DHV11-M

DHV11-M FUNC TST PT 1
CVDHAC0

AH-T653C-MC
1 OF 1 JUL 1985
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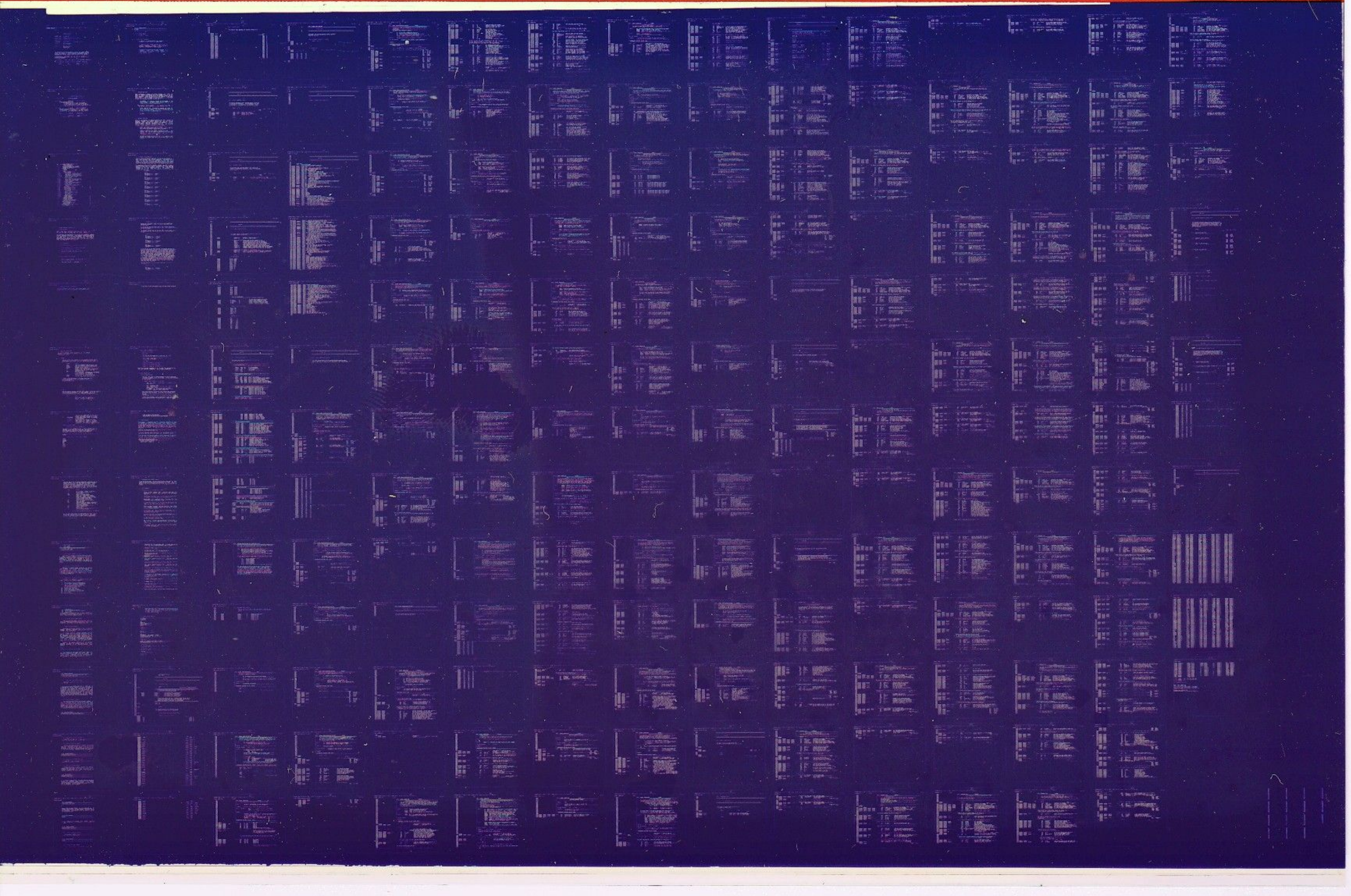

```
4 ↑2 W
A ;;                                                                    SEQ 000
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CVDHACO DHV11-M FUNC TST PART 1 MACRO Y05.02  Monday 01-Apr-85 07:47  Page 2
PROGRAM DOCUMENT

                .REM &


                                IDENTIFICATION
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                PRODUCT CODE:   AC-T652C-MC

                PRODUCT NAME:   CVDHACO DHV11-M FUNC TST PART 1

                PRODUCT DATE:   29 MARCH 1985

                MAINTAINER:     Bruce Ribolini - MK Diagnostics Group

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                                Anthony Hart
                                Peter ONeil



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PROGRAM DOCUMENT

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                        ***** MODIFICATION HISTORY *****

Original release:       31-OCT-83 (EDITED 11-JUL-83)
                        Bert Kleinschmidt

Version B0              09-OCT-83       Bert Kleinschmidt
        Fixed typographical errors.
        Moved test from CVDHB (Part 2) into this program:
                Old CVDHB (version A) tests 2 through 8 are
                now New CVDHA (version B) tests 20 through 26.
        Modified test 13 (Selftest Fail Test) to allow use of CVDHA
                in manufacturing with version 0 DHV ROM code.

Version C0              17-JUL-84       Bert Kleinschmidt
        Modified control of processor priority throughout the
        program to maintain priorities of 5 or lower to allow
        LTC interrupts.  This guarantees a less than 2 second
        responce to a Break request while running under APT.

 Version C0              9-SEP-84        PETER ONEIL
        Modified cleanup code to turn off clock if it was turned on.

                        29-MAR-85       Howard Marshall
        Did formal release of version CVDHACO.
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TABLE OF CONTENTS

1.0 GENERAL PROGRAM CONSIDERATIONS

1.1 PROGRAM ABSTRACT

CVDHA is part one of the DHV11-M functional verification test. This part of the test verifies that the reset, register access, and interrupt functions of the board are functioning correctly.

THIS DIAGNOSTIC HAS BEEN WRITTEN FOR USE WITH THE DIAGNOSTIC RUNTIME SERVICES SOFTWARE (SUPERVISOR). THESE SERVICES PROVIDE THE INTERFACE TO THE OPERATOR AND TO THE SOFTWARE ENVIRONMENT. THIS PROGRAM CAN BE USED WITH XXDP+, ACT, APT, SLIDE AND PAPER TAPE. FOR A COMPLETE DESCRIPTION OF THE RUNTIME SERVICES, REFER TO THE XXDP+ USER'S MANUAL. THERE IS A BRIEF DESCRIPTION OF THE RUNTIME SERVICES IN THE OPERATING INSTRUCTIONS-COMMANDS OF THIS DOCUMENT.

1.2 SYSTEM REQUIREMENTS

The following hardware is required to run the DHV FVT:

- LSI-11 processor with at least 32 Kbytes of RAM.
- DHV11 boards installed on the Q-bus.
- Appropriate program load device supporting XXDP+ media or a down-line loading system.

1.3 RELATED DOCUMENTS AND STANDARDS

- DHV11-M Hardware Manual - This manual describes the functions and uses of the DHV11-M device.
- XXDP+ User's Manual - Describes the running of diagnostics under the XXDP+ monitor.

PROGRAM DOCUMENT

1.4 DIAGNOSTIC HIERARCY PREREQUISITES

The LSI-11 processor, the Q-BUS, the system memory, the console terminal, and the load media are assumed to have been tested and found working before this program is run.

2.0 OPERATING INSTRUCTIONS

THIS SECTION CONTAINS A BRIEF DESCRIPTION OF THE RUNTIME SERVICES. FOR DETAILED INFORMATION, REFER TO THE XXDP+ USER'S MANUAL (CHQUS).

2.1 COMMANDS

THERE ARE ELEVEN LEGAL COMMANDS FOR THE DIAGNOSTIC RUNTIME SERVICES (SUPERVISOR). THIS SECTION LISTS THE COMMANDS AND GIVES A VERY BRIEF DESCRIPTION OF THEM. THE XXDP+ USER'S MANUAL HAS MORE DETAILS.

COMMAND	EFFECT
START	START THE DIAGNOSTIC FROM AN INITIAL STATE
RESTART	START THE DIAGNOSTIC WITHOUT INITIALIZING
CONTINUE	CONTINUE AT TEST THAT WAS INTERRUPTED (AFTER ↑C)
PROCEED	CONTINUE FROM AN ERROR HALT
EXIT	RETURN TO XXDP+ MONITOR (XXDP+ OPERATION ONLY!)
ADD	ACTIVATE A UNIT FOR TESTING (ALL UNITS ARE CONSIDERED TO BE ACTIVE AT START TIME
DROP	DEACTIVATE A UNIT
PRINT	PRINT STATISTICAL INFORMATION (IF IMPLEMENTED BY THE DIAGNOSTIC - SEE PERFOMANCE AND PROGRESS REPORTS SECTION OF THIS DOCUMENT)
DISPLAY	TYPE A LIST OF ALL DEVICE INFORMATION
FLAGS	TYPE THE STATE OF ALL FLAGS (SEE FLAGS SECTION)
ZFLAGS	CLEAR ALL FLAGS (SEE FLAGS SECTION)

A COMMAND CAN BE RECOGNIZED BY THE FIRST THREE CHARACTERS. SO YOU MAY, FOR EXAMPLE, TYPE "STA" INSTEAD OF "START".
MORE INFORMATION CAN BE FOUND WITHIN THE SECTION LABELLED EXTENDED COMMAND SYNTAX

2.2 SWITCHES

THERE ARE SEVERAL SWITCHES WHICH ARE USED TO MODIFY SUPERVISOR OPERATION. THESE SWITCHES ARE APPENDED TO THE LEGAL COMMANDS. ALL OF THE LEGAL SWITCHES ARE TABULATED BELOW WITH A BRIEF DESCRIPTION OF EACH.
IN THE DESCRIPTIONS BELOW, A DECIMAL NUMBER IS DESIGNATED BY "DDDDD".

SWITCH	EFFECT
/TESTS:LIST	EXECUTE ONLY THOSE TESTS SPECIFIED IN THE LIST. LIST IS A STRING OF TEST NUMBERS, FOR EXAMPLE - /TESTS:1:5:7-10.

```
                                THIS LIST WILL CAUSE TESTS 1,5,7,8,9,10 TO
                                BE RUN.  ALL OTHER TESTS WILL NOT BE RUN.
                /PASS:DDDDD     EXECUTE DDDDD PASSES (DDDDD = 1 TO 64000)
                /FLAGS:FLGS     SET SPECIFIED FLAGS.SEE THE FLAGS SECTION
                                OF THIS DOCUMENT.
                /EOP:DDDDD      REPORT END OF PASS MESSAGE AFTER EVERY
                                DDDDD PASSES ONLY.  (DDDDD = 1 TO 64000)
                /UNITS:LIST     TEST/ADD/DROP ONLY THOSE UNITS SPECIFIED
                                IN THE LIST.  LIST EXAMPLE - /UNITS:0:5:10-12
                                USE UNITS 0,5,10,11,12 (UNIT NUMBERS = 0-63)

EXAMPLE OF SWITCH USAGE:

        START/TESTS:1-5/PASS:1000/EOP:100

THE EFFECT OF THIS COMMAND WILL BE: 1) TESTS 1 THROUGH 5 WILL BE
EXECUTED, 2) ALL UNITS WILL TESTED 1000 TIMES AND 3) THE END OF
PASS MESSAGES WILL BE PRINTED AFTER EACH 100 PASSES ONLY.  A
SWITCH CAN BE RECOGNIZED BY THE FIRST THREE CHARACTERS.  YOU MAY,
FOR EXAMPLE, TYPE "/TES:1-5" INSTEAD OF "/TESTS:1-5".

BELOW IS A TABLE THAT SPECIFIES WHICH SWITCHES CAN BE USED BY EACH
COMMAND.

          TESTS   PASS    FLAGS   EOP     UNITS
          ------------------------------------
START       X       X       X       X       X
RESTART     X       X       X       X       X
CONTINUE            X       X       X
PROCEED                     X
DROP                                        X
ADD                                         X
PRINT
DISPLAY                                     X
FLAGS
ZFLAGS
EXIT
```

2.3 FLAGS

FLAGS ARE USED TO SET UP CERTAIN OPERATIONAL PARAMETERS SUCH AS LOOPING ON ERROR. ALL FLAGS ARE CLEARED AT STARTUP AND REMAIN CLEARED UNTIL EXPLICITLY SET USING THE FLAGS SWITCH. FLAGS ARE ALSO CLEARED AFTER A START COMMAND UNLESS SET USING THE FLAG SWITCH. THE ZFLAGS COMMAND MAY ALSO BE USED TO CLEAR ALL FLAGS. WITH THE EXCEPTION OF THE START AND ZFLAGS COMMANDS, NO COMMANDS AFFECT THE STATE OF THE FLAGS; THEY REMAIN SET OR CLEARED AS SPECIFIED BY THE LAST FLAG SWITCH.

FLAG	EFFECT
HOE	HALT ON ERROR - CONTROL IS RETURNED TO RUNTIME SERVICES COMMAND MODE
LOE	LOOP ON ERROR
IER*	INHIBIT ALL ERROR REPORTS
IBR*	INHIBIT ALL ERROR REPORTS EXCEPT FIRST LEVEL (FIRST LEVEL CONTAINS ERROR TYPE, NUMBER, PC, TEST AND UNIT)
IXR*	INHIBIT EXTENDED ERROR REPORTS (THOSE CALLED BY PRINTX MACRO'S)
PRI	DIRECT MESSAGES TO LINE PRINTER
PNT	PRINT TEST NUMBER AS TEST EXECUTES
BOE	"BELL" ON ERROR
UAM	UNATTENDED MODE (NO MANUAL INTERVENTION)
ISR	INHIBIT STATISTICAL REPORTS (DOES NOT APPLY TO DIAGNOSTICS WHICH DO NOT SUPPORT STATISTICAL REPORTING)
IDR	INHIBIT PROGRAM DROPPING OF UNITS
ADR	EXECUTE AUTODROP CODE
LOT	LOOP ON TEST
EVL	EXECUTE EVALUATION (ON DIAGNOSTICS WHICH HAVE EVALUATION SUPPORT)

*SEE THE ERROR INFORMATION SECTION OF THIS DOCUMENT.

SEE THE XXDP+ USER'S MANUAL FOR MORE DETAILS ON FLAGS. YOU MAY SPECIFY MORE THAN ONE FLAG WITH THE FLAG SWITCH. FOR EXAMPLE, TO CAUSE THE PROGRAM TO LOOP ON ERROR, INHIBIT ERROR REPORTS AND TYPE A "BELL" ON ERROR, YOU MAY USE THE FOLLOWING STRING:

```
/FLAGS:LOE:IER:BOE
```

2.4 EXTENDED COMMAND SYNTAX

2.4.1 START COMMAND -

```
****************************************************************
STA(RT)/TESTS:<TEST-LIST>/PASS:<PASS-CNT>/FLAGS:
   <FLAG-LIST>/EOP:<INCR>
****************************************************************
```

2.4.1.1 Tests Switch (/TESTS:<TEST-LIST>) -

<TEST-LIST> Is a sequence of decimal numbers (1:2 etc.) or ranges of decimal numbers (1-5:8-10 etc.), seperated by colons, that specify the tests to be executed.Tests will be executed in numerical order regardless of the order of specification. The default is to execute all tests. On this and all switches, the angle brackets <> are punctuation used in the definition only, and are not to be typed by the operator. See example at end of "Effect of Start Command" section.

2.4.1.2 Pass Switch (/PASS:<PASS-CNT>) -

<PASS-CNT> Is a decimal number indicating the desired number of passes. A pass is defined as the execution of the full diagnostic (all selected tests).The default is non-ending execution. In this case, exit from the program is accomplished either by typing a control/C or by occurance of an error with the halt on error flag being set. The exit is a return to command mode. See example at end of "Effect of Start Command" section.

2.4.1.3 Flags Switch (/FLAGS:<FLAG-LIST>) -

<FLAG-LIST> is a sequence of elements of the form <FLAG>, <FLAG=1>, or <FLAG=0>, separated by colons, where <FLAG> has one of the following values:

HOE	Halt on error, causing command mode to be entered when an error is encountered.
LOE	Loop on error, causing the diagnostic to loop continuously within the smallest defined block of coding (segment, subtest, or test) containing the error.
IER	Inhibit error reporting.
IBE	Inhibit basic error reports.
IXE	Inhibit extended error reports.
PRI	Direct all messages to a line printer.
PNT	Print number of test being executed.
BOE	Bell on error.
UAM	Run in unattended mode, bypassing manual

intervention.
ISR Inhibit statistical reports.
IDU Inhibit dropping of units by diagnostic.
LOT Loop on test.
The flags named or equated to 1 are set, those equated to 0 are cleared. A flag not specified is cleared. If the flags switch is not given all flags are cleared. See example at end of "Effect of Start Command" section.

2.4.1.4 End Of Pass Switch (/EOP:<INCR>) -

<INCR> Is a decimal number indicating how often (in terms of passes) it is desired that the end of pass message be printed. The default is at the end of every pass. See example at end of "Effect of Start Command" section.

2.4.1.5 Effect Of Start Command -

The effect of the start command is to initiate the hardware parameter dialogue, the software parameter dialogue, the initialization questions, and then the diagnostic commences testing.

The hardware parameter dialogue commences with the question "# UNITS (D) ?" to which the operator should reply with the number of units to be tested. Following this are the questions whereby the P-Tables themselves are built. Each P-Table is a core-resident table containing all the hardware information for one complete unit.Each question is followed by the response radix (D for decimal, B for binary, O for octal, L for Yes/No) in parentheses and the default value after the parentheses. For the actual Hardware P-Table questions see the "Hardware Parameters" section.

Following the hardware questions are the software questions to build the software tables, which define operating parameters of the diagnostic program. These Questions are described in the "Software Parameters" section.

EXAMPLE:

STA/TESTS:1:3-4:/PASS:3/FLAGS:IER:HOE=1

This command will cause three passes to be made, with each pass consisting of tests 1,3, and 4. There is no difference between saying <FLAG> and saying <FLAG=1>. The notation <FLAG=0> is meaningful only on a command other than start to clear a flag that was previously set. Note that on all commands only the first three letters are scanned.

2.4.2 Restart Command -

```
**************************************************************
RES(TART)/TESTS:<TEST-LIST>/PASS:<PASS-CNT>/FLAGS:
   <FLAG-LIST>/UNITS:<UNIT-LIST>
**************************************************************
```

2.4.2.1 Tests, Pass, And Flags Switches -

<TEST-LIST>, <PASS-CNT>, and <FLAG-LIST> are as in the start command.

2.4.2.2 Units Switch (/UNITS:<UNIT-LIST>) - <UNIT-LIST> IS A SEQUENCE OF DECIMAL NUMBERS (0,1 ETC.) OR RANGES OF DECIMAL NUMBERS (0-5, 8-10 ETC.) THAT SPECIFY THE UNITS TO BE TESTED. THE NUMBERS ARE SEPARATED BY COLONS. THE NUMBERS MAY RANGE FROM 0 THRU N-1 (N IS THE NUMBER OF UNITS SPECIFIED IN THE PREVIOUS START COMMAND). THE NUMBER INDICATES THE POSITION OF THE P-TABLE AS THE DATA WAS ENTERED DURING THE HARDWARE DIAGLOGUE. THE UNITS WHICH ARE SELECTED MUST NOT HAVE BEEN DROPPED BY THE DROP COMMAND. SEE THE DISCUSSION OF ADD AND DROP COMMANDS BELOW. DEFAULT IS TO TEST ALL UNITS WHICH HAVE NOT BEEN DROPPED BY A DROP COMMAND.

2.4.2.3 Effect Of Restart Command -

The restart command differs from the start command in that the P-Tables from the previous start command (there must have been one) are used, instead of new ones being built. The software dialogue may optionally be reexecuted (operator will be asked). The command can be used after command mode has been reentered in any of the three normal ways: a) the requested number of passes have been made, b) an error was encountered with the halt on error flag set, or c) a control/C was entered by the operator.

2.4.3 Continue Command -

```
**************************************************************
CON(TINUE)/PASS:<PASS-CNT/FLAGS:<FLAG-LIST>
**************************************************************
```

2.4.3.1 Flag Switch (/FLAGS:<FLAG-LIST>) -

<FLAG-LIST> Is same as in the start command, but unspecified flags retain their current value.

2.4.3.2 Effect Of Continue Command -

Continue must follow a start or restart, and command mode must have been entered due to a halt on error or a control/C. The effect of the command is to go to the beginning of the test that was being executed when the halt or control/C took place. Software dialogue may optionally be reexecuted. Hardware parameters may not be changed.

2.4.4 Proceed Command -

****
PRO(CEED)/FLAGS:<FLAG-LIST>
****

2.4.4.1 Flags Switch (/FLAGS:<FLAG-LIST>) -

<FLAG-LIST> Is as in the start command, but unspecified flags retain their current value.

2.4.4.2 Effect Of Proceed Command -

Proceed must follow a start, restart, or continue. Command mode must have been entered via a halt on error. The effect of the command is to begin execution at the location following the error call. Neither hardware nor software parameters may be altered.

2.4.5 Add Command -

****
ADD/UNITS:<UNIT-LIST>
****

2.4.6 EFFECT OF ADD COMMAND - THE UNITS SPECIFIED ARE ADDED TO THE TEST SEQUENCE. EACH UNIT MUST HAVE A P-TABLE IN MEMORY DUE TO AN EARLIER HARDWARE DIALOGUE. THIS COMMAND MUST BE FOLLOWED BY A RESTART OR CONTINUE. THE UNITS SWITCH MUST BE SPECIFIED. THE ADD COMMAND IS MEANINGFUL ONLY FOR UNITS THAT WERE PREVIOUSLY DROPPED.

2.4.7 Drop Command -

****
DRO(P)/UNITS:<UNIT-LIST>
****

2.4.8 EFFECT OF DROP COMMAND - THE UNITS SPECIFIED WILL BE DROPPED FROM TESTING. THE UNITS WILL BE RESELECTED ONLY BY THE EXECUTION OF AN ADD OR START COMMAND. THE UNITS SWITCH MUST BE ENTERED. THIS COMMAND MUST BE FOLLOWED BY A RESTART OR A CONTINUE COMMAND.

2.4.9 Print Command -

****
PRI(NT)
****

2.4.9.1 Effect Of Print Command - Error summary reporting is not implemented in this diagnostic, so this command has no effect.

2.4.10 Display Command -

****
DIS(PLAY)/UNITS:<UNIT-LIST>
****

2.4.10.1 Effect Of Display Command -

The hardware P-Tables for all units are printed in the format in which they were entered.

2.4.11 Flags Command -

****
FLA(GS)
****

2.4.11.1 Effect Of Flags Command -

The current settings of all flags are printed.

2.4.12 Zflags Command -

****
ZFL(AGS)
****

2.4.13 Zflags Command -

All flags are cleared.

2.4.14 Control Characters -

C A control/C (C) entered during the execution of a diagnostic causes a return to command mode.

Z A control/Z (Z) entered during one of the two operator dialogues-- hardware P-Table dialogue or software P-Table dialogue causes the defaults to be taken for the remainder of that dialogue.

O A control/O (O) entered during the execution of a diagnostic causes all teletype output to be surpressed for the remainder of the diagnostic or until another control/O is typed, which restores normal teletype output.

2.5 HARDWARE QUESTIONS

WHEN A DIAGNOSTIC IS STARTED, THE RUNTIME SERVICES WILL PROMPT THE USER FOR HARDWARE INFORMATION BY TYPING "CHANGE HW (L) ?" YOU MUST ANSWER "Y" AFTER A START COMMAND UNLESS THE HARDWARE INFORMATION HAS BEEN "PRELOADED" USING THE SETUP UTILITY (SEE CHAPTER 6 OF THE XXDP+ USER'S MANUAL). WHEN YOU ANSWER THIS QUESTION WITH A "Y", THE RUNTIME SERVICES WILL ASK FOR THE NUMBER OF UNITS (IN DECIMAL). YOU WILL THEN BE ASKED THE FOLLOWING QUESTIONS FOR EACH UNIT:

1. CSR ADDRESS - This question requests the CSR address of the specified DHV11. The default answer for this question is the lowest address in the PDP-11 floating address space in which a DHV11-M can be placed (160460 Octal).

2. INTERRUPT VECTOR ADDRESS - This question requests the interrupt vector address of the specified DHV11.

3. ACTIVE LINES BIT MAP - This question requests an octal bit map of the serial communication lines on the DHV11 which are being selected for testing. If the bit in the bit map is set which corresponds to a particular line (i.e. bit 3 for line 3) that line will be tested by the FVT.

4. BR Level - This questions requests the interrupt BR level of the DHV11.

2.6 SOFTWARE QUESTIONS

AFTER YOU HAVE ANSWERED THE HARDWARE QUESTIONS OR AFTER A RESTART OR CONTINUE COMMAND, THE RUNTIME SERVICES WILL ASK FOR SOFTWARE PARAMETERS. THESE PARAMETERS WILL GOVERN SOME DIAGNOSTIC SPECIFIC OPERATION MODES. YOU WILL BE PROMPTED BY "CHANGE SW (L) ?" IF YOU WISH TO CHANGE ANY PARAMETERS, ANSWER BY TYPING "Y". The following Software P-Table questions are asked by the program if the operator indicates that the Software Parameters are to be changed:

1. REPORT UNIT NUMBER AS EACH UNIT IS TESTED - This question asks whether the program should report the number of the unit which it is testing as it begins to test each unit.

2. NUMBER OF INDIVIDUAL DATA ERRORS TO REPORT ON A LINE - This question asks for the number of data errors which should be reported individually by this program for each line for each transmission test. Errors which are not reported individually are reported in summary error reports.

3. ROM VERSION PRINTOUT ON THE FIRST PASS - This question asks whether the program should print out the versions of the on board 8051 processor ROMs during the first pass of the program.

2.7 EXTENDED P-TABLE DIALOGUE

WHEN YOU ANSWER THE HARDWARE QUESTIONS, YOU ARE BUILDING ENTRIES IN A TABLE THAT DESCRIBES THE DEVICES UNDER TEST. THE SIMPLEST WAY TO BUILD THIS TABLE IS TO ANSWER ALL QUESTIONS FOR EACH UNIT TO BE TESTED. IF YOU HAVE A MULTIPLEXED DEVICE SUCH AS A MASS STORAGE CONTROLLER WITH SEVERAL DRIVES OR A COMMUNICATION DEVICE WITH SEVERAL LINES, THIS BECOMES TEDIOUS SINCE MOST OF THE ANSWERS ARE REPETITIOUS.

TO ILLUSTRATE A MORE EFFICIENT METHOD, SUPPOSE YOU ARE TESTING A FICTIONAL DEVICE, THE XY11. SUPPOSE THIS DEVICE CONSISTS OF A CONTROL MODULE WITH EIGHT UNITS (SUB-DEVICES) ATTACHED TO IT. THESE UNITS ARE DESCRIBED BY THE OCTAL NUMBERS 0 THROUGH 7. THERE IS ONE HARDWARE PARAMETER THAT CAN VARY AMONG UNITS CALLED THE Q-FACTOR. THIS Q-FACTOR MAY BE 0 OR 1. BELOW IS A SIMPLE WAY TO BUILD A TABLE FOR ONE XY11 WITH EIGHT UNITS.

```
# UNITS (D) ?  8<CR>

UNIT 1
CSR ADDRESS (O) ?  160000<CR>
SUB-DEVICE # (O) ?  0<CR>
Q-FACTOR (O) 0 ?  1<CR>

UNIT 2
CSR ADDRESS (O) ?  160000<CR>
SUB-DEVICE # (O) ?  1<CR>
Q-FACTOR (O) 1 ?  0<CR>

UNIT 3
CSR ADDRESS (O) ?  160000<CR>
SUB-DEVICE # (O) ?  2<CR>
Q-FACTOR (O) 0 ?  <CR>

UNIT 4
CSR ADDRESS (O) ?  160000<CR>
SUB-DEVICE # (O) ?  3<CR>
Q-FACTOR (O) 0 ?  <CR>

UNIT 5
CSR ADDRESS (O) ?  160000<CR>
SUB-DEVICE # (O) ?  4<CR>
Q-FACTOR (O) 0 ?  <CR>

UNIT 6
CSR ADDRESS (O) ?  160000<CR>
SUB-DEVICE # (O) ?  5<CR>
Q-FACTOR (O) 0 ?  <CR>

UNIT 7
CSR ADDRESS (O) ?  160000<CR>
SUB-DEVICE # (O) ?  6<CR>
Q-FACTOR (O) 0 ?  1<CR>

UNIT 8
CSR ADDRESS (O)  160000<CR>
SUB-DEVICE # (O) ?  7<CR>
```

```
        Q-FACTOR (0) 1 ?  <CR>
```

NOTICE THAT THE DEFAULT VALUE FOR THE Q-FACTOR CHANGES WHEN A NON-DEFAULT RESPONSE IS GIVEN. BE CAREFUL WHEN SPECIFYING MULTIPLE UNITS!

AS YOU CAN SEE FROM THE ABOVE EXAMPLE, THE HARDWARE PARAMETERS DO NOT VARY SIGNIFICANTLY FROM UNIT TO UNIT. THE PROCEDURE SHOWN IS NOT VERY EFFICIENT.

THE RUNTIME SERVICES CAN TAKE MULTIPLE UNIT SPECIFICATIONS HOWEVER. LET'S BUILD THE SAME TABLE USING THE MULTIPLE SPECIFICATION FEATURE.

```
        # UNITS (D) ?  8<CR>

        UNIT 1
        CSR ADDRESS (O) ?  160000<CR>
        SUB-DEVICE # (O) ?  0,1<CR>
        Q-FACTOR (O) 0 ?  1,0<CR>

        UNIT 3
        CSR ADDRESS (O) ?  160000<CR>
        SUB-DEVICE # (O) ?  2-5<CR>
        Q-FACTOR (O) 0 ?  0<CR>

        UNIT 7
        CSR ADDRESS (O) ?  160000<CR>
        SUB-DEVICE # (O) ?  6,7<CR>
        Q-FACTOR (O) 0 ?  1<CR>
```

AS YOU CAN SEE IN THE ABOVE DIALOGUE, THE RUNTIME SERVICES WILL BUILD AS MANY ENTRIES AS IT CAN WITH THE INFORMATION GIVEN IN ANY ONE PASS THROUGH THE QUESTIONS. IN THE FIRST PASS, TWO ENTRIES ARE BUILT SINCE TWO SUB-DEVICES AND Q-FACTORS WERE SPECIFIED. THE SERVICES ASSUME THAT THE CSR ADDRESS IS 160000 FOR BOTH SINCE IT WAS SPECIFIED ONLY ONCE. IN THE SECOND PASS, FOUR ENTRIES WERE BUILT. THIS IS BECAUSE FOUR SUB-DEVICES WERE SPECIFIED. THE "-" CONSTRUCT TELLS THE RUNTIME SERVICES TO INCREMENT THE DATA FROM THE FIRST NUMBER TO THE SECOND. IN THIS CASE, SUB-DEVICES 2, 3, 4 AND 5 WERE SPECIFIED. (IF THE SUB-DEVICE WERE SPECIFIED BY ADDRESSES, THE INCREMENT WOULD BE BY 2 SINCE ADDRESSES MUST BE ON AN EVEN BOUNDARY.) THE CSR ADDRESSES AND Q-FACTORS FOR THE FOUR ENTRIES ARE ASSUMED TO BE 160000 AND 0 RESPECTIVELY SINCE THEY WERE ONLY SPECIFIED ONCE. THE LAST TWO UNITS ARE SPECIFIED IN THE THIRD PASS.

THE WHOLE PROCESS COULD HAVE BEEN ACCOMPLISHED IN ONE PASS AS SHOWN BELOW.

