics test the individual functions and characteristics of the Line Frequency Clock.

5. PDP-11/70 SYSTEM TEST

5.1 DEC/X11

This is a comprehensive software system that provides interactive hardware system exerciser programs. The program must be configured for this AMARC system. Verify that the DEC/X11 Exerciser has been configured for this AMARC system.

5.2 Operating Procedure

5.21 The DEC/X11 Exerciser is controlled by means of keyboard commands and the switch register. The following register options apply:

SR15=1 Drop module after error.
SR14=1 Inhibit dropping module after 20 errors, if set to a 0, the monitor will drop the module after the 20th error.
SR13=1 Inhibits error and module message printouts.
SR12=1 Enables END OF PASS printouts.
SR10=1 Report all data errors.

5.22 Typing MAP and CR results in the monitor typing a list of resident modules with their PC and STATUS.

5.23 The SEL(ECT) Command is used to enable to run one module or all modules.

5.24 The DES(ELECT) Command is used to disable one module from running, or all modules from running.

5.25 The MOD(IFY) Command is used to examine and/or modify the contents of storage.

5.26 The RUN Command starts the exerciser running.

5.27 The RUNL Command inhibits the periodic relocation of the program.

5.28 Normally the exerciser runs indefinitely. The operator types CTRL C to stop all modules and types a RUN SUMMARY to indicate the modules that ran, the number of passes made by each module and the number of errors detected by each module.

5.3 Errors

5.31 System Error: A SYS ERR printout occurs whenever a bus error trap or a reserved trap occurs.

5.32 Error Printout: Test modules indicate errors other than a data error by means of the error printout.

5.33 Data Error Printout: Test modules report data errors by means of a data error printout.

5.34 Memory Management Abort Halt: The monitor clears the Memory Management Enable bit and halts.

5.4 Normal Printouts

5.41 ENDPAS: This is used by a module to indicate a pass has completed.

5.42 Dropped: A module is dropped and is not used to execute for the remainder of the exerciser run. It is caused by errors; or due to an abnormal condition, it decides that is is best to drop the module from execution.

5.43 Run Summary: Occurs at the end of an exerciser run; indicates the modules that participated in the exerciser run the number of passed made, and the number of errors made.

5.44 Rotation Enabled: Occurs when there is sufficient free core to permit reassigning the write buffer address.

5.45 Power Failure: Occurs upon restart from power failure.

5.46 Memory Management Enabled: Memory Management is allowed.

5.47 Relocated to XX000: Monitor program will relocate the entire program throughout memory.

ATTACHMENT
Table A on Page 6 & 7

Arrowed Lines indicate new
or changed information.

Manager, Product Engineering
Control Center

Reason for Reissue:
DL11 switch settings for Generic 4.

TABLE A

PERIPHERAL	NO. OF DEVICES	DESIG	DEVICE ADDRESS	VECTOR ADDRESS	BR LEVEL
DMC11-AL (See Note 2)	1	PTPM	760070-760077	520 & 524	7
DZ11-B	6-14	1DZ11B-TTY	760330-760336	550	5
		0DZ11B-TTY	760340-760346	560	5
		MUX00	760350-760356	570	5
		MUX01	760360-760366	600	5
		MUX02	760370-760376	610	5
		MUX03	760400-760406	620	5
		MUX04	760410-760416	630	5
		MUX05	760420-760426	640	5
		MUX06	760430-760436	650	5
		MUX07	760440-760446	660	5
		MUX10	760450-760456	670	5
		MUX11	760460-760466	700	5
		MUX12	760470-760476	710	5
		MUX13	760500-760506	720	5
TR79-FA (NOTE 4)	1	TAP	764000-764006	170	5
DR11-C	3	0DR11C-SA	767740-767744	420	5
		1DR11C-SA	767730-767734	430	5
		DR11C-TTY	767720-767724	440	5
KG11-A	1	CAU	770700-770704	-	-
KW11-P	1	PC	772540-772544	104	6
M9301-SN (See Note 1)	1	PTB	773000-773776	-	-
			765000-765776	-	-
DN11-DA (See Note 3)	2-16	DU0	775200	310	4
		DU1	775202	310	4
		DU2	775204	310	4
		DU3	775206	310	4
		DU4	775210	314	4
		DU5	775212	314	4
		DU6	775214	314	4
		DU7	775216	314	4
		DU10	775220	320	4
		DU11	775222	320	4
		DU12	775224	320	4
		DU13	775226	320	4
		DU14	775230	324	4
		DU15	775232	324	4
		DU16	775234	324	4
		DU17	775236	324	4
RH70	1	CONT	776700-776752	254	5
DL11-WB (NOTE 5)	1	TCO	777560-777566	60 & 64	4
			777546	100	6

NOTE 1: The micro switch settings should be set to 176 to cause the system to enter the No. 1A AMARC power fail routine as specified in vector 24 after running primary CPU diagnostics (Refer to NOTE 307 of SD-5P006-01).

NOTE 2: Option switches should be set for full duplex transmission. Switch on the DMC11-MA line unit associated with remote load detect and down line loading should be set to trigger the PDP11/70 to begin executing a program in M9301-SN bootstrap to boot DMC11 unit 0 without diagnostics. In particular the three switches on DMC11-MA shall have the following settings (Refer to NOTE 308 of SD-5P006-01):

SWITCH PACK	LOCATION	SWITCH SETTING	
		BY SWITCH	OCTAL
1	E29	ALL SW OFF	377
2	E90	SW1 - SW7 ON SW8 OFF	001
3	E91	SW1 - SW6 OFF SW7 - SW8 ON	374

NOTE 3: The M970 board must have all straps cut except 301 and EIA.

NOTE 4: The Control and Status PC assembly circuit pack in the TR79 tape drive unit must have its 'W1' strap connected to the punching labeled 'OFF'. The Write Formatter circuit pack in the TR79 tape drive unit must have its strap, connected to the circuit pack designation of '2', be connected to the punching labeled '4'.

NOTE 5: For Generic 3, set up for 300 BAUD.
Switch Pack 4 - Switch 10 'ON'.
Switch Pack 3 - Switches 3 and 5 'ON'.
- Switches 1, 2, and 4 'OFF'.
For Generic 4 and later, set up for 1200 BAUD.
Switch Pack 4 - Switch 10 'ON'.
Switch Pack 3 - Switches 1 and 5 'ON'.
- Switches 2, 3, and 4 'OFF'.