```
        # UNITS (D) ?  8<CR>

        UNIT 1
        CSR ADDRESS (O) ?  160000<CR>
        SUB-DEVICE # (O) ?  0-7<CR>
        Q-FACTOR (O) 0 ?  0,1,0,,,,1,1<CR>
```

AS YOU CAN SEE FROM THIS EXAMPLE, NULL REPLIES (COMMAS ENCLOSING
A NULL FIELD) TELL THE RUNTIME SERVICES TO REPEAT THE LAST REPLY.

2.8 QUICK START-UP PROCEDURE (XXDP+)

TO START-UP THIS PROGRAM:

1. BOOT XXDP+
2. GIVE THE DATE AND ANSWER THE LSI AND 50HZ (IF THERE IS A CLOCK AND THE QUESTION IS ASKED) QUESTIONS
3. TYPE "R NAME", WHERE NAME IS THE NAME OF THE BIN OR BIC FILE FOR THIS PROGRAM
4. TYPE "START"
5. ANSWER THE "CHANGE HW" QUESTION WITH "Y"
6. ANSWER ALL THE HARDWARE QUESTIONS
7. ANSWER THE "CHANGE SW" QUESTION WITH "N"

WHEN YOU FOLLOW THIS PROCEDURE YOU WILL BE USING ONLY THE DEFAULTS FOR FLAGS AND SOFTWARE PARAMETERS. FOR DEFAULT INFORMATION SEE THE SECTIONS WITHIN THIS DOCUMENT ON FLAGS,AND HARDWARE QUESTIONS.

3.0 ERROR INFORMATION

3.1 TYPES OF ERROR MESSAGES

THERE ARE THREE LEVELS OF ERROR MESSAGES THAT MAY BE ISSUED BY A DIAGNOSTIC: GENERAL, BASIC AND EXTENDED. GENERAL ERROR MESSAGES ARE ALWAYS PRINTED UNLESS THE "IER" FLAG IS SET (SEE THE FLAGS SECTION OF THIS DOCUMENT).

THE GENERAL ERROR MESSAGE IS OF THE FORM:

```
NAME  TYPE  NUMBER  ON UNIT NUMBER  TST NUMBER PC:XXXXXX
ERROR MESSAGE
```

```
,WHERE; NAME = DIAGNOSTIC NAME
        TYPE = ERROR TYPE (SYS FATAL, DEV FATAL, HARD OR SOFT)
        NUMBER = ERROR NUMBER
        UNIT NUMBER = 0 - N (N IS LAST UNIT IN PTABLE)
        TST NUMBER = TEST AND SUBTEST WHERE ERROR OCCURRED
        PC:XXXXXX = ADDRESS OF ERROR MESSAGE CALL
```

BASIC ERROR MESSAGES ARE MESSAGES THAT CONTAIN SOME ADDITIONAL INFORMATION ABOUT THE ERROR. THESE ARE ALWAYS PRINTED UNLESS THE "IER" OR "IBR" FLAGS ARE SET (SEE THE FLAGS SECTION OF THIS DOCUMENT).
THESE MESSAGES ARE PRINTED AFTER THE ASSOCIATED GENERAL MESSAGE.

EXTENDED ERROR MESSAGES CONTAIN SUPPLEMENTARY ERROR INFORMATION SUCH AS REGISTER CONTENTS OR GOOD/BAD DATA. THESE ARE ALWAYS PRINTED UNLESS THE "IER", "IBR" OR "IXR" FLAGS ARE SET (SEE THE

FLAGS SECTION OF THIS DOCUMENT).
THESE MESSAGES ARE PRINTED AFTER THE ASSOCIATED GENERAL ERROR MESSAGE AND ANY ASSOCIATED BASIC ERROR MESSAGES.

3.2 ERROR MESSAGES

This program is intended to provide a go/no-go indication of the functionality of DHV11-M boards. To execute the program in this mode the operator can run with the inhibit basic error reporting switch. In this mode the program prints error messages which contain the error message header described above, plus the name of the failing test. For a list of the test names in this program see the test summaries section of this document. An example of such an error message is the following:

```
CVDHA DVC FTL ERR 01603 ON UNIT 02 TST 015 SUB 000 PC: 015244
DEVICE REGISTER WORD READ/WRITE TEST
```

This error indicates that a fatal error was encountered within the test which tests the read/write capability of the DHV11-M registers.

If the operator requires more extensive error reporting he can run with all error reporting enabled by not using the inhibit reporting switches. The above error message would then become the following:

```
CVDHA DVC FTL ERR 01603 ON UNIT 02 TST 015 SUB 000 PC: 015244
DEVICE REGISTER WORD READ/WRITE TEST
  BAD BIT(S) IN DEVICE TBUFFAD1 REGISTER FOR LINE  7 (D).
    EXPECTED DATA: 000000 (0).
    ACTUAL DATA:   000023 (0).
```

4.0 PERFORMANCE AND PROGRESS REPORTS

AT THE END OF EACH PASS, THE PASS COUNT IS GIVEN ALONG WITH THE TOTAL NUMBER OF ERRORS REPORTED SINCE THE DIAGNOSTIC WAS STARTED. THE "EOP" SWITCH CAN BE USED TO CONTROL HOW OFTEN THE END OF PASS MESSAGE IS PRINTED. FOR FUTHER INFORMATION SEE THE SWITCHES SECTION OF THIS DOCUMENT.

5.0 TEST SUMMARIES

The following tests are included within CVDHA:

1. Device register address test - Verifies that the UUT registers will respond witht the proper Q-BUS handshaking when accessed. Verifies that the UUT is at the proper address.

2. MASTER.RESET (Selftest) test - Verifies that the MASTER.RESET bit clears within a specified time of it being set.

3. MASTER.RESET (Skip Selftest) test - Verifies that the MASTER.RESET bit clears within a short time after it is set if the skip selftest sequence is used.

4. RX.CHARACTER field test - Verifies that the data bits of the codes in the FIFO after a reset and skip selftest are consistant with the skip selftest codes.

5. Reception flag field test - Verifies that the 3 data status bits (OVERRRUN, FRAMING, and PARITY error bits) are all set on all of the skip selftest codes in the FIFO after a reset and skip selftest sequence.

6. RX.DATA.AVAIL test - Verifies that the RX.DATA.AVAIL bit is set when the skip selftest codes are in the FIFO and that it clears after they are read.

7. RX.DATA.VALID test - Verifies that the RX.DATA.VALID bit is set for each valid skip selftest code in the FIFO and clear after all valid codes are read.

8. RX.LINE field test - Verifies that the RX.LINE fields are correct for the skip selftest codes.

9. BMP run test - This test runs the BMP and verifies that it does not fail within a specified period. This test should signal problems that the BMP codes could cause with later tests.

10. Skip selftest test - This test verifies that if the selftest is skipped the proper codes are placed in the FIFO and that no errors are encountered.

11. DIAGNOSTIC.FAIL (Skip selftest) test - This test verifies, by using the skip selftest sequence, that the DIAGNOSTIC.FAIL bit will go to both the active and inactive states.

12. Selftest run test - Verifies that no errors are found by the execution of the selftest.

13. Selftest fail test - Verifies that the selftest will report errors correctly when it is forced to fail.

14. ROM version printout test - If requested, reports the version numbers of the 8051 ROMs.

15. Word access read/write test - Verifies that the registers respond correctly to word read and write accesses.

16. Word access read/modify/write test - Verifies that the registers respond correctly to read/modify/write word accesses.

17. Byte access read/write test - Verifies that the registers respond correctly to byte read and write accesses.

18. Byte access read/modify/write test - Verifies that the registers respond correctly to read/modify/write byte accesses.

19. ID.BIT test - Verifies that the ID.BIT reads as a zero.

20. No TX.DATA.VALID/No TX.ACTION test - Verifies that if a data word is written without the TX.DATA.VALID bit set, no TX.ACTION is generated. This test does not require that characters are TXed.

21. TX.DATA.VALID / TX.ACTION test - Verifies that if a data word is written with the TX.DATA.VALID bit set, it generates a corresponding TX.ACTION. This test does not require that characters are TXed.

22. TX.ENABLE inactive test - Verifies that if the TX.ENABLE bit is clear no transmission occurs.

23. TX.ENABLE active test - Verifies that TX occurs if the TX.ENABLE is set.

24. Interrupts test - Verifies that the TX and RX interrupts are functioning correctly.

25. BR level test - Verifies that the UUT generates TX and RX interrupts at the correct BR level.

26. DIAG field (BMP) test - Verifies that a request for BMP code reporting is answered by the UUT within the specified time.

27. Report BMP codes test - This pseudo test reports the first 32 BMP codes which were discovered in the FIFO during the execution of the other tests. This avoids the interruption of other tests by these codes, if they are not critical to the tests being performed.

6.0 EXAMPLE ERROR FREE PASS

The following is an example of an error free pass dialogue:

```
.R CVDHACO
CVDHACO.BIC

DRS
CVDHA-C-0
DHV11-M FUNC TST PART1
UNIT IS DHV11-M
RESTART ADDR: 147670
DR>STA

CHANGE HW (L)  ? Y

# UNITS (D)  ? 2

UNIT 0
CSR ADDRESS:  (0)  160460 ? †Z

UNIT 1
CSR ADDRESS:  (0)  160460 ? 160040
INTERRUPT VECTOR ADDRESS:  (0) 300 ? 320
ACTIVE LINE BIT MAP:  (0)  377 ? <CR>
INTERRUPT BR LEVEL:  (0)  4? <CR>

CHANGE SW (L)  ? Y

REPORT UNIT NUMBER AS EACH UNIT IS TESTED:  (L) Y ? <CR>
NUMBER OF INDIVIDUAL DATA ERRORS TO REPORT ON A LINE:  (D)  0 ? 4
ROM VERSION PRINTOUT ON THE FIRST PASS:  (L) Y ?

 TESTING UNIT :  0(D)

 ROM VERSION NUMBERS:  PROC_1 =  2(D)   PROC_2 =  2(D)

 TESTING UNIT :  1(D)

 ROM VERSION NUMBERS:  PROC_1 =  2(D)   PROC_2 =  2(D)

CVDHA EOP    1
    0 CUMULATIVE ERRORS

 TESTING UNIT :  0(D)
†C
DR> EXIT
```

```
                                                   .LIST SEQ,LOC,BIN,MEB
                                                   .NLIST CND

                                  ;**************************************************************************
                                  ;
                                  ;                 VDHA.PHD
                                  ;
                                  ;**************************************************************************



                                  .SBTTL  Program Header


                                                   .MCALL  SVC
     000000                                        SVC                                      ; INITIALIZE SUPERVISOR MACROS

                                  ;**************************************************************************
                                  ;      IF STRUCTURED MACROS ARE TO BE USED, ADD ".MCALL STRUCT" AND "STRUCT"
                                  ;      TO INITIALIZE THE STRUCTURED MACROS.

               000001             SVCINS= 1         ; LIST INSTRUCTIONS, SHIFTED RIGHT
               000001             SVCTST= 1         ; LIST TEST TAGS, SHIFTED RIGHT
               000001             SVCSUB= 1         ; LIST SUBTEST TAGS, SHIFTED RIGHT
               000001             SVCGBL= 1         ; LIST GLOBAL TAGS, SHIFTED RIGHT
               000001             SVCTAG= 1         ; LIST OTHER TAGS, SHIFTED RIGHT

                                  ;      CHANGE THE VALUES OF THE SVC... SYMBOLS TO BE ZERO IF YOU WISH
                                  ;      TO ALIGN THE MACRO CALLS AND THEIR EXPANSIONS.  CHANGE THE
                                  ;      SYMBOLS TO BE MINUS-ONE TO NOT LIST THE EXPANSIONS.  YOU MAY
                                  ;      CHANGE THE SYMBOLS AT ANY POINT IN YOUR PROGRAM.
                                  ;**************************************************************************

     000000                       .ENABL  ABS
                                  ;.ENABL AMA
               002000             .       =         2000

     002000                                        BGNMOD

                                  ;++
                                  ; THE PROGRAM HEADER IS THE INTERFACE BETWEEN
                                  ; THE DIAGNOSTIC PROGRAM AND THE SUPERVISOR.
                                  ;--

     002000                                        POINTER BGNRPT,BGNSW,BGNSFT,BGNDU,ERRTBL


     002000                                        HEADER  CVDHA,C,0,16,0,PRI07
     002000                                                                           L$NAME::
     002000      103                                                                                  .ASCII /C/
     002001      126                                                                                  .ASCII /V/
     002002      104                                                                                  .ASCII /D/
     002003      110                                                                                  .ASCII /H/
     002004      101                                                                                  .ASCII /A/
     002005      000                                                                                  .BYTE   0
```

M2

Program Header

SEQ 0025

```
002006      000                     .BYTE   0
002007      000                     .BYTE   0
002010                      L$REV::
002010      103                     .ASCII  /C/
002011                      L$DEPO::
002011      060                     .ASCII  /0/
002012                      L$UNIT::
002012   000000                     .WORD   0
002014                      L$TIML::
002014   000016                     .WORD   16
002016                      L$HPCP::
002016   036354                     .WORD   L$HARD
002020                      L$SPCP::
002020   036546                     .WORD   L$SOFT
002022                      L$HPTP::
002022   002214                     .WORD   L$HW
002024                      L$SPTP::
002024   002226                     .WORD   L$SW
002026                      L$LADP::
002026   037064                     .WORD   L$LAST
002030                      L$STA::
002030   000000                     .WORD   0
002032                      L$CO::
002032   000000                     .WORD   0
002034                      L$DTYP::
002034   000000                     .WORD   0
002036                      L$APT::
002036   000000                     .WORD   0
002040                      L$DTP::
002040   002124                     .WORD   L$DISPATCH
002042                      L$PRIO::
002042   000340                     .WORD   PRIO7
002044                      L$ENVI::
002044   000000                     .WORD   0
002046                      L$EXP1::
002046   000000                     .WORD   0
002050                      L$MREV::
002050      004                     .BYTE   C$REVISION
002051      000                     .BYTE   C$EDIT
002052                      L$EF::
002052   000000                     .WORD   0
002054   000000                     .WORD   0
002056                      L$SPC::
002056   000000                     .WORD   0
002060                      L$DEVP::
002060   004036                     .WORD   L$DVTYP
002062                      L$REPP::
002062   024234                     .WORD   L$RPT
002064                      L$EXP4::
002064   000000                     .WORD   0
002066                      L$EXP5::
002066   000000                     .WORD   0
002070                      L$AUT::
002070   000000                     .WORD   0
002072                      L$DUT::
002072   025156                     .WORD   L$DU
002074                      L$LUN::
```

Program Header

```
        002074  000000
        002076
        002076  004046
        002100
        002100  104035
        002102
        002102  003766
        002104
        002104  024250
        002106
        002106  025120
        002110
        002110  025116
        002112
        002112  024242
        002114
        002114  000000
        002116
        002116  000000
        002120
        002120  000000
  1137
```

```
                .WORD   0
L$DESP::
                .WORD   L$DESC
L$LOAD::
                EMT     E$LOAD
L$ETP::
                .WORD   L$ERRTBL
L$ICP::
                .WORD   L$INIT
L$CCP::
                .WORD   L$CLEAN
L$ACP::
                .WORD   L$AUTO
L$PRT::
                .WORD   L$PROT
L$TEST::
                .WORD   0
L$DLY::
                .WORD   0
L$HIME::
                .WORD   0
```

DISPATCH TABLE

```
                        .SBTTL  DISPATCH TABLE

                        ;++
                        ; THE DISPATCH TABLE CONTAINS THE STARTING ADDRESS OF EACH TEST.
                        ; IT IS USED BY THE SUPERVISOR TO DISPATCH TO EACH TEST.
                        ;--

                                DISPATCH 27
002122  000033                                                 .WORD   27
002124                                                      L$DISPATCH::
002124  025274                                                  .WORD   T1
002126  025564                                                  .WORD   T2
002130  026000                                                  .WORD   T3
002132  026230                                                  .WORD   T4
002134  026412                                                  .WORD   T5
002136  026570                                                  .WORD   T6
002140  026772                                                  .WORD   T7
002142  027164                                                  .WORD   T8
002144  027356                                                  .WORD   T9
002146  027530                                                  .WORD   T10
002150  027730                                                  .WORD   T11
002152  030142                                                  .WORD   T12
002154  030410                                                  .WORD   T13
002156  030752                                                  .WORD   T14
002160  031336                                                  .WORD   T15
002162  031546                                                  .WORD   T16
002164  031762                                                  .WORD   T17
002166  032226                                                  .WORD   T18
002170  032476                                                  .WORD   T19
002172  032604                                                  .WORD   T20
002174  033014                                                  .WORD   T21
002176  033250                                                  .WORD   T22
002200  033550                                                  .WORD   T23
002202  034106                                                  .WORD   T24
002204  035132                                                  .WORD   T25
002206  036014                                                  .WORD   T26
002210  036272                                                  .WORD   T27
1157
```

DISPATCH TABLE

```
                                ;*****************************************************************************
                                ;
                                ;               VDHA.DHT
                                ;
                                ;*****************************************************************************
                                .SBTTL  DEFAULT HARDWARE P-TABLE

                                ;++
                                ; THE DEFAULT HARDWARE P-TABLE CONTAINS DEFAULT VALUES OF
                                ; THE TEST-DEVICE PARAMETERS.  THE STRUCTURE OF THIS TABLE
                                ; IS IDENTICAL TO THE STRUCTURE OF THE HARDWARE P-TABLES,
                                ; AND IS USED AS A "TEMPLATE" FOR BUILDING THE P-TABLES.
                                ;--

002212                                  BGNHW   DFPTBL
002212  000004                                                                .WORD   L10000-L$HW/2
002214                                                                  L$HW::
002214                                                                  DFPTBL::

002214  160460                          .WORD   160460  ;Default CSR Address
002216  000300                          .WORD   300     ;Default Vector Address
002220  177777                          .WORD   177777  ;Default Active lines bit map
002222     004                          .BYTE   4       ;Default BR Level
                                        .EVEN

002224                                  ENDHW
002224                                                                  L10000:
```

```

                                    ;*****************************************************************************
*
                                    ;
                                    ;               VDHA.SWT
                                    ;
                                    ;****************************************************************************



                                    .SBTTL  SOFTWARE P-TABLE

                                    ;++
                                    ; THE SOFTWARE TABLE CONTAINS VARIOUS DATA USED BY THE
                                    ; PROGRAM AS OPERATIONAL PARAMETERS.  THESE PARAMETERS ARE
                                    ; SET UP AT ASSEMBLY TIME AND MAY BE VARIED BY THE OPERATOR
                                    ; AT RUN TIME.
                                    ;--

 002224                                     BGNSW   SFPTBL
 002224  000002                                                                         .WORD   L10001-L$SW/2
 002226                                                                         L$SW::
 002226                                                                         SFPTBL::

 002226  000021                             OPTION::        .WORD   21          ;bit map of program control flags
 002230  000000                             NDERPT::        .WORD   0           ;Default number of individual data errors to rpt.

 002232                                     ENDSW
 002232                                                                         L10001:
```

```
                                   ;****************************************************************************

                                   ;
                                   ;          VDHA.EQU
                                   ;
                                   ;***********************************************************************


                                   .SBTTL  GLOBAL EQUATES SECTION




                                   ;++
                                   ; THE GLOBAL EQUATES SECTION CONTAINS PROGRAM EQUATES THAT
                                   ; ARE USED IN MORE THAN ONE TEST.
                                   ;--

            000010                         NUMLNS==10      ;NUMBER OF LINES ON DHV11 IS 8.
            000377                         MAPLNS==377     ;BIT MAP OF LINES ON DHV11.

                                   ;****** DEVICE REGISTER OFFSETS FROM THE CSR'S ADDRESS ******
            000000                         CSRO==0         ;CSR REGISTER OFFSET FROM THE CSR ADDRESS
            000002                         RBUFO==2        ;RECEIVE REGISTER OFFSET FROM THE CSR ADDRESS
            000002                         TXCHRO==2       ;TRANSMIT REGISTER OFFSET FROM THE CSR ADDRESS
            000004                         LPRO==4         ;LINE PARAMETER REGISTER OFFSET FROM THE CSR ADDRESS
            000006                         STATO==6        ;STATUS REGISTER OFFSET FROM THE CSR ADDRESS
            000010                         LNCTRO==10      ;LINE CONTROL REGISTER OFFSET FROM THE CSR ADDRESS
            000012                         TXAD10==12      ;TRANSMIT ADDRESS 1 REGISTER OFFSET FROM THE CSR ADDRESS
            000014                         TXAD20==14      ;TRANSMIT ADDRESS 2 REGISTER OFFSET FROM THE CSR ADDRESS
            000016                         TXBFCO==16      ;TRANSMIT COUNT REGISTER OFFSET FROM THE CSR ADDRESS

                                   ;****** EQUATES USED WITH RESPECT TO THE RX BUFFER ******
            000020                         RXBETX==16.     ;LEVEL OF RX BUFFER AT WHICH TO RE-ENABLE TRANSMISSION.
            000030                         RXBDTX==24.     ;LEVEL OF RX BUFFER AT WHICH TO DISABLE TRANSMISSION.
            000100                         RXBFUL==64.     ;TOTAL CHARACTER CAPACITY OF THE RX BUFFER.


     002232                                EQUALS
                                   ;
                                   ; BIT DIFINITIONS
                                   ;
            100000                 BIT15== 100000
            040000                 BIT14== 40000
            020000                 BIT13== 20000
            010000                 BIT12== 10000
            004000                 BIT11== 4000
            002000                 BIT10== 2000
            001000                 BIT09== 1000
            000400                 BIT08== 400
            000200                 BIT07== 200
            000100                 BIT06== 100
            000040                 BIT05== 40
            000020                 BIT04== 20
            000010                 BIT03== 10
            000004                 BIT02== 4
            000002                 BIT01== 2
```

GLOBAL EQUATES SECTION

```
000001                  BIT00== 1
                        ;
001000                  BIT9==  BIT09
000400                  BIT8==  BIT08
000200                  BIT7==  BIT07
000100                  BIT6==  BIT06
000040                  BIT5==  BIT05
000020                  BIT4==  BIT04
000010                  BIT3==  BIT03
000004                  BIT2==  BIT02
000002                  BIT1==  BIT01
000001                  BIT0==  BIT00
                        ;
                        ; EVENT FLAG DEFINITIONS
                        ;   EF32:EF17 RESERVED FOR SUPERVISOR TO PROGRAM COMMUNICATION
                        ;
                        ;                                   ;  BIT POSITION IN SECOND STATUS WORD
000040                  EF.START==      32.                 ; (100000) START COMMAND WAS ISSUED
000037                  EF.RESTART==    31.                 ; (040000) RESTART COMMAND WAS ISSUED
000036                  EF.CONTINUE==   30.                 ; (020000) CONTINUE COMMAND WAS ISSUED
000035                  EF.NEW==        29.                 ; (010000) A NEW PASS HAS BEEN STARTED
000034                  EF.PWR==        28.                 ; (004000) A POWER-FAIL/POWER-UP OCCURRED
                        ;
                        ;
                        ; PRIORITY LEVEL DEFINITIONS
                        ;
000340                  PRI07== 340
000300                  PRI06== 300
000240                  PRI05== 240
000200                  PRI04== 200
000140                  PRI03== 140
000100                  PRI02== 100
000040                  PRI01== 40
000000                  PRI00== 0
                        ;
                        ;OPERATOR FLAG BITS
                        ;
000004                  EVL==         4
000010                  LOT==        10
000020                  ADR==        20
000040                  IDU==        40
000100                  ISR==       100
000200                  UAM==       200
000400                  BOE==       400
001000                  PNT==      1000
002000                  PRI==      2000
004000                  IXE==      4000
010000                  IBE==     10000
020000                  IER==     20000
040000                  LOE==     40000
100000                  HOE==    100000
1280
```

```
                        ;*****************************************************************************
                        ;
                        ;               VDHA.GDT
                        ;
                        ;*****************************************************************************


                        .SBTTL  GLOBAL DATA SECTION

                        ;++
                        ; THE GLOBAL DATA SECTION CONTAINS DATA THAT ARE USED
                        ; IN MORE THAN ONE TEST.
                        ;--

                        ;*****************************************************************
                        ;       Unit Varible Area
                        ;*****************************************************************

002232  000300                  RXVECA:: .WORD  300      ;RX VECTOR ADDRESS.
002234  000304                  TXVECA:: .WORD  304      ;TX VECTOR ADDRESS.
002236  000377                  ACTLNS:: .WORD  377      ;ACTIVE LINE BIT MAP.
002240  000000                  UNITN:: .WORD   0        ;UNIT NUMBER.
002242     004                  BRLEVL:: .BYTE  4        ;INTERRUPT BUS REQUEST LEVEL
                                         .EVEN

                        ;*****************************************************************
                        ;       Device Register Address Table
                        ;*****************************************************************
002244                          DRADRT::
002244  160020                  CSRA::  .WORD   160020  ;DHV11-M CSR ADDRESS
002246  160022          TXCHA:: RBUFA:: .WORD   160022  ;DHV11-M RECEIVE/TRANSMIT BUFFER ADDRESS
002250  160024                  LPRA::  .WORD   160024  ;DHV11-M LINE PARAMETER REGISTER ADDRESS
002252  160026                  STATA:: .WORD   160026  ;DHV11-M STATUS REGISTER ADDRESS
002254  160030                  LNCTRA:: .WORD  160030  ;DHV11-M LINE CONTROL REGISTER ADDRESS
002256  160032                  TXAD1A:: .WORD  160032  ;DHV11-M TRANSMIT BUFFER 1 REGISTER ADDRESS
002260  160034                  TXAD2A:: .WORD  160034  ;DHV11-M TRANSMIT BUFFER 2 REGISTER ADDRESS
002262  160036                  TXBFCA:: .WORD  160036  ;DHV11-M TRANSMIT BUFFER COUNT REGISTER ADDRESS


                        ;*****************************************************************
                        ;       Bit mask table of un-used DHV device register bits.
                        ;*****************************************************************
002264  137660          UNBTTB::.WORD   137660  ;UNUSED BIT MASK FOR THE CSR
002266  177777                  .WORD   177777  ;UNUSED BIT MASK FOR THE RBUF/TX REG
002270  000007                  .WORD   7       ;UNUSED BIT MASK FOR THE LPR
002272  177777                  .WORD   177777  ;UNUSED BIT MASK FOR THE STAT
002274  166051                  .WORD   166051  ;UNUSED BIT MASK FOR THE LNCTRL
002276  000000                  .WORD   0       ;UNUSED BIT MASK FOR THE TBUFFAD1
002300  077700                  .WORD   77700   ;UNUSED BIT MASK FOR THE TBUFFAD2
002302  000000                  .WORD   0       ;UNUSED BIT MASK FOR THE TBUFFCT

                        ;*****************************************************************************
                        ;       Register Message Address Table
                        ;*****************************************************************************
002304  006004                  RMATBB:: .WORD  DROOMG  ;ADDRESS OF "CSR" MESSAGE.
```

GLOBAL DATA SECTION

```
                                        .WORD   DR02MG  ;ADDRESS OF "RBUF" MESSAGE.
                                        .WORD   DR04MG  ;ADDRESS OF "LPR" MESSAGE.
                                        .WORD   DR06MG  ;ADDRESS OF "STAT" MESSAGE.
                                        .WORD   DR10MG  ;ADDRESS OF "LNCTRL" MESSAGE.
                                        .WORD   DR12MG  ;ADDRESS OF "TBUFFAD1" MESSAGE.
                                        .WORD   DR14MG  ;ADDRESS OF "TBUFAD2" MESSAGE.
                                        .WORD   DR16MG  ;ADDRESS OF "TBUFFCT" MESSAGE.

                                ;*******************************************************************************
                                ;       Assorted global variables:
                                ;*******************************************************************************
002324  000000                          BUFPTR:: .WORD  0       ;STORAGE FOR RECEIVE CHARACTER BUFFER POINTER.
002326  000001                          TSTNUM:: .WORD  1       ;STORAGE FOR THE TEST NUMBER.
002330  000000                          IESTAT:: .WORD  0       ;STORAGE FOR THE INTERRUPT ENABLE BIT STATES.
002332  000000                          PASCNT:: .WORD  0       ;STO'G FOR PASS COUNT USED IN ROM VERSION# TST.
002334  000000                          RXINTC:: .WORD  0       ;STORAGE FOR RECEIVER INTERRUPT FLAGS.
002336  000000                          RXINTF:: .WORD  0       ;STORAGE FOR RECEIVER INTERRUPT FLAGS.
002340  000000                          TXINTC:: .WORD  0       ;STORAGE FOR TRANSMIT INTERRUPT COUNT.
002342  000000                          TXINTF:: .WORD  0       ;STORAGE FOR TRANSMIT INTERRUPT FLAGS.
002344  000000                          TP4VEC:: .WORD  0       ;STORAGE FOR THE NORMAL 004 TRAP VECTOR.
002346  000000                          TP4FLG:: .WORD  0       ;FLAGS SET WHEN AN EXPECTED 004 TRAP OCCURS.
002350  000000                          WORD1::  .WORD  0       ;LOCATION FOR PASSING INDIRECT PARAMETERS.
002352  000000                          CTRLCF:: .WORD  0       ;STORAGE FOR THE CONTROL-C FLAG.

                                ;*******************************************************************************
                                ;       Line Time Clock variables and storage.
                                ;*******************************************************************************
002354  177546                          CLKCSR:: .WORD  177546  ;CSR ADDRESS OF THE LTC.
002356  000300                          CLKBRL:: .WORD  PRI06   ;INTERRUPT PRIORITY LEVEL OF THE LTC.
002360  000100                          CLKVEC:: .WORD  100     ;INTERRUPT VECTOR ADDRESS OF THE LTC.
002362  000074                          CLKHRZ:: .WORD  60.     ;INTERRUPT FREQUENCY OF THE LTC.
002364  000000                          TIMER1:: .WORD  0       ;HARDWARE CLOCK COUNTER #1.
002366  000000                          TIMER2:: .WORD  0       ;HARDWARE CLOCK COUNTER #2.
002370  000170                          TIMER3:: .WORD  120.    ;HARDWARE BREAK COUNTER LOCATION.
002372  000170                          BCOUNT:: .WORD  120.    ;BREAK COUNT VALUE IN CLOCK TICKS.
002374  000021                          MSTICK:: .WORD  17.     ;NUMBER OF MILLI-SECONDS PER LTC TICK.
002376  000062                          MSLCNT:: .WORD  62      ;LOOP COUNT (USED BY MSLOOP) TO DELAY 1 MS.

                                ;*******************************************************************************
                                ;       Memmory Management Variables and Flags.
                                ;*******************************************************************************
002400  177572                          MMSR0:: .WORD   177572  ;ADDRESS OF MEM MGT STATUS REGISTER #0.
002402  000000                          MMPRES:: .WORD  0       ;MEM MGT PRESENT FLAG (0 IF MM NOT PRESENT).
002404  000000                          MMENAB:: .WORD  0       ;MEM MGT ENABLED FLAG (0 IF MM NOT ENABLED).
002406  172340                          PAR0A:: .WORD   172340  ;ADDRESS OF MEM MGT PAR #0.

                                ;*******************************************************************************
                                ;       Table of words with corresponding bit set for generation of bit maps.
                                ;*******************************************************************************
002410  000001                  BITTBL:: .WORD  1               ;BIT 0 SET.
002412  000002                          .WORD   2               ;BIT 1 SET.
002414  000004                          .WORD   4               ;BIT 2 SET.
002416  000010                          .WORD   10              ;BIT 3 SET.
002420  000020                          .WORD   20              ;BIT 4 SET.
002422  000040                          .WORD   40              ;BIT 5 SET.
002424  000100                          .WORD   100             ;BIT 6 SET.
002426  000200                          .WORD   200             ;BIT 7 SET.
```

GLOBAL DATA SECTION

```
1396 002430  000400                    .WORD   400             ;BIT 8 SET.
1397 002432  001000                    .WORD   1000            ;BIT 9 SET.
1398 002434  002000                    .WORD   2000            ;BIT 10 SET.
1399 002436  004000                    .WORD   4000            ;BIT 11 SET.
1400 002440  010000                    .WORD   10000           ;BIT 12 SET.
1401 002442  020000                    .WORD   20000           ;BIT 13 SET.
1402 002444  040000                    .WORD   40000           ;BIT 14 SET.
1403 002446  100000                    .WORD   100000          ;BIT 15 SET.
1404
1405                            ;*******************************************************************************
1406                            ;*      GPR Save Area Zero.
1407                            ;*******************************************************************************
1408 002450                     GPRS0B::                        ;BASE OF GPR SAVE AREA NUMBER ZERO.
1409 002450  000000                    .WORD   0               ;WORD 1, STORAGE FOR R1.
1410 002452  000000                    .WORD   0               ;WORD 2, STORAGE FOR R2.
1411 002454  000000                    .WORD   0               ;WORD 3, STORAGE FOR R3.
1412 002456  000000                    .WORD   0               ;WORD 4, STORAGE FOR R4.
1413 002460  000000                    .WORD   0               ;WORD 5, STORAGE FOR R5.
1414
1415                            ;*******************************************************************************
1416                            ;*      Transmission and Reception Variables, Pointers, and Flags.
1417                            ;*******************************************************************************
1418 002462  000000                    ERSMRF:: .WORD  0       ;ERROR SUMMARY REPORT FLAGS.
1419 002464                            ERCNTB:: .BLKW  16.     ;TABLE OF ERROR COUNTERS.
1420
1421                            ;*******************************************************************************
1422                            ;       Storage area for the BMP code queue.
1423                            ;*******************************************************************************
1424 002524  000000            BMPCQP::        .WORD   0       ;POINTER USED TO ACCESS THE NEXT CELL IN QUE.
1425 002526                    BMPCQB::        .BLKW   64.     ;STORAGE FOR 32 CELLS, TEST# PLUS BMP CODE.
1426 002726                    BMPCQE::                        ;LAST ADDRESS PLUS 2 OF THE BMP CODE QUEUE.
1427                            ;*******************************************************************************
1428                            ;       General table and buffer area--513 words.
1429                            ;*******************************************************************************
1430 002726                    BUFBAS::                        ;BASE OF MEMORY BUFFER.
1431 002726                    ERLTBL::        .BLKW   128.    ;FIRST HALF OF GENERAL TABLE OR BUFFER.
1432 003326                    BUFMID::        .BLKW   64.     ;SECOND HALF OF GENERAL TABLE OR BUFFER.
1433 003526                    BUF3QT::        .BLKW   64.     ;LAST QUARTER OF THE BUFFER AREA.
1434 003726                    BUFEND::                        ;END OF GENERAL PURPOSE MEMORY BUFFER.
1435 003726                    ENDETB::        .BLKW   16.     ;BUFFER OVERFLOW SPACE.
1436
1449 003766                            ERRTBL
     003766                                                                  L$ERRTBL::
     003766  000000            ERRTYP::        .WORD   0
     003770  000000            ERRNBR::        .WORD   0
     003772  000000            ERRMSG::        .WORD   0
     003774  000000            ERRBLK::        .WORD   0
1450
1451                                    .EVEN
```

```
                        .SBTTL  GPR HANDLING ROUTINES FOR SUBROUTINE CALLS.
                        ;*******************************************************************************
                        ;*      There are 4 routines and macro definitions used for the handling of
                        ;*      GPR values during subroutine calls within this program.  The four
                        ;*      routines/macro calls have the following names:
                        ;*
                        ;*      SAVE - Macro definition used at the beginning of a subroutine to
                        ;*             save the GPR contents for later restoration.
                        ;*      PASS - Macro definition used at the end of a subroutine to restore
                        ;*             the previously saved GPR contents and to leave the contents
                        ;*             of the specified GPR(s) intact (NOT restored).
                        ;*      PREG05 - Subroutine which is called from the SAVE and PASS macro
                        ;*             expansions which actually performs the actions on the GPRs.
                        ;*
                        ;*      During a subroutine which uses these GPR save routines the values
                        ;*      of the GPRs are stored on the stack in the following stack frame:
                        ;*
                        ;*              SP     -> RET PC INTO PREG05 ROUTINE.
                        ;*              SP+2   -> GPR R0 CONTENTS.
                        ;*              SP+4   -> GPR R1 CONTENTS.
                        ;*              SP+6   -> GPR R2 CONTENTS.
                        ;*              SP+8   -> GPR R3 CONTENTS.
                        ;*              SP+10  -> GPR R4 CONTENTS.
                        ;*              SP+12  -> GPR R5 CONTENTS.
                        ;*              SP+14  -> RET PC INTO CALLER OF SUB'TNE WHICH CALLED PREG05.
                        ;*
                        ;*      Each level of sub'tne calling uses 8 words of stack overhead.
                        ;*      The SAVE and PASS macros can also be used in "straight line code"
                        ;*      to save and restore the GPR values.  In any case, after the
                        ;*      issuing of a PASS call the GPRs will be restored to the values
                        ;*      they had prior to the last SAVE call (except for the excepted,
                        ;*      or passed intact, GPRs specified as parameters to the PASS call)
                        ;*      and the SP will also be restored to its condition before the last
                        ;*      SAVE call.  The programmer must be sure that the SP has the same
                        ;*      value when the PASS macro is called as it had immediately after
                        ;*      the SAVE macro was called.
                        ;*******************************************************************************
```

```
                        .SBTTL GPR FRAME ACCESS EQUATES
                               ;+++
                               ;Equates that allow access to the stack frame.  These are the
                               ;offsets into the stack for registers saved during the PREG05
                               ;routine.
                               ;---

000036                         LPCSLT==        36      ;Offset for last return PC.
000016                         PCSLOT==        16      ;Offset for return PC.
000014                         R5SLOT==        14      ;Offset for R5.
000012                         R4SLOT==        12      ;Offset for R4.
000010                         R3SLOT==        10      ;Offset for R3.
000006                         R2SLOT==        6       ;Offset for R2.
000004                         R1SLOT==        4       ;Offset for R1.
000002                         R0SLOT==        2       ;Offset for R0.
```

GLOBAL MACRO DEFINITION - SAVE -

```
1507                            .SBTTL  GLOBAL MACRO DEFINITION         - SAVE -
1508                            ;*************************************************************************
1509                            ;*      This macro is used at the beginning of a subroutine to save the
1510                            ;*      contents of the GPRs R0 thru R5.
1511                            ;*
1512                            ;* INPUTS:      SP - Unchanged since subroutine was entered
1513                            ;*               R5SLOT - Offset to stack slot for R5 (Equated to 14 Octal)
1514                            ;*
1515                            ;* OUTPUTS:     GPR save area on the stack is loaded with the contents of GPRs
1516                            ;*               TOP OF STACK - Loaded with the return address into PREG05
1517                            ;*
1518                            ;* CALLING SEQUENCE:    SAVE
1519                            ;*
1520                            ;* COMMENTS:    No arguments are allowed.
1521                            ;*               The PASS macro should be called to restore the GPR values.
1522                            ;*
1523                            ;* SUBORDINATE ROUTINES CALLED: PREG05.
1524                            ;*************************************************************************
1525
1526                                    .MACRO  SAVE
1527                                    .LIST
1528                                            JSR     R5,PREG05       ;CALL REGISTER SAVE SUBRT.
1529                                    .NLIST
1530                                    .ENDM   SAVE
```

```
                        .SBTTL  GLOBAL MACRO DEFINITION          - PASS -
                        ;*************************************************************************
                        ;*      This macro is used in conjunction with the SAVE macro.  It is
                        ;*      called at end of a subroutine to pass parameters in GPRs back to the
                        ;*      calling routine by altering the GPR save area on the stack and then
                        ;*      returning to PREG05 to restore the GPRs to their saved values.
                        ;*
                        ;* INPUTS:      Only allowed ARGUMENTS are "R0" thru "R5".
                        ;*              R0SLOT thru R5SLOT must be equated to their respective GPR save
                        ;*                      slot offsets before calling this macro.
                        ;*
                        ;* OUTPUTS:     The GPR values are put in their respective slots on the stack.
                        ;*
                        ;* CALLING SEQUENCE:    PASS    R0,R1,...
                        ;*
                        ;* COMMENTS:    Any combination of GPR arguments may be listed in any order.
                        ;*              For example, the following are legal:
                        ;*                      PASS    R1
                        ;*                      PASS    R4,R0,R2
                        ;*              The GPRs listed as arguments will be passed intact to the
                        ;*              calling routine, all other GPRs will be restored.
                        ;*              The SP must be at its original value when PASS is called.
                        ;*
                        ;*              The macro call
                        ;*                      PASS    R0,R3
                        ;*              expands into the following assembly code:
                        ;*                      MOV     R0,R0SLOT(SP)           ;PUT R0 IN STACK SLOT.
                        ;*                      MOV     R3,R3SLOT(SP)           ;PUT R3 IN STACK SLOT.
                        ;*                      JSR     PC,@(SP)+               ;RETURN TO PREG05 SUBRT.
                        ;*              In this example GPRs R1, R2, R4, and R5 will be restored to
                        ;*              their values contained in the stack frame and R0 and R3
                        ;*              will be left at their values prior to this PASS call.
                        ;*
                        ;* SUBORDINATE ROUTINES CALLED: (PREGRT - Label within PREG05, value on stack.)
                        ;*************************************************************************

                                .MACRO  PASS    A,B,C,D,E,F
                                .IRP    X,<A,B,C,D,E,F>
                                .IF     NB,X
                                .LIST
                                        MOV     X,X'SLOT(SP)            ;PUT X IN STACK SLOT.
                                .NLIST
                                .ENDC
                                .ENDM
                                .LIST
                                        JSR     PC,@(SP)+               ;RETURN TO PREG05 SUBRT.
                                .NLIST
                                .ENDM   PASS
```

```
                        .SBTTL GLOBAL SUBROUTINE                - PREG05 -
                        ;*******************************************************************************
                        ;*      Preserve Registers R0 through R5 for subroutine calls.
                        ;*
                        ;* INPUTS:      The return address back into the calling routine must be in
                        ;*              GPR R5.  (i.e.- Macros use "JSR  R5,PREG05".)
                        ;*
                        ;* OUTPUTS:     Registers R0 through R5 are saved on the stack.
                        ;*
                        ;*CALLING SEQUENCE:     SAVE            ;Macro expansion calls PREG05.
                        ;*                      [Subroutine code]...
                        ;*                      PASS            ;Macro expansion recalls PREG05.
                        ;*
                        ;*COMMENTS:     This routine is re-entrant.
                        ;*
                        ;*              Parameters may be passed out of a subroutine by modifying the
                        ;*              register save area on the stack.  Use the PASS GPRn macro
                        ;*              to return GPR values intact.
                        ;*              Use the RnSLOT offsets from the SP to pass other parameters.
                        ;*              [Example:       MOV    VALUE,R0SLOT(SP)        ]
                        ;*              Make sure the SP is at its original value when you do this.
                        ;*
                        ;*SUBORDINATE ROUTINES CALLED:  None.
                        ;*******************************************************************************

003776                  PREG05:                 ;R5 HAS BEEN LOADED ON THE STACK BY THE SUBROUTINE CALL
003776  010446                  MOV     R4,-(SP)        ;SAVE R4
004000  010346                  MOV     R3,-(SP)        ;SAVE R3
004002  010246                  MOV     R2,-(SP)        ;SAVE R2
004004  010146                  MOV     R1,-(SP)        ;SAVE R1
004006  010046                  MOV     R0,-(SP)        ;SAVE R0
004010  010546                  MOV     R5,-(SP)        ;PUSH RETURN PC ON TOP OF STACK
004012  016605  000014          MOV     R5SLOT(SP),R5   ;RESTORE R5 TO VALUE IT HAD BEFORE CALLS

004016  004736                  JSR     PC,@(SP)+       ;Call the subroutine at the return address
                                                        ;from the PREG05 call, putting the present
                                                        ;PC on the stack as a return address into
                                                        ;this (PREG05) routine.

                                ;+++
                                ;The following code is executed when the calling routine does a
                                ;"return" [JSR  PC,@(SP)+] using the PC deposited on the stack above.
                                ;---

004020  012605          PREGRT:: MOV    (SP)+,R5        ;Put return PC in R5.
004022  012600                  MOV     (SP)+,R0        ;Restore R0.
004024  012601                  MOV     (SP)+,R1        ;Restore R1.
004026  012602                  MOV     (SP)+,R2        ;Restore R2.
004030  012603                  MOV     (SP)+,R3        ;Restore R3.
004032  012604                  MOV     (SP)+,R4        ;Restore R4.

004034  000205                  RTS     R5              ;Return to the subroutine which called PREG05.
                                                          ;restoring R5 in the process.
```

```
                        .SBTTL  GLOBAL TEXT SECTION
                        ;**********************************************************************
                        ;
                        ;               FVTSKL1.P11
                        ;
                        ;**********************************************************************


                        ;++
                        ; THE GLOBAL TEXT SECTION CONTAINS FORMAT STATEMENTS,
                        ; MESSAGES, AND ASCII INFORMATION THAT ARE USED IN
                        ; MORE THAN ONE TEST.
                        ;--

                        ;
                        ; NAMES OF DEVICES SUPPORTED BY PROGRAM
                        ;
004036                          DEVTYP  <DHV11-M>
004036                                                          L$DVTYP::
004036  104     110     126                                             .ASCIZ  %DHV11-M%
004041  061     061     055
004044  115     000
                                                                        .EVEN

                        ; TEST DESCRIPTION
                        ;
004046                          DESCRIPT        <DHV11-M FUNC TST PART 1>
004046                                                          L$DESC::
004046  104     110     126                                             .ASCIZ  /DHV11-M FUNC TST PA
RT 1/
004051  061     061     055
004054  115     040     106
004057  125     116     103
004062  040     124     123
004065  124     040     120
004070  101     122     124
004073  040     061     000

                                .EVEN                                   .EVEN
```

```
;*******************************************************************************
*
;
;               VDHA.FMT
;
;*******************************************************************************



;
; FORMAT STATEMENTS USED IN PRINT CALLS
;
```

```
                                        ;%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
                                        ;
                                        ;                VDHA.MSG
                                        ;
                                        ;%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
%%


             .NLIST BIN
             .SBTTL  GLOBAL MESSAGE AREA
                     ; ********** FORMAT STATEMENTS ***********
004076  MFUNIT:: .ASCIZ /%N%A TESTING UNIT :%D4%A(D)%N/
004134  EF0503:: .ASCIZ /%T%N/
004141  EF0505:: .ASCIZ /%A    %D5%A ILLEGAL INTERRUPTS RECEIVED.%N/
004214  EF1401:: .ASCIZ /%N%A ROM VERSION NUMBERS: PROC_1 = %D2%A(D)   PROC_2 = %D2%A(D)%N/
004316  EF1402:: .ASCIZ /%T%A ROM VERSION NUMBER %T%N/
004353  EF1601:: .ASCIZ /%A  %T%A ABORTED %N/
004377  EF1602:: .ASCIZ /%A     EXPECTED DATA: %O6%A (O).%N/
004441  EF1603:: .ASCIZ /%A     ACTUAL DATA:   %O6%A (O).%N/
004503  EF1604:: .ASCIZ /%A  BAD BIT(S) IN DEVICE %T%A REGISTER FOR LINE %D2%A (D).%N/
004600  EF3001:: .ASCIZ /%A     EXPECTED OR CORRECT VALUE: %O3%N/
004647  EF3002:: .ASCIZ /%A     ACTUAL OR MEASURED  VALUE: %O3%N/
004716  EF9001:: .ASCIZ /%A  UNEXPECTED %T%A FOUND IN RECEIVE CHAR FIFO:%N/
005000  EF9002:: .ASCIZ /%A     CODE IS ASSOCIATED WITH LINE: %D2%A(D)%N/
005057  EF9003:: .ASCIZ /%A       CODE IS: %O3%A(O)%N/
005113  EF9004:: .ASCIZ /%A     %T%A VALUE: %O3%A(O)%N/
005150  EF9005:: .ASCIZ /%A     %T%A VALUE: NONE%N/
005201  EF9006:: .ASCIZ /%A  %T%A %D2%A(D)%N/
005225  EF9010:: .ASCIZ /%A     NUMBER OF ERRORS DETECTED ON LINE %D2%A(D) IS %D5%A(D)%N/
005324  EF9016:: .ASCIZ /%A  UNEXPECTED %T%A FOR LINE %D2%A(D) IN FIFO AFTER RESET:%N/
005421  EF9017:: .ASCIZ /%A     %T%A (WITH ERROR FLAGS) IS %O6%A(O)%N/
005475  EF9018:: .ASCII /%A  %T%A IN SELFTEST CODE FIFO SLOT FOR LINE %D2/
005555           .ASCIZ /%A(D) AFTER RESET.%N/
005602  EF9019:: .ASCIZ /%A  %T%A %O6%A(O)%N/
005626  EF9301:: .ASCIZ /%A %T%D2%A(D),  BMP CODE REPORTED :%O3%A(O)%N/
005704  EF9302:: .ASCIZ /%A  OVERFLOW OCCURRED (MORE THAN 31 BMP CODES FOUND IN QUEUE)%N/
                 ;********* ERROR MESSAGES ************
006004  DR00MG:: .ASCIZ /CSR/
006010  DR02MG:: .ASCIZ /RBUF/
006015  DR04MG:: .ASCIZ /LPR/
006021  DR06MG:: .ASCIZ /STAT/
006026  DR10MG:: .ASCIZ /LNCTRL/
006035  DR12MG:: .ASCIZ /TBUFFAD1/
006046  DR14MG:: .ASCIZ /TBUFFAD2/
006057  DR16MG:: .ASCIZ /TBUFFCT/
006067  EM0103:: .ASCIZ /DEVICE REGISTER ACCESS ERRORS/
006125  EM0201:: .ASCIZ /MASTER RESET (PERFORM SELFTEST) TEST /
006173  EM0202:: .ASCIZ /  MASTER RESET BIT DID NOT CLEAR AFTER BOARD RESET./
006257           .ASCIZ /     WAITED 5 SECONDS.  BIT DEFECTIVE OR FIRMWARE HUNG./
006346  EM0203:: .ASCIZ /  MASTER RESET BIT CLEAR IMMEDIATELY AFTER BOARD RESET./
006436           .ASCIZ /     BIT DEFECTIVE OR BOARD FIRMWARE ERROR./
006511  EM0204:: .ASCIZ \  MR BIT WENT CLEAR WITHIN 1/2 SECOND OF BOARD RESET.\
006577           .ASCIZ /     BIT DEFECTIVE OR SELFTEST WAS (INCORRECTLY) SKIPPED./
006670  EM0301:: .ASCIZ /MASTER RESET (SKIP SELFTEST) TEST /
006733  EM0302:: .ASCIZ /  MR BIT CLR WITHIN 10 MILISECOND AFTER BOARD RESET./
007020           .ASCIZ /     BIT DEFECTIVE OR BOARD FIRMWARE ERROR./
007073  EM0303:: .ASCIZ \  MR BIT WENT CLEAR 1/5 TO 5 SECONDS AFTER RESET.\
```

```
1765 007155                .ASCIZ /    SELFTEST DID NOT GET SKIPPED (SHOULD HAVE BEEN SKIPPED)./
1766 007252  EM0401::  .ASCIZ /RBUF REGISTER RX CHARACTER FIELD TEST /
1767 007321  EM0402::  .ASCIZ /  IMPROPER CODE FOUND IN RX FIFO AFTER DUT RESET./
1768 007403                .ASCIZ /    EXPECTED: SELFTEST CODE,   ACTUAL: IMPROPER CODE./
1769 007471  EM0501::  .ASCIZ /RBUF REGISTER ERROR FLAGS FIELD TEST /
1770 007537  EM0502::  .ASCIZ /  RX ERROR FLAG(S) FOUND CLEAR ON SELFTEST CODE./
1771 007620                .ASCIZ /    EXPECTED: ALL ERROR FLAGS SET,  ACTUAL: FLAG(S) CLEAR./
1772 007713  EM0525::  .ASCIZ /  RX INTERRUPT(S) RECEIVED WITH RX INTERRUPTS DISABLED./
1773 010003  EM0526::  .ASCIZ /  TX INTERRUPT(S) RECEIVED WITH TX INTERRUPTS DISABLED./
1774 010073  EM0601::  .ASCIZ /CSR RX.DATA.AVAIL BIT TEST /
1775 010127  EM0602::  .ASCIZ /  RX.DATA.AVAIL BIT FOUND CLEAR AFTER RESET COMPLETION./
1776 010217                .ASCIZ /    EXPECTED BIT TO BE SET FROM SELFTEST CODES IN FIFO./
1777 010307  EM0603::  .ASCIZ /  RX.DATA.AVAIL BIT COULD NOT BE CLEARED BY PURGING FIFO./
1778 010401                .ASCIZ /    600 CHARS READ FROM FIFO WITHOUT R.D.A BIT CLEARING./
1779 010472  EM0701::  .ASCIZ /RBUF RX.DATA.VALID BIT TEST /
1780 010527  EM0702::  .ASCIZ /  RX.DATA.VALID BIT FOUND CLEAR AFTER RESET COMPLETION./
1781 010617                .ASCIZ /    EXPECTED BIT TO BE SET FROM SELFTEST CODES IN FIFO./
1782 010707  EM0703::  .ASCIZ /  RX.DATA.VALID BIT COULD NOT BE CLEARED BY PURGING FIFO./
1783 011001                .ASCIZ /    600 CHARS READ FROM FIFO WITHOUT R.D.V BIT CLEARING./
1784 011072  EM0801::  .ASCIZ /RBUF RX.LINE.NUMBER FIELD TEST /
1785 011132  EM0802::  .ASCIZ /  LINE NUMBER IS WRONG ON A SELFTEST CODE./
1786 011205  EM0901::  .ASCIZ /CHECK FOR BMP_CODES TEST/
1787 011236  EM0902::  .ASCIZ /UNEXPECTED BMP CODES FOUND./
1788 011272  EM1001::  .ASCIZ /DIAGNOSTIC FAIL (SKP SELFTEST) TEST/
1789 011336  EM1002::  .ASCIZ /  SKIP SELF-TEST TOOK TOO LONG TO COMPLETE, > 50 MS./
1790 011423  EM1003::  .ASCIZ /  SKIP SELF-TEST COMPLETED TOO SOON, < 10 MS./
1791 011501  EM1101::  .ASCIZ /SKIP SELF-TEST TEST/
1792 011525  EM1201::  .ASCIZ /SELF-TEST TEST/
1793 011544  EM1202::  .ASCIZ /  SELF-TEST TOOK TOO LONG TO COMPLETE, > 3 SECONDS./
1794 011630  EM1203::  .ASCIZ \  SELF-TEST COMPLETED TOO SOON, < 1/2 SECOND.\
1795 011706  EM1204::  .ASCIZ /  SELF-TEST DID NOT EXECUTE/
1796 011742  EM1205::  .ASCIZ /  DIAG_FAIL BIT BAD/
1797 011766  EM1301::  .ASCIZ /FAIL SELF-TEST TEST/
1798 012012  EM1302::  .ASCIZ / SELF-TEST ERROR REPORTING BAD/
1799 012051  EM1401::  .ASCIZ /ROM VERSION_NUMBER TEST/
1800 012101  EM1402::  .ASCIZ /  FIFO EMPTY, ONE OR MORE ROM VERSION_NUMBERS MISSING/
1801 012167  EM1403::  .ASCIZ /  ROM VERSION_NUMBER FOUND OUT OF SEQUENCE/
1802 012242  EM1404::  .ASCIZ /  ONE OR MORE ROM VERSION_NUMBERS MISSING/
1803 012314  EM1405::  .ASCIZ /    PROC_1/
1804 012327  EM1406::  .ASCIZ /    PROC_2/
1805 012342  EM1407::  .ASCIZ /NOT FOUND/
1806 012354  EM1408::  .ASCIZ /FOUND/
1807 012362  EM1601::  .ASCIZ /TIMEOUT OCCURRED WAITING FOR MASTER RESET TO CLEAR/
1808 012445  EM1604::  .ASCIZ \DEVICE REGISTER WORD READ/WRITE TEST \
1809 012513  EM1701::  .ASCIZ \DEVICE REGISTER WORD READ/MODIFY/WRITE TEST \
1810 012570  EM1801::  .ASCIZ \DEVICE REGISTER BYTE READ/WRITE TEST \
1811 012636  EM1901::  .ASCIZ \DEVICE REGISTER BYTE READ/MODIFY/WRITE TEST \
1812 012713  EM2001::  .ASCIZ /DEVICE STAT REGISTER ID BIT TEST /
1813 012755  EM2002::  .ASCIZ /ID BIT BAD.  EXPECTED: CLEAR, ACTUAL: SET./
1814 013030  EM2101::  .ASCIZ \NO TX_DATA_VALID/NO TX_ACTION TEST\
1815 013073  EM2102::  .ASCIZ /  TX_ACTION FOUND AFTER INVALID DATA WORD WRITTEN TO LINE: /
1816 013167  EM2201::  .ASCIZ \TX_DATA_VALID/TX_ACTION TEST\
1817 013224  EM2202::  .ASCIZ /  NO TX_ACTION FOUND AFTER VALID DATA WORD TX'D ON LINE: /
1818 013316  EM2203::  .ASCIZ /  INCORRECT LINE NUMBER FOUND WITH TX_ACT AFTER DATA TX'D ON LINE : /
1819 013423  EM2301::  .ASCIZ /TX_ENABLE (INACTIVE) BIT TEST/
1820 013461  EM2302::  .ASCIZ /  TX_ENABLE BIT BAD ON LINE: /
1821 013517  EM2401::  .ASCIZ /TX_ENABLE (ACTIVE) BIT TEST/
```

```
1822 013553  EM2601:: .ASCIZ /RECEIVE INTERRUPT TEST /
1823 013603  EM2602:: .ASCIZ /  NO RX INT GENERATED (DATA_VALID SET, RX INTS ENABLED)./
1824 013674  EM2603:: .ASCIZ /  NO RX INT GENERATED (NO CODES IN FIFO AFTER RESET)./
1825 013762  EM2604:: .ASCIZ /  NO RX INT GENERATED (RX_DATA_AVAIL CLR, RX INTS ENABLED)./
1826 014056  EM2605:: .ASCIZ /  RX INTERRUPT GENERATED WITH RX_DATA_AVAIL CLEAR./
1827 014141  EM2606:: .ASCIZ /TRANSMIT INTERRUPT TEST ERROR:/
1828 014200  EM2607:: .ASCIZ /  TX_ACTION SET REPEATEDLY AFTER BOARD RESET, NO DATA SENT./
1829 014274  EM2608:: .ASCIZ /  TX_ACTION STUCK SET AFTER BOARD RESET./
1830 014345  EM2609:: .ASCIZ /  TX INTERRUPT GENERATED WITH TX_ACTION CLEAR./
1831 014424  EM2610:: .ASCIZ /  NO TX INTERRUPT WITH TX_ACTION SET AND TX INTS ENABLED./
1832 014516  EM2611:: .ASCIZ /  TX_ACTION NOT SET AFTER CHARS SENT ON ALL LINES./
1833 014601  EM3001:: .ASCIZ /INTERRUPT BR LEVEL TEST /
1834 014632  EM3002:: .ASCIZ /  NO RX_DATA_AVAIL FROM SELFTEST CODES IN FIFO AFTER RESET./
1835 014726  EM3003:: .ASCIZ /  TX INTERRUPT GENERATED AT WRONG BR LEVEL:/
1836 015002  EM3004:: .ASCIZ /  RX INTERRUPT GENERATED AT WRONG BR LEVEL:/
1837 015056  EM3005:: .ASCIZ /  TX INTERRUPT GIVEN PRECEDENCE OVER SIMULTANEOUS RX INT./
1838 015150  EM3101:: .ASCIZ /DIAGNOSTIC FIELD (BMP) TEST/
1839 015204  EM3102:: .ASCIZ /  DIAGNOSTIC FIELD BAD ON LINE: /
1840 015245  EM9009:: .ASCIZ /EXPECTED OR CORRECT/
1841 015271  EM9010:: .ASCIZ /ACTUAL OR MEASURED /
1842 015315  EM9014:: .ASCIZ /SUMMARY REPORTS FOR LINES WITH EXCESSIVE NUMBERS OF ERRORS:/
1843 015411  EM9017:: .ASCII /  FIFO WILL NOT PURGE (DATA.VALID STUCK SET),/
1844 015466          .ASCIZ / REMAINDER OF TEST SKIPPED./
1845 015522  EM9018:: .ASCIZ /NO CODE/
1846 015532  EM9019:: .ASCIZ /NON-SELFTEST/
1847 015547  EM9020:: .ASCIZ /SELFTEST ERROR CODE/
1848 015573  EM9022:: .ASCIZ /DATA CHARACTER/
1849 015612  EM9023:: .ASCIZ /MODEM STATUS CODE/
1850 015634  EM9024:: .ASCIZ /SELFTEST CODE/
1851 015652  EM9026:: .ASCIZ /     LPR CONTENTS: /
1852 015676  EM9301:: .ASCIZ /BMP CODE REPORT/
1853 015716  EM9302:: .ASCIZ /BMP CODE FOUND IN TEST /
1854 015746  EM9303:: .ASCIZ /THE LAST BMP CODE WAS FOUND IN TEST /
1855 016013  EM9304:: .ASCIZ /UNEXPECTED BMP CODES FOUND DURING THIS PASS/
1856                  .EVEN
1857                                .LIST BIN
```

```
1859
1860
1861                    ;*****************************************************************************
1862                    ;
1863                    ;               FVTSKL2.P11
1864                    ;
1865                    ;*****************************************************************************
1866
1867
1868
1869                    .SBTTL  GLOBAL ERROR REPORT SECTION
1870
1871                    ;++
1872                    ; THE GLOBAL ERROR REPORT SECTION CONTAINS MESSAGE PRINTING AREAS
1873                    ; USED BY MORE THAN ONE TEST TO OUTPUT ADDITIONAL ERROR INFORMATION.  PRINTB
1874                    ; (BASIC) AND PRINTX (EXTENDED) CALLS ARE USED TO CALL PRINT SERVICES.
1875                    ;--
```

```
                                .SBTTL  GLOBAL ERROR REPORTING ROUTINE          - ER0101 -
                                ;*************************************************************************
                                ;*      This is an error reporting subroutine which prints additional error
                                ;*      information if an error is detected in TEST 1 (Register Address
                                ;*      Access Test).  This subroutine reports the type of access (Read or
                                ;*      Write or both) which caused a bus time-out trap (004 trap).
                                ;*      A message indicating that the DHV may be at the wrong Q-bus address
                                ;*      is also printed.
                                ;*
                                ;* INPUTS:      R5 - Error flag word.
                                ;*                   If bit 0 is set, a read error occured.
                                ;*                   If bit 1 is set, a write error occured.
                                ;*
                                ;* OUTPUTS:     Messages are printed at the operator console.
                                ;*
                                ;* CALLING SEQUENCE:    Include the label "ER0101" as the message pointer
                                ;*                      parameter in the DRS error report macro call.
                                ;*
                                ;* COMMENTS:
                                ;*
                                ;* SUBORDINATE ROUTINES USED: None.
                                ;*************************************************************************

016070                                  BGNMSG  ER0101
016070                                                                          ER0101::
016070                                  SAVE                    ;SAVE THE GPR CONTENTS.
016070  004567  165702                                  JSR     R5,PREG05       ;CALL REGISTER SAVE SUBRT.

016074  032705  000001                  BIT     #BIT0,R5        ;TEST FOR READ ERROR.
016100  001410                          BEQ     2$              ;SKIP READ ERROR MSG IF NO READ ERROR.
016102                                  PRINTB  #MSG1           ;PRINT READ ERROR MESSAGE.
016102  012746  016174                                                          MOV     #MSG1,-(SP)
016106  012746  000001                                                          MOV     #1,-(SP)
016112  010600                                                                  MOV     SP,R0
016114  104414                                                                  TRAP    C$PNTB
016116  062706  000004                                                          ADD     #4,SP
016122  032705  000002          2$:     BIT     #BIT1,R5        ;TEST FOR WRITE ERROR.
016126  001410                          BEQ     4$              ;SKIP WRITE ERROR MSG IF NO WRITE ERROR.
016130                                  PRINTB  #MSG2           ;PRINT WRITE ERROR MESSAGE.
016130  012746  016252                                                          MOV     #MSG2,-(SP)
016134  012746  000001                                                          MOV     #1,-(SP)
016140  010600                                                                  MOV     SP,R0
016142  104414                                                                  TRAP    C$PNTB
016144  062706  000004                                                          ADD     #4,SP
016150                          4$:     PRINTX  #MSG3           ;SUGGEST THAT DHV MAY BE AT WRONG ADDRESS.
016150  012746  016331                                                          MOV     #MSG3,-(SP)
016154  012746  000001                                                          MOV     #1,-(SP)
016160  010600                                                                  MOV     SP,R0
016162  104415                                                                  TRAP    C$PNTX
016164  062706  000004                                                          ADD     #4,SP
016170                                  PASS                    ;RESTORE THE GPR CONTENTS.
016170  004736                                          JSR     PC,@(SP)+               ;RETURN TO PREG05 SUBRT.
016172                                  ENDMSG
016172                                                                          L10002:
016172  104423                                                                  TRAP    C$MSG

016174      045     101     102 MSG1::  .ASCIZ  /%ABUS TIME-OUT TRAP CAUSED BY READ ATTEMPT.%N/
```

```
        016177  125  123  040
        016202  124  111  115
        016205  105  055  117
        016210  125  124  040
        016213  124  122  101
        016216  120  040  103
        016221  101  125  123
        016224  105  104  040
        016227  102  131  040
        016232  122  105  101
        016235  104  040  101
        016240  124  124  105
        016243  115  120  124
        016246  056  045  116
        016251  000
1914    016252  045  101  102  MSG2::  .ASCIZ  /%ABUS TIME-OUT TRAP CAUSED BY WRITE ATTEMPT.%N/
        016255  125  123  040
        016260  124  111  115
        016263  105  055  117
        016266  125  124  040
        016271  124  122  101
        016274  120  040  103
        016277  101  125  123
        016302  105  104  040
        016305  102  131  040
        016310  127  122  111
        016313  124  105  040
        016316  101  124  124
        016321  105  115  120
        016324  124  056  045
        016327  116  000
1915    016331  045  101  104  MSG3::  .ASCIZ  /%ADHV MAY BE AT THE WRONG Q-BUS ADDRESS.%N%N/
        016334  110  126  040
        016337  115  101  131
        016342  040  102  105
        016345  040  101  124
        016350  040  124  110
        016353  105  040  127
        016356  122  117  116
        016361  107  040  121
        016364  055  102  125
        016367  123  040  101
        016372  104  104  122
        016375  105  123  123
        016400  056  045  116
        016403  045  116  000
1916
1917                                .EVEN
```

```
                                .SBTTL  GLOBAL ERROR REPORTING ROUTINE          - ER0201 -
                                ;*******************************************************************************
                                ;*      This is an error reporting subroutine which prints 2 contiguous
                                ;*      ASCII error messages.  The address of the first message is passed
                                ;*      as an input parameter and the address of the second is found by
                                ;*      searching for the end of the first message.
                                ;*
                                ;* INPUTS:      R1 - Address of the first message to print.
                                ;*
                                ;* OUTPUTS:     A messages is printed at the operator console.
                                ;*
                                ;* CALLING SEQUENCE:    Load the address of the first message in R1.
                                ;*                      Include the label "ER0201" as the message pointer
                                ;*                      parameter in the Diag Super error report macro call.
                                ;*
                                ;* COMMENTS:    The message is printed as Basic error information.
                                ;*              The second message should follow the first one in the program
                                ;*              memory.  Each message should be defined using .ASCIZ
                                ;*
                                ;* SUBORDINATE ROUTINES USED: None.
                                ;*******************************************************************************

016406                                  BGNMSG  ER0201
016406                                                                  ER0201::
016406                                  SAVE                    ;SAVE THE GPR CONTENTS.
016406  004567  165364                                JSR     R5,PREG05       ;CALL REGISTER SAVE SUBRT.

016412  010102                           MOV    R1,R2
016414  105722                  2$:      TSTB   (R2)+           ;CHECK FOR A ZERO BYTE (END OF MESSAGE).
016416  001376                          BNE    2$              ;LOOP UNTIL NEXT MESSAGE IS FOUND.

016420                                  PRINTB  #EF0503,R1      ;PRINT THE FIRST MESSAGE.
016420  010146                                                          MOV     R1,-(SP)
016422  012746  004134                                                 MOV     #EF0503,-(SP)
016426  012746  000002                                                 MOV     #2,-(SP)
016432  010600                                                         MOV     SP,R0
016434  104414                                                         TRAP    C$PNTB
016436  062706  000006                                                 ADD     #6,SP
016442                                  PRINTB  #EF0503,R2      ;PRINT THE SECOND MESSAGE.
016442  010246                                                          MOV     R2,-(SP)
016444  012746  004134                                                 MOV     #EF0503,-(SP)
016450  012746  000002                                                 MOV     #2,-(SP)
016454  010600                                                         MOV     SP,R0
016456  104414                                                         TRAP    C$PNTB
016460  062706  000006                                                 ADD     #6,SP

016464                                  PASS                    ;RESTORE THE GPR CONTENTS.
016464  004736                                      JSR     PC,@(SP)+               ;RETURN TO PREG05 SUBRT.

016466                                  ENDMSG
016466                                                                  L10003:
016466  104423                                                                  TRAP    C$MSG
```

```
                        .SBTTL  GLOBAL ERROR REPORTING ROUTINE          - ER0503 -
                        ;*************************************************************************
                        ;*      This is an error reporting subroutine which prints an additional error
                        ;*      message whose address is passed as an input parameter.
                        ;*
                        ;* INPUTS:      R1 - Address of the message to print.
                        ;*
                        ;* OUTPUTS:     A messages is printed at the operator console.
                        ;*
                        ;* CALLING SEQUENCE:    Load the address of the message in R1.
                        ;*                      Include the label "ER0503" as the message pointer
                        ;*                      parameter in the Diag Super error report macro call.
                        ;*
                        ;* COMMENTS:    The message is printed as Basic error information.
                        ;*
                        ;* SUBORDINATE ROUTINES USED: None.
                        ;*************************************************************************

016470                          BGNMSG  ER0503
016470                                                                  ER0503::

                        PRINTB  #EF0503,R1      ;PRINT THE MESSAGE.
016470  010146                                                                 MOV     R1,-(SP)
016472  012746  004134                                                        MOV     #EF0503,-(SP)
016476  012746  000002                                                        MOV     #2,-(SP)
016502  010600                                                                 MOV     SP,R0
016504  104414                                                                 TRAP    C$PNTB
016506  062706  000006                                                        ADD     #6,SP

016512                          ENDMSG
016512                                                                  L10004:
016512  104423                                                                 TRAP    C$MSG
```

```
                        .SBTTL  GLOBAL ERROR REPORTING ROUTINE          - ER0504 -
                        ;*************************************************************************
                        ;*      This is an error reporting subroutine which prints additional error
                        ;*      messages when illegal interrupts are received.
                        ;*
                        ;* INPUTS:      R1 - Address of the message to print.
                        ;*              R2 - Number of illegal interrupts received.
                        ;*
                        ;* OUTPUTS:     Messagess are printed at the operator console.
                        ;*
                        ;* CALLING SEQUENCE:    Load the address of the message in R1.
                        ;*                      Load the number of illegal ints in R2.
                        ;*                      Include the label "ER0504" as the message pointer
                        ;*                      parameter in the Diag Super error report macro call.
                        ;*
                        ;* COMMENTS:
                        ;*
                        ;* SUBORDINATE ROUTINES USED: None.
                        ;*************************************************************************

                            BGNMSG  ER0504
                                                                    ER0504::

                            PRINTB  #EF0503,R1      ;PRINT THE FIRST LINE OF THE MESSAGE.
016514  010146                                                          MOV     R1,-(SP)
016516  012746  004134                                                  MOV     #EF0503,-(SP)
016522  012746  000002                                                  MOV     #2,-(SP)
016526  010600                                                          MOV     SP,R0
016530  104414                                                          TRAP    C$PNTB
016532  062706  000006                                                  ADD     #6,SP
                            PRINTX  #EF0505,R2      ;PRINT THE NUMBER OF INTS RECEIVED.
016536  010246                                                          MOV     R2,-(SP)
016540  012746  004141                                                  MOV     #EF0505,-(SP)
016544  012746  000002                                                  MOV     #2,-(SP)
016550  010600                                                          MOV     SP,R0
016552  104415                                                          TRAP    C$PNTX
016554  062706  000006                                                  ADD     #6,SP

                            ENDMSG
                                                                L10005:
016560  104423                                                          TRAP    C$MSG
```

GLOBAL ERROR REPORTING ROUTINE - ER1401 -

```
                                .SBTTL  GLOBAL ERROR REPORTING ROUTINE          - ER1401 -
                                ;*******************************************************************************
                                ;*      This is an error reporting subroutine which prints additional error
                                ;*      information if an error is detected in the Rom version test.
                                ;*      This subroutine analyses the input parameters which contain the
                                ;*      ROM version numbers for PROC_1 and PROC_2 and reports the appropriate
                                ;*      error message to the operator.
                                ;*
                                ;* INPUTS:      R1 - Contains the address of the first message to be reported.
                                ;*              R3 - Contains the ROM version number of PROC_1.
                                ;*              R4 _ Contains the ROM version number of PROC_2.
                                ;*
                                ;* OUTPUTS:     Basic and extended error messages are reported at the
                                ;*              operators console.
                                ;*
                                ;* CALLING SEQUENCE:    Include the label "ER1401" as the message pointer
                                ;*                      parameter in the DRS error report macro call.
                                ;*
                                ;* COMMENTS:
                                ;*
                                ;* SUBORDINATE ROUTINES USED: None.
                                ;*******************************************************************************

016562                                  BGNMSG  ER1401
016562                                                                          ER1401::

                                        PRINTB  #EF0503,R1              ;REPORT THE ERROR MESSAGE PASSED IN.
016562  010146                                                                  MOV     R1,-(SP)
016564  012746  004134                                                          MOV     #EF0503,-(SP)
016570  012746  000002                                                          MOV     #2,-(SP)
016574  010600                                                                  MOV     SP,R0
016576  104414                                                                  TRAP    C$PNTB
016600  062706  000006                                                          ADD     #6,SP

                                ;+
                                ; Determine which Rom version number(s) are missing.
                                ;-

016604  012705  000143                  MOV     #99.,R5                 ;GET INVALID ROM NUMBER.
016610  012701  012314                  MOV     #EM1405,R1              ;SELECT PROC_1 MESSAGE.
016614  012702  012342                  MOV     #EM1407,R2              ;SELECT THE "NOT FOUND" MESSAGE.
016620  120305                          CMPB    R3,R5                   ;CHECK PROC_1 ROM VERSION NUMBER.
016622  001402                        BEQ     2$                      ;GO REPORT PROC_1 CODE NOT FOUND.
016624  012702  012354                  MOV     #EM1408,R2              ;SELECT "FOUND" MESSAGE.
016630  004767  000026        2$:     JSR     PC,50$                  ;GO REPORT MESSAGE.

016634  012701  012327                  MOV     #EM1406,R1              ;SELECT PROC_2 MESSAGE.
016640  012702  012342                  MOV     #EM1407,R2              ;SELECT THE "NOT FOUND" MESSAGE.
016644  120405                          CMPB    R4,R5                   ;CHECK PROC_2 ROM VERSION NUMBER.
016646  001402                        BEQ     4$                      ;GO REPORT PROC_2 CODE NOT FOUND.
016650  012702  012354                  MOV     #EM1408,R2              ;SELECT "FOUND" MESSAGE.
016654  004767  000002        4$:     JSR     PC,50$                  ;GO REPORT THE MESSAGE.
016660  000413                        BR      60$                     ;EXIT.

016662                          50$:    PRINTX  #EF1402,R1,R2           ;REPORT THE MESSAGE.
016662  010246                                                                  MOV     R2,-(SP)
016664  010146                                                                  MOV     R1,-(SP)
```

```
        016666  012746  004316                                                  MOV     #EF1402,-(SP)
        016672  012746  000003                                                  MOV     #3,-(SP)
        016676  010600                                                          MOV     SP,R0
        016700  104415                                                          TRAP    C$PNTX
        016702  062706  000010                                                  ADD     #10,SP
  2054  016706  000207                RTS     PC              ;RETURN.
  2055  016710                  60$:  ENDMSG
        016710                                                          L10006:
        016710  104423                                                          TRAP    C$MSG
```

```
                        .SBTTL  GLOBAL ERROR REPORTING ROUTINE          - ER1601 -
                        ;*************************************************************************
                        ;*      This an error reporting subroutine which prints additional error
                        ;*      information if an error is detected in one of the device register
                        ;*      access tests.
                        ;*      This subroutine reports the actual and expected from the device
                        ;*      register(s) which is(are) in faulty.
                        ;*
                        ;* INPUTS:      R1 - Actual data (unused bits set to 0).
                        ;*              R2 - Expected data (unused bits set to 0).
                        ;*              R3 - Offset (in bytes) to the register being tested.
                        ;*              R5 - Line number of register being tested.
                        ;*              RMATBB - Label at base of register message address table.
                        ;*
                        ;* OUTPUTS:     Messages are printed at the operators console.
                        ;*
                        ;* CALLING SEQUENCE:    Include the lable "ER1601" as the message pointer
                        ;*                      parameter in the DRS error report macro call.
                        ;*
                        ;* COMMENTS:
                        ;*
                        ;* SUBORDINATE ROUTINES CALLED: NONE
                        ;*************************************************************************
016712                          BGNMSG  ER1601
016712                                                                  ER1601::
016712  016304  002304          MOV     RMATBB(R3),R4   ;FETCH ADDRESS OF REGISTER NAME MESSAGE.
016716          PRINTB  #EF1604,R4,R5   ;REPORT BASIC MESSAGE (REG NAME AND LINE #).
016716  010546                                                          MOV     R5,-(SP)
016720  010446                                                          MOV     R4,-(SP)
016722  012746  004503                                                  MOV     #EF1604,-(SP)
016726  012746  000003                                                  MOV     #3,-(SP)
016732  010600                                                          MOV     SP,R0
016734  104414                                                          TRAP    C$PNTB
016736  062706  000010                                                  ADD     #10,SP
016742          PRINTX  #EF1602,R2      ;PRINT THE EXPECTED DATA.
016742  010246                                                          MOV     R2,-(SP)
016744  012746  004377                                                  MOV     #EF1602,-(SP)
016750  012746  000002                                                  MOV     #2,-(SP)
016754  010600                                                          MOV     SP,R0
016756  104415                                                          TRAP    C$PNTX
016760  062706  000006                                                  ADD     #6,SP
016764          PRINTX  #EF1603,R1      ;PRINT THE ACTUAL DATA.
016764  010146                                                          MOV     R1,-(SP)
016766  012746  004441                                                  MOV     #EF1603,-(SP)
016772  012746  000002                                                  MOV     #2,-(SP)
017000  010600                                                          MOV     SP,R0
017002  104415                                                          TRAP    C$PNTX
017002  062706  000006                                                  ADD     #6,SP
017006          ENDMSG
017006                                                          L10007:
017006  104423                                                          TRAP    C$MSG
```

```
                        .SBTTL  GLOBAL ERROR REPORTING ROUTINE          - ER1603 -
                        ;*************************************************************************
                        ;*      This error reporting routine is used to print out a basic error
                        ;*      message, along with a message informing the operator which test is
                        ;*      about to be aborted.
                        ;*
                        ;* INPUTS:      R1 - Contains the address of the message to be printed.
                        ;*              ERRMSG - Contains the address of the message that indicates
                        ;*              the test that is being performed, eg DMA, BREAK etc.
                        ;*
                        ;* OUTPUTS:     Messages are printed at the operators console.
                        ;*              "testname TEST ABORTED"
                        ;*
                        ;* CALLING SEQUENCE:    Include the lable "ER1603" as the message pointer
                        ;*                      parameter in the DRS error report macro call.
                        ;*
                        ;* COMMENTS:
                        ;*
                        ;*
                        ;* SUBORDINATE ROUTINES CALLED: None.
                        ;*************************************************************************
017010                          BGNMSG  ER1603
017010                                                          ER1603::
017010                          SAVE
017010  004567  164762                  JSR     R5,PREG05       ;SAVE THE CONTENTS OF THE GPRS.
                                                                ;CALL REGISTER SAVE SUBRT.
017014
017014  010146                  PRINTB #EF0503,R1       ;PRINT BASIC MESSAGE ON OPERATORS CONSOLE.
017016  012746  004134                                          MOV     R1,-(SP)
017022  012746  000002                                          MOV     #EF0503,-(SP)
017026  010600                                                  MOV     #2,-(SP)
017030  104414                                                  MOV     SP,R0
017032  062706  000006                                          TRAP    C$PNTB
                                                                ADD     #6,SP
017036  016702  164730          MOV     ERRMSG,R2       ;GET THE "TEST MESSAGE".
017042                          PRINTB #EF1601,R2       ;PRINT "TEST ABORTED" MESSAGE.
017042  010246                                                  MOV     R2,-(SP)
017044  012746  004353                                          MOV     #EF1601,-(SP)
017050  012746  000002                                          MOV     #2,-(SP)
017054  010600                                                  MOV     SP,R0
017056  104414                                                  TRAP    C$PNTB
017060  062706  000006                                          ADD     #6,SP
017064                          PASS            ;RESTORE THE CONTENTS OF THE GPRS.
017064  004736                  JSR     PC,@(SP)+               ;RETURN TO PREG05 SUBRT.
017066                          ENDMSG
017066                                                          L10010:
017066  104423                                                          TRAP    C$MSG
```

GLOBAL ERROR REPORTING ROUTINE - ER3001 -

```
                        .SBTTL  GLOBAL ERROR REPORTING ROUTINE          - ER3001 -
                        ;*************************************************************************
                        ;*      This is an error reporting subroutine which is intended for use in the
                        ;*      Interrupt BR Level Test.  It reports additional information when an
                        ;*      interrupt has occurred at the wrong BR level.
                        ;*
                        ;* INPUTS:      R1 - Address of message to print first.
                        ;*              R4 - BR level at which the int request occurred.
                        ;*              R5 - Expected or correct BR level for the DUT.
                        ;*
                        ;* OUTPUTS:     A messages is printed at the operator console.
                        ;*
                        ;* CALLING SEQUENCE:    Include the label "ER3001" as the message pointer
                        ;*                      parameter in the Diag Super error report macro call.
                        ;*
                        ;* COMMENTS:    The message is printed as Basic and Extended error information.
                        ;*
                        ;* SUBORDINATE ROUTINES USED: None.
                        ;*************************************************************************

017070                          BGNMSG  ER3001
017070                                                                  ER3001::

                        PRINTB  #EF0503,R1      ;PRINT THE FIRST LINE OF THE MESSAGE.
017070  010146                                                         MOV     R1,-(SP)
017072  012746  004134                                                 MOV     #EF0503,-(SP)
017076  012746  000002                                                 MOV     #2,-(SP)
017102  010600                                                         MOV     SP,R0
017104  104414                                                         TRAP    C$PNTB
017106  062706  000006                                                 ADD     #6,SP
017112                          PRINTX  #EF3001,R5      ;REPORT EXPECTED BR LEVEL.
017112  010546                                                         MOV     R5,-(SP)
017114  012746  004600                                                 MOV     #EF3001,-(SP)
017120  012746  000002                                                 MOV     #2,-(SP)
017124  010600                                                         MOV     SP,R0
017126  104415                                                         TRAP    C$PNTX
017130  062706  000006                                                 ADD     #6,SP
017134                          PRINTX  #EF3002,R4      ;REPORT ACTUAL BR LEVEL.
017134  010446                                                         MOV     R4,-(SP)
017136  012746  004647                                                 MOV     #EF3002,-(SP)
017142  012746  000002                                                 MOV     #2,-(SP)
017146  010600                                                         MOV     SP,R0
017150  104415                                                         TRAP    C$PNTX
017152  062706  000006                                                 ADD     #6,SP

017156                          ENDMSG
017156                                                          L10011:
017156  104423                                                         TRAP    C$MSG
```

GLOBAL ERROR REPORTING ROUTINE - ER9004 -

```
                                .SBTTL  GLOBAL ERROR REPORTING ROUTINE          - ER9004 -
                                ;*******************************************************************************
                                ;*      This is an error reporting subroutine which reports error summaries
                                ;*      for lines which have exceeded the specified maximum number of
                                ;*      individual reception errors.
                                ;*
                                ;* INPUTS:      R1 - Address of message to print first.
                                ;*               ERCNTB - Label at base of line error counters table.
                                ;*               ERSMRF - "Report error summary for line" flags.
                                ;*
                                ;* OUTPUTS:     A message is printed at the operator console.
                                ;*
                                ;* CALLING SEQUENCE:    Include the label "ER9004" as the message pointer
                                ;*                      parameter in the Diag Super error report macro call.
                                ;*
                                ;* COMMENTS:    The message is printed as Basic and Extended error information.
                                ;*              The contents of GPR's R2, R3, R4, and R5 are destroyed.
                                ;*
                                ;* SUBORDINATE ROUTINES USED: None.
                                ;*******************************************************************************

017160                                  BGNMSG  ER9004
017160                                                                          ER9004::

                                        PRINTB  #EF0503,#EM9014 ;REPORT THE SECONDARY ERROR MESSAGE.
017160  012746  015315                                                          MOV     #EM9014,-(SP)
017164  012746  004134                                                          MOV     #EF0503,-(SP)
017170  012746  000002                                                          MOV     #2,-(SP)
017174  010600                                                                  MOV     SP,R0
017176  104414                                                                  TRAP    C$PNTB
017200  062706  000006                                                          ADD     #6,SP
017204  005002                          CLR     R2              ;CLEAR THE LINE COUNTER.
017206  016703  163250                  MOV     ERSMRF,R3       ;GET THE ERROR SUMMARY FLAGS.
017212  005004                          CLR     R4              ;CLEAR "LINE COUNTER TIMES 2" OFFSET.
017214  000241                2$:       CLC                     ;CLEAR THE CARRY FOR THE FOLLOWING ROTATE.
017216  006003                          ROR     R3              ;SHIFT ANOTHER ERROR SUMMARY FLAG INTO CARRY.
017220  103013                        BCC     4$              ;SKIP PRINTING MESSAGE IF FLAG FOR LINE CLEAR.
017222                                  PRINTX  #EF9010,R2,ERCNTB(R4)
017222  016446  002464                                                          MOV     ERCNTB(R4),-(SP)
017226  010246                                                                  MOV     R2,-(SP)
017230  012746  005225                                                          MOV     #EF9010,-(SP)
017234  012746  000003                                                          MOV     #3,-(SP)
017240  010600                                                                  MOV     SP,R0
017242  104415                                                                  TRAP    C$PNTX
017244  062706  000010                                                          ADD     #10,SP
017250  012405                4$:       MOV     (R4)+,R5        ;INCREMENT THE LINE OFFSET BY 2.
017252  005202                          INC     R2              ;INCREMT THE LINE COUNTER.
017254  005703                          TST     R3              ;CHECK THE ERROR SUMMARY FLAGS.
017256  001356                        BNE     2$              ;IF MORE FLAGS SET, LOOP TO DO OTHER LINES.

017260                                  ENDMSG
017260                                                                  L10012:
017260  104423                                                                  TRAP    C$MSG
```

```
                        .SBTTL  GLOBAL ERROR REPORTING ROUTINE          - ER9007 -
                        ;*************************************************************************
                        ;*      This is an error reporting subroutine which is used to report that
                        ;*      something other than a selftest code was found in a selftest code
                        ;*      FIFO slot during the removal of the selftest codes from the FIFO.
                        ;*      This routine is used by the RSTRPT routine.
                        ;*
                        ;* INPUTS:      R1 - Address of error message qualifier string.
                        ;*              R2 - Incorrect code as read from the selftest code FIFO slot.
                        ;*              R3 - Line number associated with the selftest FIFO slot.
                        ;*
                        ;* OUTPUTS:     A message is printed at the operator console.
                        ;*
                        ;* CALLING SEQUENCE:    Include the label "ER9007" as the message pointer
                        ;*                      parameter in the Diag Super error report macro call.
                        ;*
                        ;* COMMENTS:    The message is printed as Basic and Extended error information.
                        ;*
                        ;* SUBORDINATE ROUTINES USED: None.
                        ;*************************************************************************

017262                          BGNMSG  ER9007
017262                                                          ER9007::

                         BIC    #177760,R3      ;REMOVE ALL BUT LINE # BITS FROM LINE # WORD.
                        PRINTB  #EF9018,R1,R3   ;REPORT SECONDARY ERROR MESSAGE.
017266  010346                                                         MOV     R3,-(SP)
017270  010146                                                         MOV     R1,-(SP)
017272  012746  005475                                                 MOV     #EF9018,-(SP)
017276  012746  000003                                                 MOV     #3,-(SP)
017302  010600                                                         MOV     SP,R0
017304  104414                                                         TRAP    C$PNTB
017306  062706  000010                                                 ADD     #10,SP
                        PRINTX  #EF9017,R1,R2   ;REPORT THE ACTUAL INCORRECT CODE.
017312  010246                                                         MOV     R2,-(SP)
017314  010146                                                         MOV     R1,-(SP)
017316  012746  005421                                                 MOV     #EF9017,-(SP)
017322  012746  000003                                                 MOV     #3,-(SP)
017326  010600                                                         MOV     SP,R0
017330  104415                                                         TRAP    C$PNTX
017332  062706  000010                                                 ADD     #10,SP

017336                          ENDMSG
017336                                                          L10013:
017336  104423                                                         TRAP    C$MSG
```

GLOBAL ERROR REPORTING ROUTINE - ER9008 -

```
                        .SBTTL  GLOBAL ERROR REPORTING ROUTINE          - ER9008 -
                        ;*************************************************************************
                        ;*      This is an error reporting subroutine which is used to report that
                        ;*      an unexpected code or character has been found in the DUT receive
                        ;*      character FIFO.
                        ;*
                        ;* INPUTS:      R1 - Address of partial error message string.
                        ;*              R2 - Incorrect code as read from the selftest code FIFO slot.
                        ;*
                        ;* OUTPUTS:     A message is printed at the operator console.
                        ;*
                        ;* CALLING SEQUENCE:    Include the label "ER9008" as the message pointer
                        ;*                      parameter in the Diag Super error report macro call.
                        ;*
                        ;* COMMENTS:    The message is printed as Basic and Extended error information.
                        ;*
                        ;* SUBORDINATE ROUTINES USED: None.
                        ;*************************************************************************

017340                          BGNMSG  ER9008
017340                                                                  ER9008::

                        ;+
                        ; Extract the line number from the incorrect code or character which was read
                        ;    from the selftest code FIFO slot.
                        ;-
017340  010203                   MOV    R2,R3
017342  000303                   SWAB   R3
017344  042703  177760           BIC    #177760,R3      ;CALCULATE LINE NUMBER OF CODE.
017350                          PRINTB  #EF9016,R1,R3   ;REPORT TYPE OF INCORRECT CODE FOUND.
017350  010346                                                          MOV     R3,-(SP)
017352  010146                                                          MOV     R1,-(SP)
017354  012746  005324                                                  MOV     #EF9016,-(SP)
017360  012746  000003                                                  MOV     #3,-(SP)
017364  010600                                                          MOV     SP,R0
017366  104414                                                          TRAP    C$PNTB
017370  062706  000010                                                  ADD     #10,SP
017374                          PRINTX  #EF9017,R1,R2   ;REPORT THE ACTUAL INCORRECT CODE.
017374  010246                                                          MOV     R2,-(SP)
017376  010146                                                          MOV     R1,-(SP)
017400  012746  005421                                                  MOV     #EF9017,-(SP)
017404  012746  000003                                                  MOV     #3,-(SP)
017410  010600                                                          MOV     SP,R0
017412  104415                                                          TRAP    C$PNTX
017414  062706  000010                                                  ADD     #10,SP

017420                          ENDMSG
017420                                                          L10014:
017420  104423                                                          TRAP    C$MSG
```

```
                        .SBTTL  GLOBAL ERROR REPORTING ROUTINE          - ER9101 -
                        ;*************************************************************************
                        ;*      This is a general error reporting subroutine which reports a message
                        ;*      which takes a single, 2 digit decimal argument after the end of an
                        ;*      ASCII message.
                        ;*
                        ;* INPUTS:      R1 - Value to be printed after msg as 2 decimal digits.
                        ;*              R2 - Address of message to print first.
                        ;*
                        ;* OUTPUTS:     A messages is printed at the operator console.
                        ;*
                        ;* CALLING SEQUENCE:    Include the label "ER9101" as the message pointer
                        ;*                      parameter in the Diag Super error report macro call.
                        ;*
                        ;* COMMENTS:    The message is printed as Basic error information.
                        ;*
                        ;* SUBORDINATE ROUTINES USED: None.
                        ;*************************************************************************

017422                          BGNMSG  ER9101
017422                                                                  ER9101::

                        PRINTB  #EF9006,R2,R1   ;REPORT THE STRING FOLLOWED BY THE NUMBER.
017422  010146                                                                  MOV     R1,-(SP)
017424  010246                                                                  MOV     R2,-(SP)
017426  012746  005201                                                          MOV     #EF9006,-(SP)
017432  012746  000003                                                          MOV     #3,-(SP)
017436  010600                                                                  MOV     SP,R0
017440  104414                                                                  TRAP    C$PNTB
017442  062706  000010                                                          ADD     #10,SP

017446                          ENDMSG
017446                                                                  L10015:
017446  104423                                                                  TRAP    C$MSG
```

GLOBAL ERROR REPORTING ROUTINE - ER9301 -

```
                        .SBTTL  GLOBAL ERROR REPORTING ROUTINE          - ER9301 -
                        ;*******************************************************************************
                        ;*      This is an error reporting subroutine which prints any BMP codes
                        ;*      that are found in the BMP code queue, together with the the number of
                        ;*      the test that was executing at the time the BMP code was logged.
                        ;*
                        ;* INPUTS:      R1 - The address of the first message to be reported.
                        ;*              R2 - The address of the next empty cell in the queue.
                        ;*
                        ;* OUTPUTS:     The test number followed by the BMP code are printed at the
                        ;*              operator console.
                        ;*
                        ;* CALLING SEQUENCE:    Include the label "ER9301" as the message pointer
                        ;*                      parameter in the Diag Super error report macro call.
                        ;*
                        ;* COMMENTS:    The message is printed as Basic error information.
                        ;*
                        ;* SUBORDINATE ROUTINES USED: None.
                        ;*******************************************************************************

017450                          BGNMSG  ER9301
017450                                                                  ER9301::
017450                          SAVE                    ;SAVE THE GPRS ON THE STACK.
017450  004567  164322                  JSR     R5,PREG05       ;CALL REGISTER SAVE SUBRT.

017454                          PRINTB  #EF0503,R1      ;REPORT UNEXPECTED BMP CODES FOUND.
017454  010146                                                          MOV     R1,-(SP)
017456  012746  004134                                                  MOV     #EF0503,-(SP)
017462  012746  000002                                                  MOV     #2,-(SP)
017466  010600                                                          MOV     SP,R0
017470  104414                                                          TRAP    C$PNTB
017472  062706  000006                                                  ADD     #6,SP
017476  012703  002526                MOV     #BMPCQB,R3      ;GET THE START ADDRESS OF THE BMP CODE QUEUE.
017502  012705  015716                MOV     #EM9302,R5      ;GET THE MESSAGE TO BE REPORTED.
017506  012301        2$:             MOV     (R3)+,R1        ;GET THE NUMBER OF THE TEST THAT WAS EXECUTING.
017510  012304                        MOV     (R3)+,R4        ;GET BMP CODE THAT WAS REPORTED OFF THE QUEUE.
017512  004767  000056                JSR     PC,50$          ;GO REPORT THE BMP CODE.
017516  020302                        CMP     R3,R2           ;CHECK IF ALL CODES HAVE BEEN REPORTED.
017520  103772                        BLO     2$              ;IF IT IS NOT THE LAST BMP CODE THEN LOOP.
                        ;+
                        ; Check if overflow has occurred.
                        ;  The conditions for overflow are: the pointer contains the address of the
                        ;  last cell in the queue, and a bmp code has already been written into that
                        ;  cell.
                        ;-
017522  020227  002722                CMP     R2,#BMPCQE-4    ;CHECK IF THE POINTER IS AT THE LAST LOCATION.
017526  001036                        BNE     60$             ;EXIT IF NOT AT THE LAST LOCATION.
017530  005762  000002                TST     2(R2)           ;CHECK FOR A BMP CODE IN THE LAST CELL
017534  001433                      BEQ     60$             ;EXIT IF NO OVERFLOW HAS OCCURED, CELL EMPTY.
017536  012301                        MOV     (R3)+,R1        ;GET THE TEST NUMBER OFF THE QUEUE.
017540  011304                        MOV     (R3),R4         ;GET THE BMP CODE OFF THE QUEUE.
017542  012705  015746                MOV     #EM9303,R5      ;SELECT THE MESSAGE TO BE REPORTED.
017546                              PRINTX  #EF9302         ;REPORT OVERFLOW CONDITION.
017546  012746  005704                                                  MOV     #EF9302,-(SP)
017552  012746  000001                                                  MOV     #1,-(SP)
017556  010600                                                          MOV     SP,R0
017560  104415                                                          TRAP    C$PNTX
```

GLOBAL ERROR REPORTING ROUTINE - ER9301 -

```
        017562  062706  000004                                                  ADD     #4,SP
2319    017566  004767  000002          JSR     PC,50$          ;REPORT THE LAST BMP CODE PLACED ON THE QUEUE.
2320    017572  000414                  BR      60$             ;EXIT.
2321
2322    017574                  50$:    PRINTX  #EF9301,R5,R1,R4  ;PRINT THE MESSAGE.
        017574  010446                                                          MOV     R4,-(SP)
        017576  010146                                                          MOV     R1,-(SP)
        017600  010546                                                          MOV     R5,-(SP)
        017602  012746  005626                                                  MOV     #EF9301,-(SP)
        017606  012746  000004                                                  MOV     #4,-(SP)
        017612  010600                                                          MOV     SP,R0
        017614  104415                                                          TRAP    C$PNTX
        017616  062706  000012                                                  ADD     #12,SP
2323    017622  000207                  RTS     PC              ;RETURN.
2324    017624                  60$:    PASS                    ;RESTORE THE GPR CONTENTS.
        017624  004736                          JSR     PC,@(SP)+               ;RETURN TO PREG05 SUBRT.
2325
2326    017626                  ENDMSG
        017626                                                          L10016:
        017626  104423                                                          TRAP    C$MSG
```

GLOBAL SUBROUTINES SECTION

```
2328                            .SBTTL  GLOBAL SUBROUTINES SECTION
2330                            ;**********************************************************************************************
2331                            ;
2332                            ;               FVTSKL3.P11
2333                            ;
2334                            ;**********************************************************************************************
2336
2337
2338                            ;++
2339                            ; THE GLOBAL SUBROUTINES SECTION CONTAINS THE SUBROUTINES
2340                            ; THAT ARE USED IN MORE THAN ONE TEST.
2341                            ;--
```

```
                        .SBTTL  GLOBAL SUBROUTINE                - ALTFLD -
                        ;** ************************************************************************
                        ;*              - Alter Device Register Fields Routine -
                        ;*      This subroutine alters the specified field of the specified device
                        ;*      register for the specified lines.  This routine can be used to set
                        ;*      or clear bits within selected fields of selected registers.
                        ;*      Use examples:   Set RX.BAUD.RATE fields on lines 3 and 6.
                        ;*                      Clear TX.DMA bits on all lines.
                        ;*
                        ;* INPUTS:      R1 - Address of the registers to alter.
                        ;*              R2 - Bit fields set to desired states.
                        ;*              R3 - Bit map of lines for which to alter register.
                        ;*              R4 - Mask of bits to alter (1 indicates change bit).
                        ;*              CSRA - Contains the address of the device CSR.
                        ;*              IESTAT - Saved states of the interrupt enable bits.
                        ;*
                        ;* OUTPUTS:     DEVICE REGISTERS - Specified register fields altered.
                        ;*                  CSR IND.ADR.REG field - Destroyed.
                        ;*
                        ;* CALLING SEQUENCE:    JSR     PC,ALTFLD
                        ;*
                        ;* COMMENTS:    This routine reads the specified registers for all lines
                        ;*              with numbers lower than the highes specified line.
                        ;*              This routine does not read the CSR.
                        ;*
                        ;* SUBROUTINES CALLED: None.
                        ;-- ************************************************************************

017630                  ALTFLD:: SAVE                           ;SAVE CONTENTS OF GPRS R0 THRU R5.
017630  004567  164142                 JSR     R5,PREG05       ;CALL REGISTER SAVE SUBRT.

                        ;+
                        ; Set up to loop for each line:
                        ;    Prepare the word to be ORed into the register contents.
                        ;    Set up the word to write into the IND.ADR.REG field of the CSR.
                        ;-
017634  010400                  MOV     R4,R0           ;CALCULATE THE NEW CONTENTS OF THE
017636  005100                  COM     R0              ;  REGISTER FIELDS WHICH ARE TO BE
017640  040002                  BIC     R0,R2           ;  ALTERRED BY THIS ROUTINE.
017642  016705  162462          MOV     IESTAT,R5       ;SET UP TO WRITE IND.ADR.REG FIELD TO 0.

                        ;+
                        ; Loop once for each line, altering the specified field in the specified
                        ;    register if the line has been selected for altering.
                        ; Exit the loop if no more lines to alter, or if we have altered the max
                        ;    allowable number of lines (as specified by NUMLNS).
                        ;-
017646  000241          2$:     CLC                     ;PREPARE FOR ROTATE, "TST R5" DOES THIS BELOW.
017650  006003                  ROR     R3              ;GET THE LINE SELECT BIT FOR THIS LINE.
017652  103006                  BCC     4$              ;SKIP SETUP IF LINE IS NOT SELECTED.
017654  010577  162364          MOV     R5,@CSRA        ;SET DUT CSR IND.ADR.REG FIELD TO THIS LINE.
017660  011100                  MOV     (R1),R0         ;GET THE PRESENT CONTENTS OF THE REG TO ALTER.
017662  040400                  BIC     R4,R0           ;CLEAR THE BIT FIELDS WE ARE TO ALTER.
017664  050200                  BIS     R2,R0           ;OR IN THE NEW STATES OF THE FIELDS.
017666  010011                  MOV     R0,(R1)         ;WRITE THE NEW REGISTER CONTENTS TO THE REG.
017670  005205          4$:     INC     R5              ;SET LINE NUMBER TO THE NEXT LINE.
017672  005703                  TST     R3              ;CHECK FOR UNHANDLED LINES, CLEAR CARRY FLAG.
017674  001365                  BNE     2$              ;LOOP IF SELECTED LINE(S) IS NOT HANDLED.
```

```
2399
2400 017676                    60$:  PASS                    ;RESTORE GPRS.
     017676  004736                  JSR     PC,@(SP)+       ;RETURN TO PREG05 SUBRT.
2401 017700  000207                  RTS     PC              ;RETURN TO CALLING ROUTNE.
```

```
                        .SBTTL  GLOBAL SUBROUTINE                - CALMSL -
                        ;++ ******************************************************************************
                        ;*              - Calibrate Milli Second Loop count subroutine -
                        ;*      This subroutine calibrates the timing loop which is used in the MSLOOP
                        ;*      routine.  This subroutine calculates a value for the MSLCNT variable
                        ;*      which is the number of software loops which takes 1 ms to execute in
                        ;*      the MSLOOP routine.  This routine calibrates the count by using the
                        ;*      Line Time Clock (LTC), so if no LTC is available the default value for
                        ;*      the delay count must be used.
                        ;*
                        ;*
                        ;* INPUTS:      MSLCNT - Default 1 ms delay loop count value, or
                        ;*                       value from previous calibration.
                        ;*              MSTICK - Number of MS per LTC clock tick.
                        ;*              TIMER1 - Timer counter changed by LTC interrupt service rtn.
                        ;*              CLKHRZ - Number of LTC clicks per second (50 or 60).
                        ;*
                        ;* OUTPUTS:     CARRY - Set if LTC is available, and new calibration performed.
                        ;*              MSLCNT - New 1 ms delay loop count value if LTC available, or
                        ;*                       unchanged if no LTC is available.
                        ;*
                        ;* CALLING SEQUENCE:    JSR     PC,CALMSL
                        ;*
                        ;* COMMENTS:
                        ;*
                        ;* SUBORDINATE ROUTINES CALLED: UNSDIV,OOPS.
                        ;-- ******************************************************************************

017702                  CALMSL:: SAVE                           ;SAVE CONTENTS OF GPRS R0 THRU R5.
017702  004567  164070                  JSR     R5,PREG05       ;CALL REGISTER SAVE SUBRT.
017706  005067  000210          CLR     62$                     ;CLEAR THE 2ND TIME FLAG.
                        ;+
                        ; Synchronize with the LTC.
                        ;-
017712  012705  000001  2$:     MOV     #1,R5                   ;SET OUTER LOOP COUNTER TO 1 LOOP.
                                                        ;INCREASE THE VALUE LOADED INTO THIS COUNTER IF THE <**
                                                        ;FOLLOWING LOOP FAILS ON FUTURE, FASTER PROCESSORS. <**
017716  005000                  CLR     R0                      ;CLEAR THE WAIT FOR CLOCK INT COUNTER.
017720  012767  000001  162436  MOV     #1,TIMER1               ;SET UP COUNT OF 1 TO SYNCH WITH LTC.
017726  005767  162432  4$:     TST     TIMER1                  ;CHECK FOR COUNTER HAVING GONE TO ZERO.
017732  001410                  BEQ     6$                      ;JUMP OUT OF LOOP IF LTC HAS INTERRUPTED.
017734  005200                  INC     R0                      ;COUNT THIS ITERATION OF THE INNER LOOP.
017736  001373                  BNE     4$                      ;LOOP IF COUNTER HAS NOT TURNED OVER.
017740  005305                  DEC     R5                      ;DECREMENT THE INNER LOOP COUNTER.
017742  003371                  BGT     4$                      ;LOOP IF OUTER LOOP COUNT NOT UP.
                            ;+
                            ; If we got no LTC interrupt, indicate that there is no LTC available.
                            ; LTC must be flakey, or not really an LTC at all.
                            ;-
017744  005067  162412          CLR     CLKHRZ                  ;CLEAR LTC FREQUENCY WORD TO INDICATE NO LTC.
017750  000241                  CLC                             ;INDICATE FAILURE FOR RETURN.
017752  000461                  BR      60$                     ;BYPASS THE FOLLOWING CALIBRATION PROCEDURES.
                        ;+
                        ; We are now synchronized with the LTC.
                        ; Set up for the calibration loop.
                        ;-
017754  012704  002364  6$:     MOV     #TIMER1,R4              ;WILL TEST TIMER1 IN THE LOOP BELOW.
```

GLOBAL SUBROUTINE - CALMSL -

```
2459 017760  005001                    CLR     R1              ;CLEAR THE OUTER LOOP COUNTER.
2460 017762  005002                    CLR     R2              ;INDICATE TO CHECK ALL BITS OF TIMER1.
2461 017764  005003                    CLR     R3              ;INDICATE TO CHECK FOR TIMER1 CLEAR.
2462 017766  012714  000001            MOV     #1,(R4)         ;LOAD TIMER1 WITH COUNT OF 1.
2463
2464 017772  016705  162400    8$:     MOV     MSLCNT,R5       ;LOAD MS LOOP COUNT.
2465 017776  011400            10$:    MOV     (R4),R0         ;GET THE TIMER1 VALUE.
2466 020000  010067  000120            MOV     R0,64$          ;SAVE WORD (LIKE IN THE REAL LOOP).
2467 020004  040200                    BIC     R2,R0           ;LEAVE ALL THE BITS.
2468 020006  020003                    CMP     R0,R3           ;COMPARE AGAINST ZERO.
2469 020010  000261                    SEC                     ;SET CARRY IN CASE OF SUCCESS.
2470 020012  001406                    BEQ     12$             ;EXIT LOOP IF TIMER1 HAS CLEARED.
2471 020014  005305                    DEC     R5              ;COUNT DOWN THE INSIDE MS LOOP COUNT.
2472 020016  001367                    BNE     10$             ;LOOP IF MS NOT UP.
2473 020020  005301                    DEC     R1              ;DECREMENT THE MS TIME COUNT.
2474 020022  001363                    BNE     8$              ;KEEP LOOPING.
2475 020024  004767  000440            JSR     PC,OOPS         ;WE OVERFLOWED, SOMETHING IS WRONG, ABORT.
2476                            ;+
2477                            ; We have now have loop count information for one clock tick.
2478                            ; We have negative of number of outer loops in R1, each is MSLCNT inner loops.
2479                            ; We have the portion of the last outer loop not executed, in R5.
2480                            ; Now we calculate the total number of inner loops executed.
2481                            ;-
2482 020030  005401    12$:     NEG     R1              ;GET NUMBER OF OUTER LOOPS.
2483 020032  016702  162340            MOV     MSLCNT,R2       ;GET THE NUMBER OF INNER LOOPS PER OUTER LOOP.
2484 020036  010203                    MOV     R2,R3           ;COPY NUMBER OF LOOPS FOR MULTIPLY.
2485 020040  160502                    SUB     R5,R2           ;CALC # OF INNER LOOPS DONE IN LAST OUTER LOOP
2486 020042  010204                    MOV     R2,R4           ;  AND ADD TO ACCUMULATOR LSWORD.
2487 020044  005005                    CLR     R5              ;CLEAR ACCUMULATOR MSWORD.
2488 020046  005301    14$:     DEC     R1              ;CHECK R1 FOR 0 CONDITION
2489 020050  100403                    BMI     16$             ; SKIP MULTIPLICATION IF ZERO
2490 020052  060304                    ADD     R3,R4           ;MULTIPLY NUMBER OF INNER
2491 020054  005505                    ADC     R5              ; LOOPS PER OUTER LOOP BY
2492 020056  000773                    BR      14$             ;NUMBER OF OUTER LOOPS PERFORMED.
2493                            ;+
2494                            ; Divide the total number of inner loops by the number of MS per LTC tick.
2495                            ;-
2496 020060  016701  162310    16$:     MOV     MSTICK,R1       ;# OF MS PER LTC TICK IS DIVISOR.
2497 020064  010403                    MOV     R4,R3           ;LSWORD OF LOOP COUNT IS LSWORD OF DIVIDEND.
2498 020066  010502                    MOV     R5,R2           ;MSWORD OF LOOP COUNT IS MSWORD OF DIVIDEND.
2499 020070  004767  002756            JSR     PC,UNSDIV       ;DIVIDE NUMBER OF LOOPS BY MS PER LTC TICK.
2500 020074  103402                    BCS     18$             ;BYPASS OOPS IF WE'RE OK.
2501 020076  004767  000366            JSR     PC,OOPS         ;CLOCK ROUTINES ARE NOT LONG ENOUGH, OR BUG.
2502 020102  010167  162270    18$:     MOV     R1,MSLCNT       ;SET NEW VALUE FOR MS LOOP COUNT.
2503 020106  005167  000010            COM     62$             ;SET THE 2ND ITERATION FLAGS IF 1ST ITERATION.
2504 020112  001277                    BNE     2$              ;BRANCH IF ONLY ONE ITERATION DONE.
2505 020114  000261                    SEC                     ;SET THE SUCCESS FLAG FOR EXIT.
2506
2507 020116            60$:     PASS                            ;RESTORE GPRS,
     020116  004736                                JSR     PC,@(SP)+               ;RETURN TO PREGO5 SUBRT.
2508 020120  000207                    RTS     PC              ; CARRY - SUCCESS FLAG. SET IF SUCCESS.
2509
2510 020122  000000    62$:     .WORD   0               ;2ND CALIBRATION ITERATION FLAGS.
2511 020124  000000    64$:     .WORD   0               ;DUMMY WORD FOR STORAGE OF THE READ WORD.
```

GLOBAL SUBROUTINE - CKTRAP -

```
                                .SBTTL  GLOBAL SUBROUTINE                - CKTRAP -
                                ;*************************************************************************
                                ;*      Check Trap Routine -
                                ;*      This subroutine is used to check for a bus time-out trap (004 trap)
                                ;*      which is caused by an access to a non-existent memory or I/O location.
                                ;*      If the trap does not occur, this routine returns a success indication.
                                ;*
                                ;* INPUTS:      R0 - Source address for move.
                                ;*              R1 - Destination address for move.
                                ;*              (R0) - Source for the move.
                                ;*
                                ;* OUTPUTS:     (R1) - Written to the contents of (R0).
                                ;*              Carry flag - Set on return if no 004 trap detected.
                                ;*              TP4FLG - Nonzero if trap occurred, cleared otherwise.
                                ;*
                                ;* CALLING SEQUENCE:    JSR     PC,CKTRAP
                                ;*
                                ;* COMMENTS:    If this subroutine causes a trap, either the address which
                                ;*              is labeled ADRPTR will be the trap PC address on the stack.
                                ;*
                                ;* SUBORDINATE ROUTINES CALLED: None.
                                ;*************************************************************************

020126                          CKTRAP:: SAVE                           ;SAVE CONTENTS OF GPRS R0 THRU R5.
020126  004567  163644                          JSR     R5,PREG05       ;CALL REGISTER SAVE SUBRT.
020132  005067  162210                  CLR     TP4FLG                  ;CLEAR THE 004 TRAP FLAGS.
020136  011011                          MOV     (R0),(R1)               ;PERFORM THE MOVE IN QUESTION.
020140  005767  162202          ADRPTR:: TST    TP4FLG                  ;CHECK FOR OCCURENCE OF TRAP.
020144  000261                          SEC                             ;INDICATE SUCCESS.
020146  001401                          BEQ     60$                     ;EXIT WITH SUCCESS IF TRAP DID NOT OCCUR.
020150  000241                          CLC                             ;INDICATE FAILURE.
020152                          60$:    PASS                            ;RESTORE GPRS.
020152  004736                                          JSR     PC,@(SP)+               ;RETURN TO PREG05 SUBRT.
020154  000207                          RTS     PC
```

GLOBAL SUBROUTINE - CLNRST -

```
                                .SBTTL  GLOBAL SUBROUTINE                - CLNRST -
                                ;*****************************************************************************
                                ;*              - Clean Reset of the Device Under Test -
                                ;*      This subroutine is used to reset the DUT to a known state.
                                ;*      The DUT's self-test is skipped,and the fifo is purged of any error
                                ;*      codes, etc.
                                ;*      If the reset does not succesfully complete, then the carry bit is
                                ;*      passed back to the calling routine (clear).
                                ;*
                                ;* INPUTS:      CSRA - Contains the address of the CSR
                                ;*              TXBFCA - Contains address of DUT DMA Buffer Count register.
                                ;*              ERRNBR - Error number for possible error report.
                                ;*              ERRTBL- ERRTYP,ERNBR,and ERRMSG set up correctly.
                                ;*
                                ;* OUTPUTS:     The DUT performs its reset function into a known state.
                                ;*              CARRY - Clear indicates the test is to be aborted.
                                ;*              ERRBLK - value may be destroyed.
                                ;*              IESTAT - TX and RX interrupt flags are cleared.
                                ;*              TX and RX interrupt enable bits in the DUT's CSR are cleared.
                                ;*
                                ;* CALLING SEQUENCE:    JSR     PC,CLNRST
                                ;*
                                ;* COMMENTS:    This subroutine can report errors with numbers ERRNBR.
                                ;*              This routine does not destroy the value of ERRNBR.
                                ;*
                                ;* SUBORDINATE ROUTINES CALLED: DELAY,MSLGET,PUFIFO,RESETT.
                                ;*****************************************************************************

020156                          CLNRST:: SAVE                           ;SAVE CONTENTS OF GPRS R0 THRU R5.
020156  004567  163614                                  JSR     R5,PREG05       ;CALL REGISTER SAVE SUBRT.
                                ;+
                                ; Reset the DUT.
                                ;  This routine reports errors with numbers from ERRNBR thru ERRNBR+2.
                                ;-
020162  004767  001270                  JSR     PC,RESETT       ;RESET THE DUT TO A KNOWN STATE.
020166  103002                  BCC     60$             ;EXIT ROUTINE WITH ABORT TEST INDICATOR.
                                ;+
                                ; Purge the FIFO of error codes, save any BMP codes found.
                                ;-
020170  004767  000522                  JSR     PC,PUFIFO       ;PURGE THE FIFO.

020174                          60$:                            ;EXIT THE TEST USING RESETT OR PUFIFO STATUS.
020174                  PASS                    ;RESTORE GPRS, PASS THE FOLLOWING INTACT:
020174  004736                                  JSR     PC,@(SP)+               ;RETURN TO PREG05 SUBRT.
                                                ;CARRY BIT:IF CLEAR, THEN ABORT THE TEST.
020176  000207                  RTS     PC
```

```
                                .SBTTL  GLOBAL SUBROUTINE                - CLR16W -
                                ;** ************************************************************************
                                ;*                        - Clear Sixteen Words Routine -
                                ;*      This subroutine clears 16 words starting with the specified word.
                                ;*
                                ;* INPUTS:      R0 - Address of the first word to clear.
                                ;*
                                ;* OUTPUTS:     (R0) to (R0+15) - 16 words of memory are cleared to 0.
                                ;*
                                ;* CALLING SEQUENCE:    JSR     PC,CLR16W
                                ;*
                                ;* COMMENTS:
                                ;*
                                ;* SUBORDINATE ROUTINES CALLED: None.
                                ;-- ************************************************************************

020200                          CLR16W:: SAVE                           ;SAVE CONTENTS OF GPRS R0 THRU R5.
020200  004567  163572                           JSR     R5,PREG05       ;CALL REGISTER SAVE SUBRT.
020204  012701  000020                   MOV     #16.,R1                 ;SET THE LOOP COUNTER TO 16.
020210  005020                  2$:      CLR     (R0)+                   ;CLEAR A WORD OF MEMORY.
020212  005301                           DEC     R1                      ;COUNT THIS LOOP.
020214  001375                           BNE     2$                      ;LOOP IF NOT 16 WORD CLEARED.
020216                          60$:     PASS                            ;RESTORE GPRS.
020216  004736                                   JSR     PC,@(SP)+               ;RETURN TO PREG05 SUBRT.
020220  000207                           RTS     PC
```

```
                        .SBTTL  GLOBAL SUBROUTINE                - CNTERR -
                        ;** ************************************************************************
                        ;*                                - Count Error Routine -
                        ;*      This subroutine is used to count a "data" error on the specified
                        ;*      line.  It checks whether error summary reporting is active, or should
                        ;*      be made active on this line, and activates it if necessary.
                        ;*
                        ;* INPUTS:      R5 - Line number of line under consideration.
                        ;*              ERCNTB - Label at base of error counters table.
                        ;*              ERSMRF - Error summary flags (bit set if line in summary mode).
                        ;*              NDERPT - Number of individual data errors to report on a line.
                        ;*
                        ;* OUTPUTS:     CARRY - Set if line is in error summary mode.
                        ;*              ERCNT - Error counter incremented for specified line.
                        ;*              ERSMRF - Bit set if line should be in summary mode.
                        ;*
                        ;* CALLING SEQUENCE:    JSR     PC,CNTERR
                        ;*
                        ;* COMMENTS:
                        ;*
                        ;* SUBORDINATE ROUTINES CALLED: None.
                        ;-- ************************************************************************

020222                  CNTERR:: SAVE                           ;SAVE CONTENTS OF GPRS R0 THRU R5.
020222  004567  163550                 JSR     R5,PREG05       ;CALL REGISTER SAVE SUBRT.
                        ;+
                        ; Count the error on the counter for the specified line.
                        ;-
020226  006305                  ASL     R5                      ;FORM WORD OFFSET FROM LINE NUMBER.
020230  016501  002464          MOV     ERCNTB(R5),R1           ;GET THE PRESENT ERROR COUNT FOR THIS LINE.
020234  005201                  INC     R1                      ;COUNT ERROR.
020236  103402                  BCS     2$                      ;OVERFLOW?  YES, DON'T UPDATE COUNTER IN TABLE.
020240  010165  002464          MOV     R1,ERCNTB(R5)           ;UPDATE ERROR COUNTER TABLE ENTRY.
020244  005767  161760  2$:     TST     NDERPT
020250  001411                  BEQ     60$                     ;SUMMARYS DISABLED?  YES, EXIT WITH CARRY 0.
020252  020167  161752          CMP     R1,NDERPT               ;NO,  CHECK FOR ENOUGH ERRORS FOR SUMMARY USE.
020256  101002                  BHI     4$                      ;ENOUGH ERRORS TO USE SUMMARY?  YES, GO HANDLE.
020260  000241                  CLC                             ;INDICATE NOT TO USE SUMMARY REPORT YET.
020262  000404                  BR      60$                     ;EXIT WITH CARRY 0.
020264  056567  002410  162170  4$:     BIS     BITTBL(R5),ERSMRF       ;SET THE ERROR SUMMARY FLAG FOR LINE.
020272  00C261                  SEC                             ;INDICATE TO USE SUMMARY REPORT.
020274                  60$:    PASS                            ;RESTORE GPRS.
020274  004736                                  JSR     PC,@(SP)+               ;RETURN TO PREG05 SUBRT.
020276  000207                  RTS     PC
```

```
                                .SBTTL  GLOBAL SUBROUTINE                - DELAY -
                                ;*****************************************************************************
                                ;*                                - DELAY SUBROUTINE -
                                ;*      This subroutine is used to delay a variable number of milli-seconds.
                                ;*
                                ;* INPUTS:      R4 - Contains the number of ms to delay.
                                ;*                MSLCNT.
                                ;*
                                ;* OUTPUTS:     None.
                                ;*
                                ;* CALLING SEQUENCE:    JSR     PC,DELAY
                                ;*
                                ;* COMMENTS:    If no hardware clock interrupts are occuring, control-Cs will
                                ;*              not be honored for the duration of the delay.
                                ;*
                                ;* SUBORDINATE ROUTINES CALLED: None.
                                ;*****************************************************************************

020300                          DELAY:: SAVE                            ;SAVE CONTENTS OF GPRS R0 THRU R5.
020300  004567  163472                          JSR     R5,PREG05       ;CALL REGISTER SAVE SUBRT.
020304  010401                  MOV     R4,R1                           ;PASS NUMBER OF MS DELAY AS TIME-OUT VALUE.
020306  012702  177777          MOV     #-1,R2                          ;TELL MSLOOP ROUTINE TO CHECK ALL BITS.
020312  005003                  CLR     R3                              ;TELL MSLOOP RTN TO CHECK FOR ALL BITS CLEAR.
020314  012704  020336          MOV     #62$,R4                         ;TELL MSLOOP TO CHECK DUMMY NON-ZERO WORD.
020320  004767  000130          JSR     PC,MSLOOP                       ;DELAY THE REQUESTED # OF MS.
020324  103002                  BCC     60$                             ;EXIT ROUTINE IF WE TIMED-OUT.]
020326  004767  000136          JSR     PC,OOPS                         ;IF NO TIME-OUT, BAD PROGRAM OR HOST MACHINE.
020332                          60$:    PASS                            ;RESTORE GPRS.
020332  004736                                  JSR     PC,@(SP)+               ;RETURN TO PREG05 SUBRT.
020334  000207                  RTS     PC

020336  177777                  62$:    .WORD   -1                      ;DUMMY, NON-ZERO WORD.
```

```
                        .SBTTL  GLOBAL SUBROUTINE                - MSLGET -
                        ;*************************************************************************
                        ;*      - Milli Seconds Loop which returns read word and remaining time -
                        ;*      This subroutine is a general purpose test loop subroutine.  It is used
                        ;*      to verify that a certain action occurs before a time-out period.  The
                        ;*      calling routine passes in which bits should be set and cleared for the
                        ;*      desired condition and the time-out value in milli-seconds.
                        ;*      This routine checks for the desired condition upon entrance into the
                        ;*      routine and then once each milli-second there after.
                        ;*      Upon return, the last word which was read to check for the condition
                        ;*      is returned by this subroutine.
                        ;*
                        ;* INPUTS:      R1 - Time-out value in milli-seconds (up to 64K ms).
                        ;*              R2 - Bit map of bits to test (1 indicates to test the bit).
                        ;*              R3 - Desired states of the indicated fields in R2.
                        ;*              R4 - Address of the word to test.
                        ;*              MSLCNT - Milli second software loop count.
                        ;*
                        ;* OUTPUTS:     R0 - The last word which was read to check for the condition.
                        ;*              R1 - Remaining number of ms in time-out time.
                        ;*              CARRY - Success flag (set if condition is met before time-out).
                        ;*
                        ;* CALLING SEQUENCE:    JSR     PC,MSLGET
                        ;*
                        ;* COMMENTS:    This routine works with or without a hardware clock, but the
                        ;*              calibration is only guarenteed when a line clock is available
                        ;*              on the system.
                        ;*              This routine can be used as a delay routine, by specifying the
                        ;*              desired delay as the time-out and specifying a condition to
                        ;*              look for which will not be met during the delay.
                        ;*              If a time-out value of 0 is specified, this routine checks for
                        ;*              the desired condition before returning.  It indicates success
                        ;*              if the condition is met, failure otherwise.
                        ;*
                        ;*
                        ;* SUBORDINATE ROUTINES CALLED: None.
                        ;*************************************************************************

020340                  MSLGET:: SAVE                           ;SAVE CONTENTS OF GPRS R0 THRU R5.
020340  004567  163432                          JSR     R5,PREG05       ;CALL REGISTER SAVE SUBRT.
                        ;+
                        ; Set up mask for removing unused bits in the test word, and clear unused
                        ; bits in the desired state word to allow direct comparison.
                        ;-
020344  005102                  COM     R2              ;GET MASK OF UNUSED BITS.
020346  040203                  BIC     R2,R3           ;MASK OUT UNUSED BITS IN DESIRED STATE WORD.
                        ;+
                        ; Handle the test and exit if we have a 0 time-out value.
                        ;-
020350  005701                  TST     R1              ;TEST THE TIME-OUT VALUE FOR ZERO.
020352  001011                  BNE     2$              ;IF NON-ZERO TIME-OUT, GO LOOP AND TEST.
020354  011400                  MOV     (R4),R0         ;GET THE WORD TO TEST BEFORE EXITING.
020356  010067  000070          MOV     R0,62$          ;SAVE VALUE SO WE CAN RETURN IT.
020362  040200                  BIC     R2,R0           ;MASK OUT UNTESTED BITS OF WORD.
020364  020003                  CMP     R0,R3           ;COMPARE AGAINST DESIRED STATE WORD.
020366  000261                  SEC                     ;INDICATE SUCCESS IN CASE WORDS ARE EQUAL.
020370  001420                  BEQ     6$              ;EXIT WITH SUCCESS IF WORDS ARE EQUAL.
```

GLOBAL SUBROUTINE - MSLGET -

```
2745 020372  000241                    CLC                     ;INDICATE FAILURE (TIME-OUT).
2746 020374  000416                    BR      6$              ;EXIT WITH FAILURE, WORDS AREN'T EQUAL.
2747                                ;+
2748                                ; Non-zero time-out value.  Loop, waiting for condition or time-out.
2749                                ;-
2750 020376  016705  161774        2$:     MOV     MSLCNT,R5       ;LOAD MS LOOP COUNT.
2751 020402  011400                4$:     MOV     (R4),R0         ;GET THE WORD TO TEST.
2752 020404  010067  000042              MOV     R0,62$          ;SAVE WORD IN CASE THIS IS THE LAST.
2753 020410  040200                      BIC     R2,R0           ;MASK OUT UNTESTED BITS OF WORD.
2754 020412  020003                      CMP     R0,R3           ;COMPARE AGAINST DESIRED STATE WORD.
2755 020414  000261                      SEC                     ;SET CARRY IN CASE OF SUCCESS.
2756 020416  001405                      BEQ     6$              ;EXIT WITH SUCCESS IF WORDS ARE EQUAL.
2757 020420  005305                      DEC     R5              ;COUNT DOWN THE INSIDE MS LOOP COUNT.
2758 020422  001367                      BNE     4$              ;LOOP IF MS NOT UP.
2759 020424  005301                      DEC     R1              ;DECREMENT THE MS TIME COUNT.
2760 020426  001363                      BNE     2$              ;IF TIME NOT UP, LOOP TO COUNT ANOTHER MS.
2761 020430  000241                      CLC                     ;CLEAR CARRY, WE TIMED-OUT.
2762                                ;+
2763                                ; Have either found condition, or timed-out (possibly from 0 time-out value).
2764                                ; Restore the last contents read from the test word.  Exit routine.
2765                                ;-
2766 020432  016700  000014        6$:     MOV     62$,R0          ;PASS OUT THE LAST READ WORD.
2767 020436                        60$:    PASS    R0,R1           ;RESTORE GPRS, EXCEPT THE FOLLOWING:
     020436  010066  000002                            MOV     R0,R0SLOT(SP)           ;PUT R0 IN STACK SLOT.
     020442  010166  000004                            MOV     R1,R1SLOT(SP)           ;PUT R1 IN STACK SLOT.
     020446  004736                                    JSR     PC,@(SP)+               ;RETURN TO PREG05 SUBRT.
2768                                                                ;R0 - LAST READ WORD CHECKED FOR CONDITION.
2769                                                                ;R1 - REMAINING TIME (0 IF TIME-OUT OCCURED).
2770 020450  000207                      RTS     PC              ;CARRY - SET IF SUCCESS, CLEAR IF TIME-OUT.
2771                                ;+
2772                                ; Local storage.
2773                                ;-
2774 020452  000000                62$:    .WORD   0               ;STORAGE FOR THE LAST READ WORD.
```

```
                        .SBTTL  GLOBAL SUBROUTINE                - MSLOOP -
                        ;*************************************************************************
                        ;*      - Test Loop subroutine -
                        ;*      This subroutine is a general purpose test loop subroutine.  It is used
                        ;*      to verify that a certain action occurs before a time-out period.  The
                        ;*      calling routine passes in which bits should be set and cleared for the
                        ;*      desired condition and the time-out value in milli-seconds.
                        ;*      This routine checks for the desired condition upon entrance into the
                        ;*      routine and then once each milli-second thereafter.
                        ;*
                        ;* INPUTS:      R1 - Time-out value in milli-seconds (up to 64K ms).
                        ;*              R2 - Bit map of bits to test (1 indicates to test the bit).
                        ;*              R3 - Desired states of the indicated fields in R2.
                        ;*              R4 - Address of the word to test.
                        ;*              MSLCNT - Milli second software loop count.
                        ;*
                        ;* OUTPUTS:     CARRY - Success flag (set if condition is met before time-out).
                        ;*
                        ;* CALLING SEQUENCE:    JSR     PC,MSLOOP
                        ;*
                        ;* COMMENTS:    This routine works with or without a hardware clock, but the
                        ;*              calibration is only guarenteed when a line clock is available
                        ;*              on the system.
                        ;*              This routine can be used as a delay routine, by specifying the
                        ;*              desired delay as the time-out and specifying a condition to
                        ;*              look for which will not be met during the delay.
                        ;*              If a time-out value of 0 is specified, this routine checks for
                        ;*              the desired condition before returning.  It indicates success
                        ;*              if the condition is met, failure otherwise.
                        ;*
                        ;* SUBORDINATE ROUTINES CALLED: MSLGET.
                        ;*************************************************************************

020454                  MSLOOP:: SAVE                           ;SAVE CONTENTS OF GPRS R0 THRU R5.
020454  004567  163316                          JSR     R5,PREG05       ;CALL REGISTER SAVE SUBRT.

                        ;+
                        ; Calling the MSLGET routine from the MSLOOP routine isolates the caller of
                        ; MSLOOP from the returned test word and remaining time-out values.
                        ;-
020460  004767  177654          JSR     PC,MSLGET       ;CALL THE MULTI-PURPOSE MS LOOP AND SEARCH RTN.

020464                  60$:    PASS                    ;RESTORE GPRS,
020464  004736                          JSR     PC,@(SP)+               ;RETURN TO PREG05 SUBRT.
020466  000207          RTS     PC                        ;CARRY - SET IF SUCCESS, CLEAR IF TIME-OUT.
```

GLOBAL SUBROUTINE - OOPS -

```
                        .SBTTL  GLOBAL SUBROUTINE                - OOPS -
                        ;++ ************************************************************************
                        ;*                      - Program abort subroutine -
                        ;*      This subroutine is used to abort the program when a fatal error is
                        ;*      detected in the program or the host system hardware.  An error message
                        ;*      is printed giving some information about the nature of the abort.
                        ;*
                        ;* INPUTS:      R1 - Error code giving reason for abort.
                        ;*
                        ;* OUTPUTS:     An error message is printed.
                        ;*              A list of return PC values for all subroutine calls is printed.
                        ;*
                        ;* CALLING SEQUENCE:    JSR     PC,OOPS
                        ;*
                        ;* COMMENTS:
                        ;*
                        ;* SUBORDINATE ROUTINES CALLED: None.
                        ;-- ************************************************************************

020470                  OOPS::  SAVE                    ;SAVE CONTENTS OF GPRS R0 THRU R5.
020470  004567  163302                JSR     R5,PREG05       ;CALL REGISTER SAVE SUBRT.
                            ; REPORT "HOST COMPUTER HARDWARE OR SOFTWARE BUG ENCOUNTERED." ERROR.
020474                          ERRSF   101,EM0101
020474  104454                                                                  TRAP    C$ERSF
020476  000145                                                                  .WORD   101
020500  020534                                                                  .WORD   EM0101
020502  000000                                                                  .WORD   0
                            ; REPORT "PROGRAM HUNG, WAITING FOR A CONTROL-C."
020504                          PRINTF  #EM0102
020504  012746  020620                                                          MOV     #EM0102,-(SP)
020510  012746  000001                                                          MOV     #1,-(SP)
020514  010600                                                                  MOV     SP,R0
020516  104417                                                                  TRAP    C$PNTF
020520  062706  000004                                                          ADD     #4,SP
020524                  2$:     BREAK                   ;LOOK FOR OPERATOR CONTROL-C INPUT.
020524  104422                                                                  TRAP    C$BRK
020526  000776                  BR      2$              ;INFINITE LOOP.
020530                  60$:    PASS                    ;DON'T NEED THIS, BUT SOMEBODY MAY CHANGE THIS
020530  004736                          JSR     PC,@(SP)+               ;RETURN TO PREG05 SUBRT.
020532  000207                  RTS     PC              ; ROUTINE IN THE FUTURE, SO BE CONSISTANT.

020534    110   117   123     EM0101:: .ASCIZ /HOST COMPUTER HARDWARE OR SOFTWARE BUG ENCOUNTERED./
020537    124   040   103
020542    117   115   120
020545    125   124   105
020550    122   040   110
020553    101   122   104
020556    127   101   122
020561    105   040   117
020564    122   040   123
020567    117   106   124
020572    127   101   122
020575    105   040   102
020600    125   107   040
020603    105   116   103
020606    117   125   116
020611    124   105   122
```

```
        020614      105      104      056
        020617      000
  2850  020620      045      116      045  EM0102:: .ASCIZ /%N%APROGRAM HUNG, WAITING FOR A CONTROL-C. <**************%N%N/
        020623      101      120      122
        020626      117      107      122
        020631      101      115      040
        020634      110      125      116
        020637      107      054      040
        020642      127      101      111
        020645      124      111      116
        020650      107      040      106
        020653      117      122      040
        020656      101      040      103
        020661      117      116      124
        020664      122      117      114
        020667      055      103      056
        020672      040      074      052
        020675      052      052      052
        020700      052      052      052
        020703      052      052      052
        020706      052      052      052
        020711      045      116      045
        020714      116      000
  2851                                          .EVEN
```

GLOBAL SUBROUTINE - PUFIFO -

```
                        .SBTTL  GLOBAL SUBROUTINE                - PUFIFO -
                        ;*****************************************************************************
                        ;*      - PURGE THE FIFO
                        ;*      This routine tries to remove all the characters from the FIFO.
                        ;*      Any BMP codes that are found are saved on the BMP code queue.
                        ;*
                        ;* INPUTS:      RBUFA- Contains the  address of the Receiver.
                        ;*
                        ;*
                        ;* OUTPUTS:     Carry bit - Indicates the state of the fifo, set:= purged.
                        ;*              BMPCQ - The contents of the BMP code queue may be updated.
                        ;*
                        ;* CALLING SEQUENCE:    JSR     PC,PUFIFO
                        ;*
                        ;* COMMENTS:
                        ;*
                        ;* SUBORDINATE ROUTINES CALLED: SAVBMP.
                        ;*****************************************************************************

020716                  PUFIFO::SAVE                            ;SAVE CONTENTS OF GPRS R0 THRU R5.
020716  004567  163054                      JSR     R5,PREG05       ;CALL REGISTER SAVE SUBRT.
020722  012701  001000          MOV     #512.,R1                ;SET MAXIMUM TRY COUNT OF 512.
020726  016704  161314          MOV     RBUFA,R4                ;GET ADDRESS OF THE RECEIVER BUFFER REGISTER.

020732  011402                  2$:     MOV     (R4),R2         ;GET THE CONTENTS OF THE RECEIVER BUFFER REG.
020734  100016                        BPL     6$                      ;EXIT IF THE FIFO IS EMPTY, DATA_VALID CLR.
                        ;+
                        ; Check if the read character is actually a BMP code.
                        ;  If it is, then save it on the BMP code queue to be reported later.
                        ;-
020736  012700  070000          MOV     #70000,R0               ;GENERATE A BIT MAP OF CHAR ERROR BITS
020742  040200                  BIC     R2,R0                   ; WHICH ARE NOT SET FOR CHAR.
020744  001006                BNE     4$                      ;THROW CHAR AWAY IF NOT BMP OR SELFTEST CODE.
                          ;+
                          ; Check if the read data is modem status , BMP or Selftest?.
                          ;-
020746  012700  000300          MOV     #300,R0                 ; CHECK IF BMP OR SELFTEST?.
020752  040200                  BIC     R2,R0                   ;TRY TO CLEAR BMP FLAGS IN THE READ DATA.
020754  001002                BNE     4$                      ;IF IT IS MODEM OR SELFTEST CODE THROW IT AWAY.
020756  004767  001306          JSR     PC,SAVBMP               ;SAVE BMP CODE ON THE QUEUE.

020762  005301                  4$:     DEC     R1              ;DECREMENT THE TRY COUNT.
020764  001362                BNE     2$                      ;LOOP TO TRY AGAIN.
020766  000241                  CLC                             ;CLEAR CARRY,TO INDICATE FIFO NOT PURGED.
020770  000401                BR      60$                     ;EXIT WITH CARRY CLEAR.
020772  000261                6$:     SEC                     ;SET CARRY, TO INDICATE FIFO PURGED.

020774                  60$:    PASS                            ;RESTORE GPRS,
020774  004736                                  JSR     PC,@(SP)+               ;RETURN TO PREG05 SUBRT.
                                                                ;CARRY BIT, SET INDICATES FIFO PURGED.
020776  000207                RTS     PC
```

```
                                .SBTTL  GLOBAL SUBROUTINE                - RDPDR -
                                ;*************************************************************************
                                ;*      - Read and verify Data Pattern from Device Registers Routine -
                                ;*      This routine reads and verifies the rotated data pattern which has
                                ;*      been written by the WDPDR subroutine.
                                ;*      Each active line's register's contents is read and compared with the
                                ;*      written data.
                                ;*      After the unused and Read Only (RO) bits are masked out, any errors are
                                ;*      reported from this routine.
                                ;*      This routine will take into account the type of write operation which
                                ;*      was performed by the WDPDR subroutine.
                                ;*
                                ;* INPUTS:      R2 - Used to pass in the data pattern to be rotated & verified.
                                ;*              R3 - Byte indicator (- => lo byte, + => hi byte, 0 => both).
                                ;*              R4 - Operation type indicator (- => BIC, + => BIS, 0 => MOV).
                                ;*              ACTLNS - Bit map of active lines on the device under test.
                                ;*              CSRA - Contains the CSR address of the Device under test.
                                ;*              DRADRT - Base address of device register address table.
                                ;*              ERCNTB - Label at base of error counters table for lines.
                                ;*              ERRMSG - Set up with the proper error message for this test.
                                ;*              ERRNBR - Set up with the proper error number.
                                ;*              LPRO - Equated to LPR reg offset from device CSR address.
                                ;*              NUMLNS - Number of lines on the device under test.
                                ;*              NDERPT - Number of individual data errors to report on a line.
                                ;*              TXBFCO - Equated to TBUFFCT reg offset from device CSR address.
                                ;*              UNBTTB - Base address of the unused bit table.
                                ;*
                                ;* OUTPUTS:     Error messages may be printed at the operator's console.
                                ;*              ERCNT - Error counters table is updated for line under test.
                                ;*              ERRBLK - Contents destroyed.
                                ;*              ERSMRF - Error summary flags bit set if line in summary mode.
                                ;*              UUT CSR - All bits cleared, except IND.ADR.REG field destroyed.
                                ;*
                                ;* CALLING SEQUENCE:    JSR     PC,RDPDR
                                ;*
                                ;* COMMENTS:    For byte accesses, only the specified byte is verified.
                                ;*
                                ;* SUBORDINATE ROUTINES CALLED: ER1601,ROLDAP.
                                ;-- *************************************************************************

021000                          RDPDR:: SAVE                            ;SAVE CONTENTS OF GPRS RO THRU R5.
021000  004567  162772                          JSR     R5,PREG05       ;CALL REGISTER SAVE SUBRT.
021004  012767  016712  162762          MOV     #ER1601,ERRBLK  ;SET UP THE ADDRESS OF THE ERROR REPORT RTN.
                                ;+
                                ; Determine whether register data should be inverted from data pattern.
                                ;-
021012  005704                          TST     R4              ;CHECK THE OPERAND TYPE INDICATOR.
021014  100001                        BPL     2$              ;BIC WRITE PERFORMED?  NO, USE STANDARD DATA.
021016  005102                         COM     R2              ;YES, INVERT THE DATA PATTERN.
                                ;+
                                ; Set up outer loop.
                                ;-
021020  005005                  2$:     CLR     R5              ;CLEAR LINE COUNTER TO SELECT LINE 0.
                                ;+
                                ; The outer loop follows.  Each pass through this loop reads and compares data
                                ; from all of the device registers for a particular line if the line is active.
                                ;-
```

GLOBAL SUBROUTINE - RDPDR -

```
 2959 021022  010267  000170          4$:     MOV     R2,70$          ;SAVE THE OUTER LOOP DATA PATTERN.
 2960 021026  010577  161212                  MOV     R5,@CSRA        ;SET CSR IND.ADR.REG FIELD TO THIS LINE.
 2961 021032  010500                          MOV     R5,R0
 2962 021034  006300                          ASL     R0
 2963 021036  036067  002410  161172          BIT     BITTBL(R0),ACTLNS
 2964 021044  001452                        BEQ     16$             ;IS THE LINE ACTIVE?  NO, SKIP THE LINE.
 2965 021046  012703  000004                  MOV     #LPR0,R3        ;YES, INITIALIZE REGISTER OFFSET FOR LPR.
 2966                                  ;+
 2967                                  ;       The inner loop follows.  Each pass through this loop reads and compares
 2968                                  ;       data from a device register.
 2969                                  ;-
 2970 021052  010204                  6$:     MOV     R2,R4           ;SAVE THE INNER LOOP DATA PATTERN.
 2971 021054  046302  002264                  BIC     UNBTTB(R3),R2   ;REMOVE UNUSED BITS FROM EXPECTED DATA.
 2972 021060  016300  002244                  MOV     DRADRT(R3),R0
 2973 021064  005766  000010                  TST     R3SLOT(SP)      ;CHECK THE ACCESS TYPE INDICATOR.
 2974 021070  001002                        BNE     8$              ;BYTE ACCESS?  YES, GO PERFORM BYTE READ.
 2975 021072  011001                          MOV     (R0),R1         ;NO, PERFORM WORD READ OF DEVICE REGISTER.
 2976 021074  000416                        BR      12$
 2977 021076  100410                  8$:     BMI     10$             ;LOW BYTE ACCESS?  YES, GO DO LOW BYTE READ.
 2978 021100  005200                          INC     R0              ;HIGH BYTE ACCESS.  FORM HIGH BYTE ADDRESS.
 2979 021102  111001                          MOVB    (R0),R1         ;READ THE HI BYTE OF THE DUT REGISTER.
 2980 021104  000301                          SWAB    R1              ;PUT HI BYTE BACK INTO THE HI BYTE.
 2981 021106  042701  000377                  BIC     #377,R1         ;REMOVE THE UNUSED BYTE IN ACTUAL DATA.
 2982 021112  042702  000377                  BIC     #377,R2         ;REMOVE THE UNUSED BYTE IN EXPECTED DATA.
 2983 021116  000405                        BR      12$
 2984 021120  111001                  10$:    MOVB    (R0),R1         ;READ THE LOW BYTE OF THE DUT REGISTER.
 2985 021122  042701  177400                  BIC     #177400,R1      ;REMOVE THE UNUSED BYTE.
 2986 021126  042702  177400                  BIC     #177400,R2      ;FORM EXPECTED LOW BYTE FOR COMAPARISON.
 2987
 2988 021132  046301  002264          12$:    BIC     UNBTTB(R3),R1   ;REMOVE UNUSED BITS FROM ACTUAL DATA.
 2989 021136  020102                          CMP     R1,R2           ;COMPARE ACTUAL AND EXPECTED DATA.
 2990 021140  001404                        BEQ     14$             ;ACTUAL = EXPECTED?  YES, SKIP ERROR.
 2991 021142  004767  177054                JSR     PC,CNTERR       ;NO, COUNT THE ERROR, CHECK FOR ERROR SUMMARY.
 2992 021146  103401                        BCS     14$             ;USE ERROR SUMMARY?  YES, SKIP ERROR.
 2993                                  ;No, report "BAD BIT(S) IN DEVICE xxxxx REGISTER FOR LINE nn (D)."
 2994 021150                                  ERROR
      021150  104460                                                                  TRAP    C$ERROR
 2995 021152  010402                  14$:    MOV     R4,R2           ;RESTORE THE INNER LOOP DATA PATTERN.
 2996 021154  004767  000410                JSR     PC,ROLDAP       ;ROTATE DATA PATTERN LEFT, NOT THROUGH CARRY.
 2997 021160  062703  000002                  ADD     #2,R3           ;SET REGISTER OFFSET TO THE NEXT REGISTER.
 2998 021164  020327  000016                  CMP     R3,#TXBFC0      ;COMPARE REG OFFSET WITH OFFSET OF LAST REG.
 2999 021170  003730                          BLE     6$              ;LOOP IF NOT ALL REG DONE FOR THIS LINE.
 3000                                  ;+
 3001                                  ; Back into the outer loop.  Now set up for next line.  Loop if not done.
 3002                                  ;-
 3003 021172  016702  000020          16$:    MOV     70$,R2          ;SET UP TO ROTATE THE DATA PATTERN.
 3004 021176  004767  000366                JSR     PC,ROLDAP       ;ROTATE THE DATA PATTERN.
 3005 021202  005205                          INC     R5              ;COUNT THIS LINE
 3006 021204  020527  000010                  CMP     R5,#NUMLNS      ;COMPARE LINE COUNT WITH NUMBER OF LINES.
 3007 021210  002704                          BLT     4$              ;LOOP IF SOME LINES NOT DONE.
 3008
 3009 021212                          60$:    PASS                    ;RESTORE GPRS.
      021212  004736                                  JSR     PC,@(SP)+               ;RETURN TO PREG05 SUBRT.
 3010 021214  000207                        RTS     PC
 3011
 3012 021216  000000                  70$:    .WORD   0               ;STORAGE FOR DATA PATTERN OUTSIDE INNER LOOP.
```

```
                        .SBTTL  GLOBAL SUBROUTINE                - REGTST -
                        ;** ************************************************************************
                        ;*                              - Registers Test Subroutine -
                        ;*      Subroutine to test the Device Under Test (DUT) registers.  The used
                        ;*      bits of the registers are either all cleared or all set and then the
                        ;*      data pattern is written and verified using either word or byte
                        ;*      accesses in read/write or read/modify/write mode.
                        ;*
                        ;* INPUTS:      R3 - Byte indicator (- => low, + => high, 0 => both bytes).
                        ;*              R4 - Access mode (-1 => set then BIC, 1 => clear then BIS,
                        ;*                   (-2 => set them MOV, +2 clear then MOV).
                        ;*              ERRNBR - Set up with initial error number.
                        ;*
                        ;* OUTPUTS:     GPRS0 - GPR save area 0 is destroyed.
                        ;*              Device Under Test registers are written.
                        ;*              Error messages may be printed at the operators console.
                        ;*
                        ;* CALLING SEQUENCE:    JSR     PC,REGTST
                        ;*
                        ;* COMMENTS:    This routine loop 16 times writing the same data pattern
                        ;*              rotated left once each iteration.
                        ;*              This routine can report errors INITIAL ERRNBR thru INITIAL+2.
                        ;*
                        ;* SUBORDINATE ROUTINES CALLED: RDPDR,ROLDAP,SWAP0,WDPDR
                        ;-- ************************************************************************

021220                  REGTST:: SAVE                           ;SAVE CONTENTS OF GPRS R0 THRU R5.
021220  004567  162552                          JSR     R5,PREG05       ;CALL REGISTER SAVE SUBRT.
                        ;+
                        ; Set up the GPRs for the writting of the data pattern.
                        ;-
021224  012705  000020          MOV     #16.,R5         ;SET UP LOOP COUNTER TO COUNT 16 ITERATIONS.
021230  012702  167410          MOV     #167410,R2      ;INITIALIZE THE DATA PATTERN.
021234  032704  000001          BIT     #BIT0,R4        ;TEST FOR R/W ACCESS.
021240  001001                  BNE     2$              ;R/M/W ACCESS?  YES, R4 IS ALL SET UP.
021242  005004                  CLR     R4              ;NO, INDICATE R/W ACCESS.
021244                  2$:
                        ;+
                        ; Set up the GPRs for the clearing or setting of all the used bits.
                        ;-
021244  010400                  MOV     R4,R0           ;PASS OPERATION TYPE INDICATOR AROUND SWAP0.
021246  004767  001142          JSR     PC,SWAP0        ;GET ALTERNATE GPR SET IN R1 THRU R5.
021252  016701  162512          MOV     ERRNBR,R1       ;SAVE THE INITIAL ERROR NUMBER.
021256  010004                  MOV     R0,R4
021260  005404                  NEG     R4              ;SET UP OP TYPE FOR CLEARING OR SETTING.
021262  005002                  CLR     R2              ;SET UP CLEAR WRITE PATTERN.
021264  026627  000012  000002  CMP     R4SLOT(SP),#2   ;TEST FOR CLEAR THEN MOV TEST SEQUENCE.
021272  001401                  BEQ     4$              ;CLEAR THEN MOV?  YES, LEAVE WRITE PAT CLEAR.
021274  005102                  COM     R2              ;NO, SET ALL BITS OF WRITE PATTERN.
021276  005003          4$:     CLR     R3              ;INDICATE THAT WORD ACCESSES SHOULD BE USED.
021300  005000                  CLR     R0              ;SET ALTERNATE BYTE EXPECTED DATA PAT TO CLEAR.
021302  026627  000012  177776  CMP     R4SLOT(SP),#-2  ;TEST FOR SET THEN MOV TEST SEQUENCE.
021310  001001                  BNE     6$              ;SET THEN MOV?  YES, LEAVE ALT BYTE PAT CLEAR.
021312  005100                  COM     R0              ;NO, SET ALT BYTE EXPECTED DATA PAT TO ALL 1'S.
021314  004767  001074  6$:     JSR     PC,SWAP0        ;RESTORE SWAPPED GPR VALUES TO R1 THRU R5.
                        ;+
                        ; Start of data pattern loop.
```

```
                                        ;-
021320                          8$:
                                    ;+
                                    ; Set or clear all the used bits of the device registers for all lines.
                                    ; Verify that all the bits were set or cleared correctly.
                                    ;-
021320  004767  001070                  JSR     PC,SWAPO        ;GET ALTERNATE GPRS FOR SETTING INTIAL STATES.
021324  004767  002006                  JSR     PC,WDPDR        ;GO CLEAR ALL USED REGISTER BITS, ALL LINES.
021330  010167  162434                   MOV    R1,ERRNBR       ;SET UP ERROR NUMBER TO INITIAL ERRNBR.
021334  004767  177440                  JSR     PC,RDPDR        ;VERIFY ALL USED REGISTER BITS, ALL LINES.
021340  004767  001050                  JSR     PC,SWAPO        ;RESTORE MAIN GPRS CONTENTS.
                                    ;+
                                    ; Write data patterns, all lower byte used bits, all registers, all lines.
                                    ; Verify that the data pattern was written correctly.
                                    ;-
021344  004767  001766                  JSR     PC,WDPDR        ;WRITE DATA PATTERN TO DEVICE REGISTERS.
021350  005267  162414                   INC    ERRNBR          ;SET ERROR NUMBER TO INITIAL+1.
021354  004767  177420                  JSR     PC,RDPDR        ;VERIFY DATA PATTERN IN ALTERRED BYTE(S).
021360  005703                           TST    R3              ;CHECK THE BYTE INDICATOR.
021362  001411                          BEQ     10$             ;WORD ACCESS?  YES, SKIP SECOND BYTE CHECK.
                                    ;+
                                    ; Check that the alternate (unmodified) byte is clear or set as expected.
                                    ;-
021364  010201                           MOV    R2,R1           ;SAVE THE DATA PATTERN.
021366  010002                           MOV    R0,R2           ;GET THE ALTERNATE BYTE EXPECTED DATA.
021370  005403                           NEG    R3              ;INDICATE THAT OTHER BYTE IS TO BE CHECKED.
021372  005267  162372                   INC    ERRNBR          ;SET ERROR NUMBER TO INITIAL+2.
021376  004767  177376                  JSR     PC,RDPDR        ;VERIFY DATA PATS IN OTHER BYTES OF REGISTERS.
021402  005403                           NEG    R3              ;RESTORE BYTE INDICATOR.
021404  010102                           MOV    R1,R2           ;RESTORE DATA PATTERN.
                                    ;+
                                    ; Pepare the next data pattern and loop if not done.
                                    ;-
021406  004767  000156          10$:     JSR    PC,ROLDAP       ;ROTATE DATA PATTERN LEFT, NOT THROUGH CARRY.
021412  005305                           DEC    R5              ;COUNT THIS ITERATION OF THE LOOP.
021414  003341                          BGT     8$              ;ALL PATTERNS DONE?  NO, LOOP.
                                                                ;YES, RESTORE ERROR NUMBER AND EXIT.
021416  016767  161026  162344  60$:     MOV    GPRS0B,ERRNBR   ;GET THE ERROR NUMBR FROM GPR SWAP STORAGE.
021424                                  PASS                    ;RESTORE GPRS.
021424  004736                                          JSR     PC,@(SP)+               ;RETURN TO PREG05 SUBRT.
021426  000207                          RTS     PC
```

```
                                .SBTTL  GLOBAL SUBROUTINE               - REPSMR -
                                ;** ************************************************************************
                                ;*                      - Report Error Summary Routine -
                                ;*      This subroutine reports an error summary for those lines which have
                                ;*      exceeded the number of individual errors to report for a single line
                                ;*      in a single test.  This parameter can be specified by the operator if
                                ;*      he/she answers the Software Parameter Questions.
                                ;*
                                ;* INPUTS:      ERCNTB - Label at base of line error counters table.
                                ;*              ERRMSG - Address of primary error message.
                                ;*              ERRNBR - Error number of errors in this routine.
                                ;*              ERSMRF - "Report error summary for line" flags.
                                ;*
                                ;* OUTPUTS:     ERRBLK - Address of error reporting routine (Destroyed).
                                ;*              Summary messages may be printed at the operator console.
                                ;*
                                ;* CALLING SEQUENCE:    JSR     PC,REPSMR
                                ;*
                                ;* COMMENTS:    If no lines have exceeded the maximum number of individual
                                ;*              errors to report, no messages are printed by this routine.
                                ;*              Error summaries in this routine are reported as errors.
                                ;*              The contents of ERRBLK are destroyed.
                                ;*
                                ;* SUBORDINATE ROUTINES CALLED:
                                ;-- ************************************************************************

021430                          REPSMR:: SAVE                           ;SAVE CONTENTS OF GPRS R0 THRU R5.
021430  004567  162342                         JSR     R5,PREG05       ;CALL REGISTER SAVE SUBRT.
021434  005767  161022                 TST     ERSMRF                  ;CHECK THE "PRINT LINE ERROR SUMMARY" FLAGS.
021440  001404                         BEQ     60$                     ;EXIT WITHOUT ACTION IF NO SUMMARY FLAGS SET.
                                ;+
                                ; We have some error summaries to report.
                                ;-
021442  012767  017160  162324         MOV     #ER9004,ERRBLK          ;SELECT ERROR REPORTING ROUTINE.
                                    ;+
                                    ; Report
                                    ;     "ERROR SUMMARY REPORT FOR LINES WITH EXCESSIVE NUMBERS OF ERRORS:"
                                    ;-
021450                              ERROR
021450  104460                                                           TRAP    C$ERROR

021452                          60$:    PASS                            ;RESTORE GPRS.
021452  004736                                  JSR     PC,@(SP)+       ;RETURN TO PREG05 SUBRT.
021454  000207                  RTS     PC
```

```
                        .SBTTL  GLOBAL SUBROUTINE                - RESETT -
                        ;*****************************************************************************
                        ;*              - Reset Device Under Test -
                        ;*      This subroutine is used to reset the DUT to a known state.
                        ;*      If reset does not succesfully complete, ie. time-out occurs, then
                        ;*      an abort test error message is reported.
                        ;*
                        ;* INPUTS:      CSRA - Contains the address of the CSR
                        ;*              TXBFCA - Contains address of DUT DMA Buffer Count register.
                        ;*              ERRTBL- ERRTYP,ERNBR,and ERRMSG set up correctly.
                        ;*
                        ;* OUTPUTS:     The DUT performs its reset function into a known state.
                        ;*              CARRY - Clear indicates the test is to be aborted.
                        ;*              ERRBLK - value may be destroyed.
                        ;*              IESTAT - TX and RX interrupt flags are cleared.
                        ;*              TX and RX interrupt enable bits in the DUT's CSR are cleared.
                        ;*
                        ;* CALLING SEQUENCE:    JSR     PC,RESETT
                        ;*
                        ;* COMMENTS:    This subroutine can report errors with numbers initial ERRNBR
                        ;*              This routine does not destroy the value of ERRNBR.
                        ;*
                        ;* SUBORDINATE ROUTINES CALLED: DELAY,MSLGET.
                        ;*****************************************************************************

021456                  RESETT:: SAVE                   ;SAVE CONTENTS OF GPRS R0 THRU R5.
021456  004567  162314          JSR     R5,PREG05       ;CALL REGISTER SAVE SUBRT.
021462  012702  000040          MOV     #BIT05,R2       ;SET BIT MASK OF MASTER RESET BIT.
                        ;+
                        ; Test the state of the master reset bit in the CSR.
                        ;  If MR is set then wait for self-test to complete.
                        ;   If time-out occurs, report the error and pass-out abort test indicator.
                        ;-
021466  016704  160552          MOV     CSRA,R4         ;GET THE ADDRESS OF THE DUT'S CSR.
021472  030214                  BIT     R2,(R4)         ;CHECK STATE OF MASTER RESET BIT.
021474  001406                  BEQ     2$              ;DON'T DELAY IF MR IS ALREADY CLEAR.
021476  005003                  CLR     R3              ;SET UP DESIRED STATE OF MASTER RESET BIT.
021500  012701  004704          MOV     #2500.,R1       ;PASS TIME-OUT VALUE OF 2.5 SECONDS.
021504  004767  176630          JSR     PC,MSLGET       ;WAIT FOR SELF-TEST TO COMPLETE, MR CLEAR.
021510  103012                  BCC     4$              ;GO REPORT ERROR IF TIMEOUT OCCURRED.

                        ;+
                        ; Set Master Reset bit in CSR.  Clear TX and RX enable bits, etc.
                        ;  Skip the selftest.
                        ;  Time-out of 2.5 secs, just in case the self-test executes.
                        ;-
021512  010277  160526  2$:      MOV     R2,@CSRA        ;SET MASTER RESET BIT, DISABLE TX AND RX INTS.
021516  004767  000614          JSR     PC,SKPSTS       ;TRY TO SKIP THE SELFTEST.
                          ;+
                          ;   Set Self-test time-out of 2.5 seconds, and wait for M.R to clear.
                          ;   If Time-out occurs, then report the fatal error and pass-out the abort
                          ;   test indicator.
                          ;-
021522  005003                  CLR     R3              ;SET UP DESIRED STATE OF MASTER RESET BIT.
021524  012701  004704          MOV     #2500.,R1       ;PASS TIME-OUT VALUE OF 2.5 SECONDS.
021530  004767  176604          JSR     PC,MSLGET       ;WAIT FOR SELF-TEST TO COMPLETE, MR CLEAR.
021534  103410                  BCS     6$              ;SKIP ERROR REPORT IF MR CLEARED IN TIME.
```

GLOBAL SUBROUTINE - RESETT -

```
3209                                    ;+
3210                                    ; Set up error message to report "fatal error found during reset,test aborted".
3211                                    ; Indicate test is to be aborted by clearing the carry bit.
3212                                    ;-
3213 021536  012701  012362            4$:     MOV     #EM1601,R1      ;PASS ERROR MESSAGE TO REPORT.
3214 021542  012767  017010  162224            MOV     #ER1603,ERRBLK ;PASS ADDRESS OF ERROR HANDLING ROUTINE.
3215                                            ;REPORT ERROR "TIME-OUT OCCURRED WAITING FOR MASTER RESET TO CLEAR"
3216                                            ; "TEST ABORTED"
3217 021550                                    ERROR                   ;               >>>>> ERROR <<<<<
     021550  104460                                                                            TRAP    C$ERROR
3218 021552  000241                            CLC                     ;INDICATE TEST IS TO BE ABORTED.
3219 021554  000403                            BR      60$             ;EXIT THIS SUBROUTINE, ABORT TEST INDICATOR.
3220                                    ;+
3221                                    ; Clear TX and RX Interrupt enable status flags in IESTAT.
3222                                    ; Exit with continue test indicator set (ie,carry set).
3223                                    ;-
3224 021556  005067  160546            6$:      CLR    IESTAT          ;CLEAR TX AND RX INTERRUPT STATUS FLAGS.
3225 021562  000261                             SEC                    ;INDICATE SUCCESS, CONTINUE TEST.
3226
3227 021564                            60$:    PASS                    ;RESTORE GPRS, PASS THE FOLLOWING INTACT:
     021564  004736                                    JSR     PC,@(SP)+               ;RETURN TO PREGO5 SUBRT.
3228                                            ;CARRY BIT:IF CLEAR,INDICATES ABORT TEST.
3229 021566  000207                            RTS     PC
3230
```

```
                        .SBTTL  GLOBAL SUBROUTINE                - ROLDAP -
                        ;*************************************************************************
                        ;*      - ROtate Left DAta Pattern
                        ;*      This routine rotates the passed input data pattern left,without going
                        ;*      through the carry.The carry is initially set or cleared depending
                        ;*      upon the state of the MSB of the data pattern,before a ROL instruction
                        ;*      is executed.
                        ;*
                        ;* INPUTS:      R2 - Contains the data pattern to be rotated
                        ;*
                        ;* OUTPUTS:     R2 - Contains the rotated data pattern
                        ;*
                        ;* CALLING SEQUENCE:    JSR     PC,ROLDAP
                        ;*
                        ;* COMMENTS:
                        ;*
                        ;* SUBORDINATE ROUTINES CALLED: NONE
                        ;*************************************************************************

021570                  ROLDAP::SAVE                    ;SAVE CONTENTS OF GPRS R0 THRU R5.
021570  004567  162202                 JSR     R5,PREGO5       ;CALL REGISTER SAVE SUBRT.
021574  010202                  MOV     R2,R2           ;SET PROCESSOR STATUS CODES
021576  005702                  TST     R2              ;CHECK MSB
021600  100402                  BMI     2$              ;BRANCH IF SET
021602  000241                  CLC                     ;CLEAR CARRY BIT IF MSB CLEAR
021604  000401                  BR      4$              ;
021606  000261          2$:     SEC                     ;SET CARRY IF MSB SET
021610  006102          4$:     ROL     R2              ;ROTATE DATA PATTERN LEFT
021612                  60$:    PASS    R2              ;RESTORE GPRS,EXCEPT
021612  010266  000006                          MOV     R2,R2SLOT(SP)           ;PUT R2 IN STACK SLOT.
021616  004736                              JSR     PC,@(SP)+               ;RETURN TO PREGO5 SUBRT.
                         ;R2 - CONTAINS THE ROTATED DATA PATTERN
021620  000207                  RTS     PC
```

```
                        .SBTTL  GLOBAL SUBROUTINE               - RSTRPT -
                        ;++ ******************************************************************************
                        ;*                      - Report any Reset Errors Routine -
                        ;*      This routine determines if any error codes are among the diagnostic
                        ;*      codes reported placed in the DUT received character FIFO by the
                        ;*      Self-test.  If any non BMP error codes are found, or if other errors
                        ;*      are encountered, appropriate errors are reported.  Any BMP codes that
                        ;*      are found, are placed on the BMP code queue to be reported later.
                        ;*      This routine also purges the DUT FIFO looking for any characters
                        ;*      or modem status codes.  If any are found, errors are reported.
                        ;*
                        ;* INPUTS:      ERRMSG - Address of the primary error message.
                        ;*              ERRNBR - Error number of first error reported by this rouitne.
                        ;*              NUMLNS - Equated to the number of line on the DUT.
                        ;*              RBUFA - Contains address of the DUT receiver FIFO.
                        ;*
                        ;* OUTPUTS:     CARRY - Success flag (set if FIFO cleared successfully).
                        ;*              ERRBLK - Address of the error report routine (Destroyed).
                        ;*              Error messages can be printed at the operators console.
                        ;*
                        ;* CALLING SEQUENCE:    JSR     PC,RSTRPT
                        ;*
                        ;* COMMENTS:    This subroutine can report errors with numbers Initial ERRNBR
                        ;*              thru Initial ERRNBR+4.
                        ;*              This routine does not destroy the value of ERRNBR.
                        ;*
                        ;* SUBORDINATE ROUTINES CALLED: ER0503,ER9007,ER9008,SAVBMP.
                        ;-- ******************************************************************************

021622                  RSTRPT:: SAVE                           ;SAVE CONTENTS OF GPRS R0 THRU R5.
021622  004567  162150                          JSR     R5,PREG05       ;CALL REGISTER SAVE SUBRT.
                        ;+
                        ; Read correct number (number of line on DUT) of chars from the FIFO.
                        ; Verify that each char is a selftest success code.
                        ;-
021626  005003                  CLR     R3              ;CLEAR THE CODE COUNTER.
021630  016705  162134          MOV     ERRNBR,R5       ;SAVE ERRNBR FOR RESTORATION LATER.
021634  017702  160406  2$:     MOV     @RBUFA,R2       ;READ A CHAR FROM THE DUT FIFO.
021640  100412                  BMI     4$              ;SKIP ERROR IF DATA.VALID SET FOR CHAR.
                            ;+
                            ; We expect a selftest code, but this FIFO slot is empty.
                            ;-
021642  010567  162122          MOV     R5,ERRNBR       ;RESTORE ERROR NUMBER TO INTITIAL VALUE.
021646  012701  015522          MOV     #EM9018,R1      ;PASS ERROR MESSAGE INFO TO ER9007 ROUTINE.
021652  012767  017262  162114  MOV     #ER9007,ERRBLK  ;SELECT PROPER ERROR REPORT ROUTINE.
                            ;+
                            ; Report error with number Initial ERRNRB.
                            ;    "NO SELFTEST CODE IN SELFTEST CODE FIFO SLOT FOR LINE nn AFTER RESET."
                            ;-
021660                      ERROR                           ;               >>>>> ERROR <<<<<.
021660  104460                                                                      TRAP    C$ERROR
                            ;+
                            ; Inidicate "success" (because FIFO is purged), and exit this routine.
                            ;-
021662  000261                  SEC                         ;SET SUCCESS FLAG.
021664  000545                  BR      60$                 ;EXIT ROUTINE.
                            ;+
```

```
                                        ; Determine if this is not a selftest code.
                                        ;-
021666  012700  070001          4$:     MOV     #70001,R0       ;GENERATE BIT MAP OF ANY CLEAR ERROR BITS OR
021672  040200                          BIC     R2,R0           ;  BIT 0 WHICH ARE CLEAR.
021674  001033                          BNE     8$              ;GO TO REPORT ERROR IF THIS IS NOT A TEST CODE.
                                        ;+
                                        ; We have a test code (either BMP or selftest code).
                                        ; Determine what type of code we have.
                                        ;-
021676  032702  000200                  BIT     #BIT7,R2        ;TEST ROM VERSION CODE INDICATOR BIT.
021702  001443                          BEQ     10$             ;SKIP ERRORS IF SELFTEST ROM VERSION CODE.
021704  120227  000203                  CMPB    R2,#203         ;CHECK IF SKIP SELF TEST CODE.
021710  001440                          BEQ     10$             ;SKIP ERROR REPORT IF SKIP SELF TEST CODE FOUND
021712  120227  000201                  CMPB    R2,#201         ;CHECK IF NULL CODE PRESENT.
021716  001435                          BEQ     10$             ;SKIP ERROR REPORT IF SELF TEST NULL CODE.
021720  012700  000300                  MOV     #300,R0         ;TEST CODE TYPE BITS FOR BOTH CODE
021724  040200                          BIC     R2,R0           ;  TYPE BITS SET (INDICATING BMP CODE).
021726  001003                          BNE     6$              ;IF IT IS NOT A BMP CODE GO REPORT ERROR.
021730  004767  000334                  JSR     PC,SAVBMP       ;SAVE THE BMP CODE ON THE QUEUE.
021734  000426                          BR      10$             ;GO GET THE NEXT CHARACTER FROM THE FIFO.
                                        ;+
                                        ; We have a selftest error code.
                                        ;-
021736  010567  162026          6$:     MOV     R5,ERRNBR       ;RESTORE ERROR NUMBER TO INTITIAL VALUE.
021742  005267  162022                  INC     ERRNBR          ;CALCULATE INITIAL ERROR NUMBER PLUS 1.
021746  012701  015547                  MOV     #EM9020,R1      ;PASS ERROR MESSAGE INFO TO ER9008 ROUTINE.
021752  012767  017340  162014          MOV     #ER9008,ERRBLK  ;SELECT PROPER ERROR REPORT ROUTINE.
                                        ;+
                                        ; Report error with number Initial ERRNRB + 1.
                                        ;    "UNEXPECTED SELFTEST ERROR CODE FOR LINE nn IN FIFO AFTER RESET:"
                                        ;-
021760                                  ERROR                   ;               >>>>> ERROR <<<<<.
021760  104460                                                                          TRAP    C$ERROR
021762  000413                          BR      10$             ;GO TO END OF LOOP.
                                        ;+
                                        ; We have a non-selftest code (either BMP code or data char).
                                        ;-
021764  010567  162000          8$:     MOV     R5,ERRNBR       ;RESTORE ERROR NUMBER TO INTITIAL VALUE.
021770  062767  000002  161772          ADD     #2,ERRNBR       ;CALCULATE INITIAL ERROR NUMBER PLUS 2.
021776  012701  015532                  MOV     #EM9019,R1      ;PASS ERROR MESSAGE INFO TO ER9007 ROUTINE.
022002  012767  017262  161764          MOV     #ER9007,ERRBLK  ;SELECT PROPER ERROR REPORT ROUTINE.
                                        ;+
                                        ; Report error with number Initial ERRNRB + 2.
                                        ;   "NON-SELFTEST CODE IN SELFTEST CODE FIFO SLOT FOR LINE nn AFTER RESET."
                                        ;-
022010                                  ERROR                   ;               >>>>> ERROR <<<<<.
022010  104460                                                                          TRAP    C$ERROR
                                        ;+
                                        ; End of loop, loop if not all chars have been read from the FIFO.
                                        ;-
022012  005203                  10$:    INC     R3              ;SET CODE COUNTER FOR NEXT ITERATION OF LOOP.
022014  020327  000010                  CMP     R3,#NUMLNS      ;TEST FOR ALL CODES READ.
022020  002705                          BLT     2$              ;LOOP IF NOT CHARS READ FROM FIFO.
                                        ;+
                                        ; Purge the FIFO until DATA.VALID is clear or until too many chars are read.
                                        ;-
022022  012704  000022                  MOV     #18.,R4         ;INITIALIZE THE CHARACTER COUNTER.
```

GLOBAL SUBROUTINE - RSTRPT -

```
3373 022026  010567  161736                MOV     R5,ERRNBR       ;GET INITIAL VALUE OF THE ERROR NUMBER.
3374 022032  062767  000003  161730        ADD     #3,ERRNBR       ;CALCULATE ERROR NUMBER OF NEXT ERROR.
3375 022040  012767  017340  161726        MOV     #ER9008,ERRBLK  ;SELECT PROPER ERROR REPORT ROUTINE.
3376 022046  017702  160174          12$:  MOV     @RBUFA,R2       ;READ A CHARACTER FROM THE DUT FIFO.
3377 022052  000261                        SEC                     ;INDICATE SUCCESS IN CASE DATA.VALID IS CLEAR.
3378 022054  100051                      BPL     60$             ;EXIT ROUTINE WITH SUCCESS IF DATA.VALID CLEAR.
3379                                    ;+
3380                                    ; We have a character.
3381                                    ; Determine if character is a data character.
3382                                    ;-
3383 022056  012700  070000                MOV     #70000,R0       ;TEST BITS 12 THRU 14 OF THE
3384 022062  040200                        BIC     R2,R0           ;  CODE READ FROM THE DUT FIFO.
3385 022064  001403                      BEQ     14$             ;SKIP THIS ERROR IF CODE IS NOT A DATA CHAR.
3386                                    ;+
3387                                    ; We have an unexpected data character: set up and go to report error.
3388                                    ;-
3389 022066  012701  015573                MOV     #EM9022,R1      ;SELECT ERROR MSG INFO FOR ER0808 ROUTINE.
3390 022072  000423                      BR      22$             ;GO TO REPORT THIS ERROR.
3391                                    ;+
3392                                    ; We have an unexpected code.
3393                                    ; Determine if the code is a modem status code.
3394                                    ;-
3395 022074  032702  000001          14$:  BIT     #BIT0,R2        ;TEST MODEM STATUS INDICATOR BIT OF CODE.
3396 022100  001003                      BNE     16$             ;SKIP THIS ERROR IF NOT MODEM STATUS CODE.
3397                                    ;+
3398                                    ; We have a modem status code: set up and go to report error.
3399                                    ;-
3400 022102  012701  015612                MOV     #EM9023,R1      ;SELECT ERROR MSG INFO FOR ER0808 ROUTINE.
3401 022106  000415                      BR      22$             ;GO TO REPORT THIS ERROR.
3402                                    ;+
3403                                    ; We have an onboard test code.
3404                                    ; Determine if this code is a BMP code.
3405                                    ;-
3406 022110  032702  000200          16$:  BIT     #BIT7,R2        ;TEST THE ROM VERSION BIT OF THE CODE.
3407 022114  001404                      BEQ     18$             ;GOTO SET UP FOR SELFTEST CODE IF ROM VERSION.
3408 022116  012700  000300                MOV     #300,R0
3409 022122  040200                        BIC     R2,R0           ;TEST THE ERROR TYPE BITS OF THE CODE.
3410 022124  001403                      BEQ     20$             ;SKIP THIS ERROR IF BMP CODE.
3411                                    ;+
3412                                    ; We have a selftest code: set up and go to report error.
3413                                    ;-
3414 022126  012701  015634          18$:  MOV     #EM9024,R1      ;SELECT ERROR MSG INFO FOR ER0808 ROUTINE.
3415 022132  000403                      BR      22$             ;GO TO REPORT THIS ERROR.
3416                                    ;+
3417                                    ; We have a BMP code: save it on the queue.
3418                                    ;-
3419 022134  004767  000130          20$:  JSR     PC,SAVBMP       ;SAVE THE BMP CODE ON THE QUEUE.
3420 022140  000401                      BR      24$             ;
3421                                    ;+
3422                                    ; Report the error with error number of Initial ERRNBR + 3.
3423                                    ;    "UNEXPECTED xxx xxxx FOR LINE nn IN FIFO AFTER RESET:"
3424                                    ;-
3425 022142                          22$:  ERROR                   ;                >>>>> ERROR <<<<<.
     022142  104460                                                                    TRAP    C$ERROR
3426                                    ;+
3427                                    ; End of loop.
3428                                    ; Count the character we just received, and check for too many received.
```

```
GLOBAL SUBROUTINE                - RSTRPT -
                                          \  \
                                           \  \  ;-
3429
3430 022144  005304                  24$:    DEC     R4              ;COUNT THIS CHARACTER.
3431 022146  001337                          BNE     12$             ;LOOP IF NOT TOO MANY CHARACTERS PURGED.
3432                                  ;+
3433                                  ; We read too many valid characters while trying to purge the FIFO.
3434                                  ; Report error and exit without success.
3435                                  ;    "FIFO WILL NOT PURGE (DATA.VALID STUCK SET), REMAINDER OF TEST SKIPPED."
3436                                  ;-
3437 022150  012701  015411                  MOV     #EM9017,R1      ;SELECT PROPER ERROR MESSAGE.
3438 022154  010567  161610                  MOV     R5,ERRNBR       ;GET INITIAL ERROR NUMBER.
3439 022160  062767  000004  161602          ADD     #4,ERRNBR       ;CALCULATE INITIAL ERRNBR + 4.
3440 022166  012767  016470  161600          MOV     #ER0503,ERRBLK  ;SELECT PROPER ERROR REPORT ROUTINE.
3441                                         ;PRINT ERROR REPORT.
3442 022174                                  ERROR                   ;               >>>>> ERROR <<<<<.
     022174  104460                                                                      TRAP    C$ERROR
3443 022176  000241                          CLC                     ;CLEAR THE SUCCESS FLAG.
3444
3445 022200                          60$:    PASS                    ;RESTORE GPRS,
     022200  004736                                  JSR     PC,@(SP)+               ;RETURN TO PREG05 SUBRT.
3446 022202  000207                          RTS     PC              ; CARRY - SUCCESS FLAG (SET IF FIFO IS PURGED).
```

```
                                .SBTTL  GLOBAL SUBROUTINE                - RXIE0 -
                                ;** ************************************************************************
                                ;*                          - RECEIVER INTERRUPT DISABLE -
                                ;*      This routine is used to disable receiver interrupts in the DHV11.
                                ;*
                                ;* INPUTS:      NONE.
                                ;*
                                ;* OUTPUTS:     The RX.INT.ENBL bit is cleared in the DUT CSR.
                                ;*              IESTST -contains the updated status of the TX and RX interrupt
                                ;*              enable bits.
                                ;*
                                ;* CALLING SEQUENCE:    JSR     PC,RXIE0
                                ;*
                                ;* COMMENTS:    The contents of the indirect address register field in
                                ;*              the DUT CSR are destroyed.
                                ;*
                                ;* SUBORDINATE ROUTINES CALLED: NONE.
                                ;-- ************************************************************************
022204  010046                  RXIE0:: MOV     R0,-(SP)        ;SAVE CONTENTS OF R0 ON THE STACK.
022206                                  GETPRI -(SP)            ;SAVE PROCESSOR PRIORITY ON STACK.
022206  104440                                                                    TRAP    C$GPRI
022210  010046                                                                    MOV     R0,-(SP)
022212                                  SETPRI #PRI07           ;IGNORE ANY INTERRUPT THAT MAY BE GENERATED.
022212  012700  000340                                                           MOV     #PRI07,R0
022216  104441                                                                   TRAP    C$SPRI
022220  042767  137777  160102        BIC     #137777,IESTAT  ;CLEAR RX.INT.ENBL BIT IN IESTAT.
022226  016777  160076  160010        MOV     IESTAT,@CSRA    ;DISABLE RX INTERRUPTS.
022234                                  SETPRI (SP)+            ;ENABLE INTERRUPTS TO THE PROCESSOR AGAIN.
022234  012600                                                                   MOV     (SP)+,R0
022236  104441                                                                   TRAP    C$SPRI
022240  012600                          MOV     (SP)+,R0        ;RESTORE R0.
022242  000207                  RTS     PC
```

```
                                .SBTTL  GLOBAL SUBROUTINE                - RXIE1 -
                                ;** ************************************************************************
                                ;*                              - RECEIVER INTERRUPT ENABLE -
                                ;*      This routine is used to enable receiver interrupts in the DHV11.
                                ;*
                                ;* INPUTS:       NONE.
                                ;*
                                ;* OUTPUTS:      The RX.INT.ENBL bit is set in the DUT CSR.
                                ;*               IESTST -contains the updated status of the TX and RX interrupt
                                ;*               enable bits.
                                ;*
                                ;* CALLING SEQUENCE:    JSR     PC,RXIE1
                                ;*
                                ;* COMMENTS:     The contents of the indirect address register field in
                                ;*               the DUT CSR are destroyed.
                                ;*
                                ;* SUBORDINATE ROUTINES CALLED: NONE.
                                ;-- ************************************************************************

022244  052767  000100  160056  RXIE1::  BIS     #BIT06,IESTAT   ;SET RX.INT.ENBL BIT IN IESTAT.
022252  042767  137677  160050           BIC     #137677,IESTAT  ;CLEAR ALL OTHER BITS, EXCEPT TX AND RX I.E.
022260  016777  160044  157756           MOV     IESTAT,@CSRA    ;ENABLE RX INTERRUPTS.
022266  000207                           RTS     PC
```

GLOBAL SUBROUTINE - SAVBMP -

```
                                .SBTTL  GLOBAL SUBROUTINE               - SAVBMP -
                                ;** ************************************************************************
                                ;*                      - Save BMP codes Routine -
                                ;*      This routine saves the parameter passed in, onto the BMP code queue
                                ;*      together with the number of the currently executing test.
                                ;*
                                ;* INPUTS:      R2 - Contains the BMP code that is to be placed on the queue.
                                ;*              BMPCQP - Contains address of next location in the bmp queue.
                                ;*              BMPCQB - Label at base of the BMP code queue.
                                ;*              BMPCQE - Label of next location after the end of the BMP queue.
                                ;*              TSTNUM - Contains the number of the current test.
                                ;*
                                ;* OUTPUTS:     BMPCQP -  Incremented by 4.
                                ;*              The contents of the BMP code queue are updated.
                                ;*
                                ;* CALLING SEQUENCE:    JSR     PC,SAVBMP
                                ;*
                                ;* COMMENTS:    If the overflow occurs then the last location will be
                                ;*              overwritten by any subsequent attempts to update the queue.
                                ;*
                                ;* SUBORDINATE ROUTINES CALLED: None.
                                ;-- ************************************************************************

022270                          SAVBMP:: SAVE                           ;SAVE CONTENTS OF GPRS R0 THRU R5.
022270  004567  161502                         JSR     R5,PREG05       ;CALL REGISTER SAVE SUBRT.
022274  016704  160224                 MOV     BMPCQP,R4               ;GET THE POINTER TO THE NEXT LOCATION IN QUEUE.
022300  116724  160022                 MOVB    TSTNUM,(R4)+            ;SAVE THE CURRENT TEST NUMBER ON THE QUEUE.
022304  005204                         INC     R4                      ;INCREMENT THE POINTER TO GIVE AN EVEN ADDRESS.
022306  042702  177400                 BIC     #177400,R2              ;CLEAR THE UNWANTED BITS FROM THE BMP CODE.
022312  010224                         MOV     R2,(R4)+                ;SAVE THE BMP CODE ON THE QUEUE.
022314  020427  002726                 CMP     R4,#BMPCQE              ;CHECK IF OVERFLOW WILL OCCUR THE NEXT TIME.
022320  103402                        BLO     2$                      ;GO SAVE THE POINTER IF WE WILL NOT OVERFLOW.
022322  162704  000004                 SUB     #4,R4                   ;RESET THE POINTER TO THE LAST LOCATION IN QUE.
022326  010467  160172         2$:     MOV     R4,BMPCQP               ;SAVE THE POINTER.

022332                          60$:    PASS                            ;RESTORE GPRS.
022332  004736                                 JSR     PC,@(SP)+               ;RETURN TO PREG05 SUBRT.
022334  000207                         RTS     PC
```

GLOBAL SUBROUTINE - SKPSTS -

```
                                .SBTTL  GLOBAL SUBROUTINE                - SKPSTS -
                                ;++ ************************************************************************
                                ;*                      - Skip Selftest Routine -
                                ;*      This subroutine is used to skip the selftest after a DUT reset has been
                                ;*      initiated.  It must be entered immediately after setting the DUT Master
                                ;*      Reset routine or after the execution of a bus reset (because of timing
                                ;*      considerations).
                                ;*
                                ;* INPUTS:      CSRA - Contains address of the DUT CSR.
                                ;*              TXBFCA - Contains address of DUT DMA Buffer Count register.
                                ;*
                                ;* OUTPUTS:     Skip selftest codes are written to the DUT registers.
                                ;*
                                ;* CALLING SEQUENCE:    JSR     PC,SKPSTS
                                ;*
                                ;* COMMENTS:
                                ;*
                                ;* SUBORDINATE ROUTINES CALLED: DELAY.
                                ;-- ************************************************************************

022336                          SKPSTS:: SAVE                           ;SAVE CONTENTS OF GPRS R0 THRU R5.
022336  004567  161434                          JSR     R5,PREG05       ;CALL REGISTER SAVE SUBRT.
022342  012704  000012                  MOV     #10.,R4                 ;PASS DELAY VALUE OF 10 MILLI-SECONDS.
022346  004767  175726                 JSR     PC,DELAY                ;DELAY FOR 10 MILLI-SECONDS.
                                ;+
                                ; Write skip self-test code (52525) to all the indexed DUT Registers.
                                ;-
022352  012701  000050                  MOV     #NUMLNS!BIT05,R1 ;FORM IND.ADR.REG FIELD (PLUS M.R. BIT) WORD.
                                ;THE ABOVE INCLUSION OF THE M.R. BIT IS NECESSARY BECAUSE OF THE
                                ;  LACK OF A M.R. BIT WRITE LOCK-OUT ON THE DHV11-M.
022356  012703  052525                  MOV     #52525,R3               ;INITIALISE THE SKIP SELF-TEST CODE.
022362  005301                  4$:     DEC     R1                      ;SELECT THE NEXT SET OF DEVICE REGISTERS.
022364  016704  157654                  MOV     CSRA,R4                 ;GET THE ADDRESS OF THE CSR OF THE DUT.
022370  010124                          MOV     R1,(R4)+                ;SELECT A BANK OF DUT REGISTERS.
022372  010324                  6$:     MOV     R3,(R4)+                ;WRITE THE CODE TO A DUT REGISTER.
022374  020467  157662                  CMP     R4,TXBFCA               ;COMPARE POINTER WITH LAST REGISTER ADDRESS.
022400  103774                 BLO     6$                      ;LOOP IF NOT ALL REGS DONE IN THIS BANK.
022402  032701  000017                  BIT     #17,R1                  ;TEST FOR IND.ADR.REG FIELD DECREMENTED TO 0.
022406  001365                 BNE     4$                      ;LOOP UNTIL ALL REGISTERS CONTAIN THE CODE.

022410                          60$:    PASS                            ;RESTORE GPRS.
022410  004736                                          JSR     PC,@(SP)+               ;RETURN TO PREG05 SUBRT.
022412  000207                 RTS     PC
```

GLOBAL SUBROUTINE - SWAPO -

```
                                .SBTTL  GLOBAL SUBROUTINE                - SWAPO -
                                ;++ ************************************************************************
                                ;*                          - Swap GPRs With GPR Set 0 Routine -
                                ;*      This subroutine swaps the present contents of GPRs R1 thru R5 with
                                ;*      the contents of the number zero GPR save area.  The contents of R0
                                ;*      are not altered by this subroutine.
                                ;*
                                ;* INPUTS:      GPR contents R1 thru R5.
                                ;*              GPRS0B - Label at base of GPR save area number zero.
                                ;*
                                ;* OUTPUTS:     R1 thru R5 contain the previous contents of GPR save area
                                ;*                      zero words 1 thru 5 respectively.
                                ;*              GPRS0 - GPR save area 0 words 1 thru 5, contain previous
                                ;*                      contents of GPRs R1 thru R5 respectively.
                                ;*
                                ;* CALLING SEQUENCE:    JSR     PC,SWAP0
                                ;*
                                ;* COMMENTS:    The state of the CARRY flag is not alterred by this routine.
                                ;*
                                ;* SUBORDINATE ROUTINES CALLED: None.
                                ;-- ************************************************************************

022414  010046                  SWAP0::  MOV    R0,-(SP)        ;SAVE THE CONTENTS OF R0.
                                ;*
                                ; Load the stack from the GPRs.
                                ;-
022416  010146                          MOV    R1,-(SP)        ;SAVE THE CONTENTS OF R1.
022420  010246                          MOV    R2,-(SP)        ;SAVE THE CONTENTS OF R2.
022422  010346                          MOV    R3,-(SP)        ;SAVE THE CONTENTS OF R3.
022424  010446                          MOV    R4,-(SP)        ;SAVE THE CONTENTS OF R4.
022426  010546                          MOV    R5,-(SP)        ;SAVE THE CONTENTS OF R5.
                                ;*
                                ; Load the GPRs from the GPR save area 0.
                                ;-
022430  012700  002450                  MOV    #GPRS0B,R0      ;GET THE BASE ADDRESS OF GPR SAVE AREA 0.
022434  012001                          MOV    (R0)+,R1        ;LOAD R1 WITH GPR SAVE AREA 0 WORD 1.
022436  012002                          MOV    (R0)+,R2        ;LOAD R1 WITH GPR SAVE AREA 0 WORD 2.
022440  012003                          MOV    (R0)+,R3        ;LOAD R1 WITH GPR SAVE AREA 0 WORD 3.
022442  012004                          MOV    (R0)+,R4        ;LOAD R1 WITH GPR SAVE AREA 0 WORD 4.
022444  012005                          MOV    (R0)+,R5        ;LOAD R1 WITH GPR SAVE AREA 0 WORD 5.
                                ;*
                                ; Load the GPR save area 0 from the stack.
                                ;-
022446  012640                          MOV    (SP)+,-(R0)     ;LOAD GPR SAVE AREA 0 WORD 5 WITH SAVED R5.
022450  012640                          MOV    (SP)+,-(R0)     ;LOAD GPR SAVE AREA 0 WORD 4 WITH SAVED R4.
022452  012640                          MOV    (SP)+,-(R0)     ;LOAD GPR SAVE AREA 0 WORD 3 WITH SAVED R3.
022454  012640                          MOV    (SP)+,-(R0)     ;LOAD GPR SAVE AREA 0 WORD 2 WITH SAVED R2.
022456  012640                          MOV    (SP)+,-(R0)     ;LOAD GPR SAVE AREA 0 WORD 1 WITH SAVED R1.

022460  012600                          MOV    (SP)+,R0        ;RESTORE THE INITIAL VALUE OF R0.

022462  000207                         RTS    PC
```

GLOBAL SUBROUTINE - TSABRT -

```
                                .SBTTL  GLOBAL SUBROUTINE                - TSABRT -
                                ;++ ************************************************************************
                                ;*                          - TEST ABORT ROUTINE -
                                ;*      This subroutine is used when a non-test related error has been found
                                ;*      during the execution of the current test.
                                ;*      It is used to inform the operator that the current test has been
                                ;*      aborted.
                                ;*
                                ;* INPUTS:      ERRMSG - Contains the name of the current test.
                                ;*              ERRNBR - Contains the correct error number.
                                ;*              The remainder of the ERRTBL is correctly initialised.
                                ;*
                                ;* OUTPUTS:     Messages are reported to the operator.
                                ;*
                                ;* CALLING SEQUENCE:    JSR     PC,TSABRT
                                ;*
                                ;* COMMENTS:
                                ;*
                                ;* SUBORDINATE ROUTINES CALLED: ER1603.
                                ;-- ************************************************************************

022464                          TSABRT:: SAVE                           ;SAVE CONTENTS OF GPRS R0 THRU R5.
022464  004567  161306                         JSR     R5,PREG05       ;CALL REGISTER SAVE SUBRT.
022470  012701  022506                 MOV     #2$,R1                  ;PASS ADDRESS OF FIRST MESSAGE TO BE REPORTED.
022474  012767  017010  161272         MOV     #ER1603,ERRBLK          ;SET-UP THE ERROR REPORTING ROUTINE.
022502                                 ERROR                           ;               >>>>> ERROR <<<<<.
022502  104460                                                                           TRAP    C$ERROR
022504  000432                         BR      60$                     ;
022506    040     116     117  2$:     .ASCIZ / NON-RELATED TEST ERROR FOUND DURING TEST EXECUTION/
022511    116     055     122
022514    105     114     101
022517    124     105     104
022522    040     124     105
022525    123     124     040
022530    105     122     122
022533    117     122     040
022536    106     117     125
022541    116     104     040
022544    104     125     122
022547    111     116     107
022552    040     124     105
022555    123     124     040
022560    105     130     105
022563    103     125     124
022566    111     117     116
022571    000

                                .EVEN
022572                          60$:    PASS                            ;RESTORE GPRS.
022572  004736                                  JSR     PC,@(SP)+               ;RETURN TO PREG05 SUBRT.
022574  000207                          RTS     PC
```

GLOBAL SUBROUTINE - TXDSBL -

```
                                .SBTTL  GLOBAL SUBROUTINE               - TXDSBL -
                                ;** ************************************************************************
                                ;*                      - Transmitter Disable -
                                ;*      This subroutine is used to disable transmission on selected lines by,
                                ;*      clearing the associated TX.ENABLE bit on the DUT.
                                ;*
                                ;* INPUTS:      R5 - Bit's set correspond to lines on which to clear TX.ENABLE.
                                ;*              CSRA - Contains the address of the DUT CSR.
                                ;*              IESTAT - Contains the state of TXIE and RXIE bits in the CSR.
                                ;*              NUMLNS - Equated to be the maximum number of lines available.
                                ;*              TXAD2A - Contains the address of the TBUFFAD2 register.
                                ;*
                                ;* OUTPUTS:     R5 - Bit's set indicate the initial states of all TX.ENBLE bits.
                                ;*              TBUFFAD2 - The state of the TX.ENBLE bit may be altered.
                                ;*              The contents of the I.  ADD.REG field in the CSR are destroyed.
                                ;*
                                ;* CALLING SEQUENCE:    JSR     PC,TXDSBL
                                ;*
                                ;* COMMENTS:
                                ;*
                                ;* SUBORDINATE ROUTINES CALLED: NONE.
                                ;-- ************************************************************************

022576                          TXDSBL:: SAVE                   ;SAVE CONTENTS OF GPRS R0 THRU R5.
022576  004567  161174                          JSR     R5,PREGO5       ;CALL REGISTER SAVE SUBRT.
022602  010500                          MOV     R5,R0           ;COPY BIT MAP OF LINES TO DISABLE TRANSMISSION.
022604  012701  000001                  MOV     #BIT0,R1        ;INITIALIZE THE SELECTED LINE BIT MASK.
022610  016702  157444                  MOV     TXAD2A,R2       ;GET THE ADDRESS OF THE TBUFFAD2 REGISTER.
022614  005202                          INC     R2              ;GET THE ADDRESS OF THE MSBYTE OF TBUFFAD2 REG.
022616  012703  000010                  MOV     #NUMLNS,R3      ;GET MAXIMUM LINE NUMBER PLUS ONE.
022622  016704  157502                  MOV     IESTAT,R4       ;GET THE STATES OF THE INT ENABLE BITS.
022626  005005                          CLR     R5              ;LOG POSSIBLE TX DISABLED ON ALL LINES.
                                ;+
                                ; Select every line in turn, and log the state of each TX.ENABLE bit.
                                ;-
022630  010477  157410          2$:     MOV     R4,@CSRA        ;WRITE TO DUT CSR TO SELECT LINE REGISTERS.
022634  105712                          TSTB    (R2)            ;CHECK STATE OF TX.ENABLE BIT ON SELECTED LINE.
022636  100001                  BPL     4$                      ;SKIP NEXT INSTRUCTION IF TX.ENABLE CLEAR.
022640  050105                          BIS     R1,R5           ;LOG TX ENABLE BIT SET FOR SELECTED LINE.
                                ;+
                                ;  Clear TX.ENBLE on lines that have a corresponding bit set in the tx disable
                                ;  line bit map.
                                ;-
022642  030100                  4$:     BIT     R1,R0           ;CHECK STATE OF DISABLE LINE BIT MAP.
022644  001402                  BEQ     6$                      ;BRANCH IF THIS LINE TO REMAIN UNALTERED.
022646  142712  000200                  BICB    #BIT7,(R2)      ;CLEAR TX.ENABLE BIT ON SELECTED LINE.
022652  005204                  6$:     INC     R4              ;PREPARE TO SELECT REGISTERS FOR NEXT LINE.
022654  006301                          ASL     R1              ;SHIFT BIT MAP FOR NEXT LINE.
022656  005303                          DEC     R3              ;DECREMENT LINE NUMBER.
022660  001363                  BNE     2$                      ;LOOP TO CHECK NEXT LINE.

022662                          60$:    PASS    R5              ;RESTORE GPRS,EXCEPT
022662  010566  000014                                  MOV     R5,R5SLOT(SP)           ;PUT R5 IN STACK SLOT.
022666  004736                                          JSR     PC,@(SP)+               ;RETURN TO PREGO5 SUBRT.
                                                                ;R5 - PREVIOUS STATES OF ALL TX.ENABLE BITS.
022670  000207                  RTS     PC
```

GLOBAL SUBROUTINE - TXENBL -

```
                        .SBTTL  GLOBAL SUBROUTINE                - TXENBL -
                        ;++ ************************************************************************
                        ;*                          - Transmitter Enable -
                        ;*      This subroutine is used to enable transmission on selected lines by
                        ;*      setting the associated TX.ENABLE bit on the DUT.
                        ;*
                        ;* INPUTS:      R5 - Bit's set correspond to lines on which to set TX.ENABLE.
                        ;*              CSRA - Contains the address of the DUT CSR.
                        ;*              IESTAT - Contains the state of TXIE and RXIE bits in the CSR.
                        ;*              NUMLNS - Equated to be the maximum number of lines available.
                        ;*              TXAD2A - Contains the address of the TBUFFAD2 register.
                        ;*
                        ;* OUTPUTS:     R5 - Bit's set indicate previously disabled lines.
                        ;*              TBUFFAD2 - The state of the TX.ENBLE bit may be altered.
                        ;*              The contents of the IND.ADD.REG field in the CSR are destroyed.
                        ;*
                        ;* CALLING SEQUENCE:    JSR     PC,TXENBL
                        ;*
                        ;* COMMENTS:
                        ;*
                        ;* SUBORDINATE ROUTINES CALLED: NONE.
                        ;-- ************************************************************************
                        TXENBL:: SAVE                           ;SAVE CONTENTS OF GPRS R0 THRU R5.
022672  004567  161100                        JSR     R5,PREG05       ;CALL REGISTER SAVE SUBRT.
022676  010500                MOV     R5,R0           ;COPY BIT MAP OF LINES TO ENABLE.
022700  012701  000001        MOV     #BIT0,R1        ;INITIALIZE THE SELECTED LINE BIT MASK.
022704  016702  157350        MOV     TXAD2A,R2       ;GET THE ADDRESS OF THE TBUFFAD2 REGISTER.
022710  005202                INC     R2              ;GET THE ADDRESS OF THE MSBYTE OF TBUFFAD2 REG.
022712  012703  000010        MOV     #NUMLNS,R3      ;GET MAXIMUM LINE NUMBER.
022716  016704  157406        MOV     IESTAT,R4       ;GET THE STATES OF THE INT ENABLE BITS.
022722  005005                CLR     R5              ;CLEAR TX.ENABLE BIT LOG OF DISABLED LINES.
                        ;+
                        ; Select every line in turn,and log any TX.ENBLE bit that is clear.
                        ;-
022724  010477  157314  2$:   MOV     R4,@CSRA        ;WRITE TO DUT CSR TO SELECT LINE REGISTERS.
022730  105712                TSTB    (R2)            ;CHECK STATE OF TX.ENABLE BIT ON SELECTED LINE.
022732  100401              BMI     4$              ;SKIP NEXT INSTRUCTION IF TX.ENABLE SET.
022734  050105                BIS     R1,R5           ;LOG TX ENABLE BIT CLEAR FOR SELECTED LINE.
                        ;+
                        ;  Set TX.ENBLE on lines that have a corresponding bit set in the tx enable
                        ;  line bit map.
                        ;-
022736  030100  4$:    BIT     R1,R0           ;CHECK STATE OF TX.ENABLE LINE BIT MAP.
022740  001402              BEQ     6$              ;BRANCH IF THIS LINE TO REMAIN UNALTERED.
022742  152712  000200        BISB    #BIT7,(R2)      ;ENABLE TRANSMISSION ON SELECTED LINE.
022746  005204  6$:    INC     R4              ;PREPARE TO SELECT REGISTERS FOR NEXT LINE.
022750  006301                ASL     R1              ;SHIFT BIT MAP FOR NEXT LINE.
022752  005303                DEC     R3              ;DECREMENT LINE NUMBER.
022754  001363              BNE     2$              ;LOOP TO CHECK NEXT LINE.

022756  60$:    PASS    R5                      ;RESTORE GPRS,EXCEPT
022756  010566  000014                MOV     R5,R5SLOT(SP)           ;PUT R5 IN STACK SLOT.
022762  004736                JSR     PC,@(SP)+               ;RETURN TO PREG05 SUBRT.
                                                ;R5 - LINE BIT MAP CORRESPONDING TO THE
                                                ; PREVIOUS LINES THAT WERE DISABLED.

022764  000207              RTS     PC
```

GLOBAL SUBROUTINE - TXIEO -

```
                                .SBTTL  GLOBAL SUBROUTINE               - TXIEO -
                                ;++ ************************************************************************
                                ;*                          - TRANSMITTER INTERRUPT DISABLE -
                                ;*      This routine is used to disable transmitter interrupts in the DHV11.
                                ;*
                                ;* INPUTS:      NONE.
                                ;*
                                ;* OUTPUTS:     The TX.INT.ENBL bit is cleared in the DUT CSR.
                                ;*              IESTST -contains the updated status of the TX and RX interrupt
                                ;*              enable bits.
                                ;*
                                ;* CALLING SEQUENCE:    JSR     PC,TXIEO
                                ;*
                                ;* COMMENTS:    The contents of the indirect address register field in
                                ;*              the DUT CSR are destroyed.
                                ;*
                                ;* SUBORDINATE ROUTINES CALLED: NONE.
                                ;-- ************************************************************************
022766  010046                  TXIEO:: MOV     R0,-(SP)        ;SAVE CONTENTS OF R0 ON THE STACK.
022770                                  GETPRI  -(SP)           ;SAVE CURRENT PROCESSOR PRIORITY ON THE STACK.
022770  104440                                                                  TRAP    C$GPRI
022772  010046                                                                  MOV     R0,-(SP)
022774                                  SETPRI  #PRI07          ;IGNORE ANY INTERRUPTS THAT MAY BE GENERATED.
022774  012700  000340                                                          MOV     #PRI07,R0
023000  104441                                                                  TRAP    C$SPRI
023002  042767  177677  157320          BIC     #177677,IESTAT  ;CLEAR TX.INT.ENBL BIT IN IESTAT.
023010  016777  157314  157226          MOV     IESTAT,@CSRA    ;DISABLE TX INTERRUPTS.
023016                                  SETPRI  (SP)+           ;ENABLE INTERRUPTS TO THE PROCESSOR AGAIN.
023016  012600                                                                  MOV     (SP)+,R0
023020  104441                                                                  TRAP    C$SPRI
023022  012600                          MOV     (SP)+,R0        ;RESTORE R0.
023024  000207                  RTS     PC
```

GLOBAL SUBROUTINE - TXIE1 -

```
                                .SBTTL  GLOBAL SUBROUTINE                - TXIE1 -
                                ;++ ************************************************************************
                                ;*                          - TRANSMITTER INTERRUPT ENABLE -
                                ;*      This routine is used to enable transmitter interrupts in the DHV11.
                                ;*
                                ;* INPUTS:      NONE.
                                ;*
                                ;* OUTPUTS:     The TX.INT.ENBL bit is set in the DUT CSR.
                                ;*              IESTST -contains the updated status of the TX and RX interrupt
                                ;*              enable bits.
                                ;*
                                ;* CALLING SEQUENCE:    JSR     PC,TXIE1
                                ;*
                                ;* COMMENTS:    The contents of the indirect address register field in
                                ;*              the DUT CSR are destroyed.
                                ;*
                                ;* SUBORDINATE ROUTINES CALLED: NONE.
                                ;-- ************************************************************************

023026  052767  040000  157274  TXIE1::  BIS     #BIT14,IESTAT   ;SET TX.INT.ENBL BIT IN IESTAT.
023034  042767  137677  157266          BIC     #137677,IESTAT  ;CLEAR ALL BITS EXCEPT TX RX I.E BITS.
023042  016777  157262  157174          MOV     IESTAT,@CSRA    ;DISABLE TX INTERRUPTS.
023050  000207                        RTS     PC
```

```
                                .SBTTL  GLOBAL SUBROUTINE                - UNSDIV -
                                ;++ ************************************************************************
                                ;*                      - Unsigned Divide Routine -
                                ;*      This subroutine is used to divide a 32 bit unsigned dividend by a
                                ;*      16 bit unsigned divisor giving a 16 bit quotient.  All numbers are
                                ;*      considered to be unsigned.  A success flag is not set on return if
                                ;*      the quotient was too big to be contained in 16 bits.
                                ;*
                                ;* INPUTS:      R1 - The divisor, unsigned, 16 bits.
                                ;*              R2 - Most significant word of the dividend, unsigned, 16 bits.
                                ;*              R3 - Least significant word of the dividend, unsigned, 16 bits.
                                ;*
                                ;* OUTPUTS:     R1 - Quotient, unsigned, 16 bits (177777 if overflow).
                                ;*              CARRY - Success flag, set if complete quotient fits in 16 bits.
                                ;*
                                ;* CALLING SEQUENCE:    JSR     PC,UNSDIV
                                ;*
                                ;* COMMENTS:    If the divisor is 0 the quotient is returned as all ones
                                ;*              (177777) and the carry is clear regardless of the dividend.
                                ;*
                                ;* SUBORDINATE ROUTINES CALLED: None.
                                ;-- ************************************************************************

023052                          UNSDIV:: SAVE                           ;SAVE CONTENTS OF GPRS R0 THRU R5.
023052  004567  160720                          JSR     R5,PREG05       ;CALL REGISTER SAVE SUBRT.
                                ;+
                                ; Check for quotient greater than 16 bits condition.
                                ;-
023056  010204                          MOV     R2,R4                   ;GET MSW OF DIVIDEND FOR SUBTRACT.
023060  160104                          SUB     R1,R4                   ;SUBTRACT DIVISOR FROM MSW OF DIVIDEND.
023062  103403                          BCS     2$                      ;IF IT DIDN'T GO, WE HAVE QUOTIENT < 16 BITS.
023064  012701  177777                  MOV     #-1,R1                  ;SET QUOTIENT TO ALL ONES (177777),
023070  000442                          BR      60$                     ;EXIT WITH CARRY CLEAR.
                                ;+
                                ; Set up counters and various working GPRs.
                                ;-
023072  005004                  2$:     CLR     R4                      ;CLEAR THE LSW OF THE DIVISOR.
023074  000241                          CLC                             ;CLEAR CARRY FOR THE SHIFT OF THE DIVISOR.
023076  006001                          ROR     R1                      ; DIVISOR BY
023100  006004                          ROR     R4                      ; 2(UNSIGNED)
023102  012700  000020                  MOV     #16.,R0                 ;SET UP INITIAL SHIFT COUNT TO 16.
                                ;+
                                ; The subtract and shift loop.
                                ;-
023106  010246                  4$:     MOV     R2,-(SP)                ;SAVE MSWORD OF DIVIDEND.
023110  010346                          MOV     R3,-(SP)                ;SAVE LSWORD OF DIVIDEND.
023112  160403                          SUB     R4,R3                   ;LSWORD DIVIDEND - LSWORD OF DIVISOR.
023114  005602                          SBC     R2                      ;MSWORD DIVIDEND - BORROW .
023116  103402                          BCS     6$                      ;IF BORROW FROM BORROW SUBTRACT, IT DIDN'T GO.
023120  160102                          SUB     R1,R2                   ;MSWORD DIVIDEND - MSWORD OF DIVISOR.
023122  103003                          BCC     8$                      ;IF NO BORROW, IT WENT, CARRY IS CLEAR.
                                    ;+
                                    ; It didn't go, so we shift a 1 into the quotient (complemented later).
                                    ; Carry is set.
                                    ;-
023124  012603                  6$:     MOV     (SP)+,R3                ;RESTORE LSWORD OF DIVIDEND.
023126  012602                          MOV     (SP)+,R2                ;RESTORE MSWORD OF DIVIDEND.
```

GLOBAL SUBROUTINE - UNSDIV -

```
3878 023130  000401                        BR      10$             ;GOTO SHIFT 1 INTO THE QUOTIENT.
3879                                    ;+
3880                                    ; It went, so we restore the stack and shift a 0 into quotient (will be
3881                                    ; complemented later).   Carry is clear.
3882                                    ;-
3883 023132  012626                 8$:     MOV     (SP)+,(SP)+     ;POP THE SAVED DIVIDEND OFF OF THE STACK.
3884                                    ;+
3885                                    ; Shift the result of the subtract attempt into the quotient shift reg.
3886                                    ;-
3887 023134  006105                 10$:    ROL     R5              ;SHIFT NEXT BIT INTO THE INVERTED QUOTIENT.
3888 023136  000241                         CLC                     ;DIVIDE THE
3889 023140  006001                         ROR     R1              ;  DEVISOR BY
3890 023142  006004                         ROR     R4              ;  2 (UNSIGNED).
3891 023144  005300                         DEC     R0              ;COUNT THIS SHIFT AND SUBTRACT.
3892 023146  001357                         BNE     4$              ;LOOP FOR ANOTHER SHIFT & SUB IF NOT DONE.
3893 023150  005105                         COM     R5              ;GET QUOTIENT FROM INVERTED QUOTIENT.
3894                                    ;+
3895                                    ; Now we either round up or leave quotient alone.
3896                                    ;-
3897 023152  000241                         CLC                     ;CLEAR THE CARRY FOR THE SHIFT OF THE DIVIDEND.
3898 023154  006103                         ROL     R3              ;MULTIPLY LSWORD OF DIVIDEND BY 2, MSWORD IS 0.
3899 023156  103402                         BCS     12$             ;IF CARRY FROM SHIFT, ROUND UP.
3900 023160  160403                         SUB     R4,R3           ;SUBTRACT DIVISOR FROM DIVIDEND.
3901 023162  103403                         BCS     14$             ;IF BORROW, DON'T ROUND UP.
3902                                    ;+
3903                                    ; Round up, extra subtract went.
3904                                    ;-
3905 023164  005205                 12$:    INC     R5              ;INCREMENT THE QUOTIENT BY ONE.
3906 023166  001001                         BNE     14$             ;IF NO OVERFLOW, WE LEAVE THE ROUND UP.
3907 023170  005305                         DEC     R5              ;DON'T LET ROUNDING CAUSE OVERFLOW.
3908                                    ;+
3909                                    ; All done, pass quotient and exit.
3910                                    ;-
3911 023172  010501                 14$:    MOV     R5,R1           ;PASS QUOTIENT BACK IN R1.
3912 023174  000261                         SEC                     ;INDICATE NO OVERFLOW.
3913
3914 023176                         60$:    PASS    R1              ;RESTORE GPRS, LEAVE THE FOLLOWING INTACT:
     023176  010166  000004                                 MOV     R1,R1SLOT(SP)           ;PUT R1 IN STACK SLOT.
     023202  004736                                         JSR     PC,@(SP)+               ;RETURN TO PREGO5 SUBRT.
3915                                                                 ;R1 - 16 BIT, UNSIGNED QUOTIENT,
3916 023204  000207                         RTS     PC              ;CARRY - SET INDICATES NO OVERFLOW (SUCCESS).
```

```
                                .SBTTL  GLOBAL SUBROUTINE                - WAIBIC -
                                ;** ************************************************************************
                                ;*                        - Wait For Bit Clear Routine -
                                ;*      This subroutine waits for the specified bit to become clear.  If the
                                ;*      specified bit goes to a clear state within the specified time-out
                                ;*      period a success indication is returned by this routine.
                                ;*      The last value which is read looking for the condition is returned to
                                ;*      allow the use of this routine to look for destructive read conditions.
                                ;*
                                ;* INPUTS:      R1 - Time-out value and bit number indication:
                                ;*                 Bits 15 thru 12 - Number of bit to test (range 0 thru 15).
                                ;*                 Bits 11 thru 0  - Time-out value in milli-seconds (4095 max).
                                ;*               R2 - Address of word containing the bit to test.
                                ;*                    MSLCNT.
                                ;*
                                ;* OUTPUTS:     R2 - The last word which was read to check for the condition.
                                ;*               CARRY - Success flag (CARRY set if bit clr before time-out).
                                ;*
                                ;* CALLING SEQUENCE:    MOV     #130040,R1      ;PASS BIT 11 (13 OCTAL) AND
                                ;*                                              ;  32 (40 OCTAL) MS DELAY.
                                ;*                      MOV     #LABEL,R2       ;TEST BIT IN WORD AT "LABEL".
                                ;*                      JSR     PC,WAIBIC       ;WAIT 32 MS FOR BIT 11 TO CLR.
                                ;*
                                ;* COMMENTS:
                                ;*
                                ;* SUBORDINATE ROUTINES CALLED: MSLGET.
                                ;-- ************************************************************************

023206                          WAIBIC:: SAVE                           ;SAVE CONTENTS OF GPRS R0 THRU R5.
023206  004567  160564                           JSR     R5,PREG05       ;CALL REGISTER SAVE SUBRT.
023212  010204                          MOV     R2,R4                   ;SET UP THE ADDRESS PARAMETER FOR MSLGET.
023214  010102                          MOV     R1,R2
023216  042701  170000                  BIC     #170000,R1              ;SEPERATE DELAY COUNT OUT OF PASSED PARAMETER.
023222  042702  007777                  BIC     #7777,R2                ;SEPERATE LINE NUMBER FIELD OF PASSED PARAM.
023226  000302                          SWAB    R2                      ;PUT LINE NUMBER FIELD IN LSBYTE.
023230  006202                          ASR     R2                      ;SHIFT THE LINE NUMBER FIELD INTO THE PROPER
023232  006202                          ASR     R2                      ;  POSITION TO USE IT AS A WORD TABLE OFFSET
023234  006202                          ASR     R2                      ;  FOR THE TABLE LOOKUP OF THE LINE BIT MAP.
023236  016202  002410                  MOV     BITTBL(R2),R2           ;GET BIT MAP OF LINE TO TEST FROM TABLE.
023242  005003                          CLR     R3                      ;INDICATE THAT THE BIT SHOULD BE CLR.
023244  004767  175070                  JSR     PC,MSLGET               ;WAIT FOR THE BIT TO BE CLR WITHIN TIME-OUT.
                                                                        ;  CARRY IS CORRECT UPON MSLGET RETURN.
023250  010002                          MOV     R0,R2                   ;PASS LAST VALUE READ AS OUTPUT PARAMETER.
023252                          60$:    PASS    R2                      ;RESTORE GPRS, EXCEPT THE FOLLOWING:
023252  010266  000006                                  MOV     R2,R2SLOT(SP)           ;PUT R2 IN STACK SLOT.
023256  004736                                          JSR     PC,@(SP)+               ;RETURN TO PREG05 SUBRT.
                                                                        ;  R2 - LAST VALUE READ LOOKING FOR CONDITION.
023260  000207                          RTS     PC                      ;  CARRY - SUCCESS FLAG (SET IF BIT FOUND CLR).
```

GLOBAL SUBROUTINE - WAIBIS -

```
                        .SBTTL  GLOBAL SUBROUTINE                - WAIBIS -
                        ;++ ************************************************************************
                        ;*                        - Wait For Bit Set Routine -
                        ;*      This subroutine waits for the specified bit to become set.  If the
                        ;*      specified bit goes to a set state within the specified time-out
                        ;*      period a success indication is returned by this routine.
                        ;*      The last value which is read looking for the condition is returned to
                        ;*      allow the use of this routine to look for destructive read conditions.
                        ;*
                        ;* INPUTS:      R1 - Time-out value and bit number indication:
                        ;*                Bits 15 thru 12 - Number of bit to test (range 0 thru 15).
                        ;*                Bits 11 thru 0  - Time-out value in milli-seconds (4095 max).
                        ;*              R2 - Address of word containing the bit to test.
                        ;*                   MSLCNT.
                        ;*
                        ;* OUTPUTS:     R2 - The last word which was read to check for the condition.
                        ;*              CARRY - Success flag (CARRY set if bit set before time-out).
                        ;*
                        ;* CALLING SEQUENCE:    MOV     #130040,R1      ;PASS BIT 11 (13 OCTAL) AND
                        ;*                                              ;  32 (40 OCTAL) MS DELAY.
                        ;*                      MOV     #LABEL,R2       ;TEST BIT IN WORD AT "LABEL".
                        ;*                      JSR     PC,WAIBIS       ;WAIT 32 MS FOR BIT 11 TO SET.
                        ;*
                        ;* COMMENTS:
                        ;*
                        ;* SUBORDINATE ROUTINES CALLED: MSLGET.
                        ;-- ************************************************************************

023262                  WAIBIS:: SAVE                           ;SAVE CONTENTS OF GPRS R0 THRU R5.
023262  004567  160510                      JSR     R5,PREG05       ;CALL REGISTER SAVE SUBRT.
023266  010204                  MOV     R2,R4           ;SET UP THE ADDRESS PARAMETER FOR MSLGET.
023270  010102                  MOV     R1,R2
023272  042701  170000          BIC     #170000,R1      ;SEPERATE DELAY COUNT OUT OF PASSED PARAMETER.
023276  042702  007777          BIC     #7777,R2        ;SEPERATE LINE NUMBER FIELD OF PASSED PARAM.
023302  000302                  SWAB    R2              ;PUT LINE NUMBER FIELD IN LSBYTE.
023304  006202                  ASR     R2              ;SHIFT THE LINE NUMBER FIELD INTO THE PROPER
023306  006202                  ASR     R2              ;  POSITION TO USE IT AS A WORD TABLE OFFSET
023310  006202                  ASR     R2              ;  FOR THE TABLE LOOKUP OF THE LINE BIT MAP.
023312  016202  002410          MOV     BITTBL(R2),R2   ;GET BIT MAP OF LINE TO TEST FROM TABLE.
023316  010203                  MOV     R2,R3           ;INDICATE THAT THE BIT SHOULD BE SET.
023320  004767  175014          JSR     PC,MSLGET       ;WAIT FOR THE BIT TO BE SET WITHIN TIME-OUT.
                                                        ;  CARRY IS CORRECT UPON MSLGET RETURN.
023324  010002                  MOV     R0,R2           ;PASS LAST VALUE READ AS OUTPUT PARAMETER.
023326                  60$:    PASS    R2              ;RESTORE GPRS, EXCEPT THE FOLLOWING:
023326  010266  000006                          MOV     R2,R2SLOT(SP)           ;PUT R2 IN STACK SLOT.
023332  004736                              JSR     PC,@(SP)+               ;RETURN TO PREG05 SUBRT.
                                                        ;  R2 - LAST VALUE READ LOOKING FOR CONDITION.
023334  000207                  RTS     PC              ;  CARRY - SUCCESS FLAG (SET IF BIT FOUND SET).
```

GLOBAL SUBROUTINE - WDPDR -

```
                        .SBTTL  GLOBAL SUBROUTINE                - WDPDR -
                        ;++ ************************************************************************
                        ;*                      - Write Data Pattern to Device Registers -
                        ;*      This routine writes a rotated data pattern to each of the 6 device
                        ;*      registers of each active line of the device under test.
                        ;*      The data pattern is rotated once after each write to a device register
                        ;*              on a particular line.  The starting data pattern for each line
                        ;*              is rotated once after writing all the registers on a particular
                        ;*              line.  This leads to the following data pattern:
                        ;*                      Line 0, register 0 - shifted 0 bit positions
                        ;*                      Line 0, register 1 - shifted 1 bit position
                        ;*                      ...
                        ;*                      Line 1, register 0 - shifted 1 bit position
                        ;*                      Line 2, register 1 - shifted 2 bit positions
                        ;*                      ...
                        ;*      Any bits fields in the device registers that cannot be altered
                        ;*      are masked out of the data pattern before it is written.
                        ;*      This routine will use either MOV, MOVB, BIS, BISB, BIC, or BICB
                        ;*      instructions.  The upper or lower byte can be specified for writing.
                        ;*
                        ;* INPUTS:      R2 - Used to pass in the data pattern to be rotated & written.
                        ;*              R3 - Byte indicator (- => lo byte, + => hi byte, 0 => both).
                        ;*              R4 - Operation type indicator (- => BIC, + => BIS, 0 => MOV).
                        ;*              ACTLNS - Bit map of the active lines on the device under test.
                        ;*              CSRA - Contains the CSR address of the Device under test.
                        ;*              DRADRT - Base address of device register address table.
                        ;*              LPRO - Equated to LPR reg offset from device CSR address.
                        ;*              NUMLNS - Number of lines on the device under test.
                        ;*              TXBFCO - Equated to TBUFFCT reg offset from device CSR address.
                        ;*              UNBTTB - Base address of the unused bit table.
                        ;*
                        ;* OUTPUTS:     Device registers on all active device lines are modified.
                        ;*
                        ;* CALLING SEQUENCE:    JSR     PC,WDPDR
                        ;*
                        ;* COMMENTS:    This routine does not write any data to the TX.CHAR registers.
                        ;*              The CSR is cleared except for the IND.ADR.REG field.
                        ;*
                        ;* SUBORDINATE ROUTINES CALLED: ROLDAP.
                        ;-- ************************************************************************

023336                  WDPDR:: SAVE                            ;SAVE CONTENTS OF GPRS RO THRU R5.
023336  004567  160434                  JSR     R5,PREG05       ;CALL REGISTER SAVE SUBRT.
                        ;+
                        ; Set up outer loop which writes the data pattern to each line's registers
                        ;-
023342  005005                  CLR     R5                      ;CLEAR LINE COUNTER TO SELECT LINE 0.
                        ;+
                        ; The outer loop follows.  Each pass through this loop writes data to all of
                        ; the device registers for a particular line if it is active.
                        ;-
023344  010204          2$:     MOV     R2,R4                   ;SAVE THE OUTER LOOP DATA PATTERN.
023346  010577  156672          MOV     R5,@CSRA                ;SET CSR IND.ADR.REG FIELD TO THIS LINE.
023352  006305                  ASL     R5                      ;TURN LINE NUMBER INTO A WORD OFFSET.
023354  036567  002410  156654  BIT     BITTBL(R5),ACTLNS
023362  001451                  BEQ     20$                     ;LINE ACTIVE?  NO, SKIP THIS LINE.
023364  012701  000004          MOV     #LPRO,R1                ;YES, INITIALIZE THE REGISTER OFFSET.
```

```
4066                                    ;+
4067                                    ;       The inner loop follows.  Each pass through this loop writes data to a
4068                                    ;       device register.
4069                                    ;-
4070 023370  010200                     4$:      MOV     R2,R0
4071 023372  046100  002264                      BIC     UNBTTB(R1),R0   ;CLEAR BIT FIELDS FOR UNUSED REGISTER BITS.
4072 023376  016103  002244                      MOV     DRADRT(R1),R3   ;GET THE ADDRESS OF THE DEVICE REGISTER.
4073 023402  005766  000010                      TST     R3SLOT(SP)      ;CHECK THE OPERAND TYPE INDICATOR.
4074 023406  003402                             BLE     6$              ;HIGH BYTE?  NO, SKIP HIGH BYTE ADDRESS SET UP.
4075 023410  005203                              INC     R3              ;YES, SET THE REG ADDRESS TO THE HIGH BYTE.
4076 023412  000300                              SWAB    R0              ;MOVE HIGH BYTE DATA INTO THE LOW BYTE.
4077 023414  005766  000010             6$:      TST     R3SLOT(SP)      ;CHECK THE OPERAND TYPE INDICATOR.
4078 023420  001412                             BEQ     12$             ;WORD ACCESS?  YES, GO PERFORM WORD ACCESS.
4079                                        ;+
4080                                        ;Perform byte access to the specified byte of the specified register.
4081                                        ;-
4082 023422  005766  000012                      TST     R4SLOT(SP)      ;NO, CHECK THE ACCESS TYPE INDICATOR.
4083 023426  100403                             BMI     8$              ;USE BIC?  YES, GO PERFORM BICB INSTRUCTION.
4084 023430  001404                             BEQ     10$             ;USE MOV?  YES, GO PERFORM MOVB INSTRUCTION.
4085 023432  150013                              BISB    R0,(R3)         ;NEITHER.  PERFORM BISB ACCESS TO REGISTER.
4086 023434  000415                             BR      18$
4087 023436  140013                     8$:      BICB    R0,(R3)         ;PERFORM BICB ACCESS TO REGISTER.
4088 023440  000413                             BR      18$
4089 023442  110013                     10$:     MOVB    R0,(R3)         ;PERFORM MOVB ACCESS TO REGISTER.
4090 023444  000411                             BR      18$
4091                                        ;+
4092                                        ;Perform word access to the specified register.
4093                                        ;-
4094 023446  005766  000012             12$:     TST     R4SLOT(SP)      ;CHECK THE ACCESS TYPE INDICATOR.
4095 023452  100403                             BMI     14$             ;USE BIC?  YES, GO PERFORM BIC INSTRUCTION.
4096 023454  001404                             BEQ     16$             ;USE MOV?  YES, GO PERFORM MOV INSTRUCTION.
4097 023456  050013                              BIS     R0,(R3)         ;NEITHER.  PERFORM BIS ACCESS TO REGISTER.
4098 023460  000403                             BR      18$
4099 023462  040013                     14$:     BIC     R0,(R3)         ;PERFORM BIC ACCESS TO REGISTER.
4100 023464  000401                             BR      18$
4101 023466  010013                     16$:     MOV     R0,(R3)         ;PERFORM MOV ACCESS TO REGISTER.
4102                                        ;+
4103                                        ; Prepare the data pattern and offset for the next register on this line.
4104                                        ;-
4105 023470  004767  176074             18$:     JSR     PC,ROLDAP       ;ROTATE DATA PATTERN LEFT, NOT THROUGH CARRY.
4106 023474  062701  000002                       ADD     #2,R1           ;INCREMENT OFFSET FOR NEXT REGISTER.
4107 023500  020127  000016                      CMP     R1,#TXBFCO      ;COMPARE REG OFFSET WITH OFFSET OF LAST REG.
4108 023504  003731                             BLE     4$              ;LOOP IF NOT ALL REG DONE FOR THIS LINE.
4109                                        ;+
4110                                        ; Back into the outer loop.  Now set up for next line.  Loop if not done.
4111                                        ;-
4112 023506  010402                     20$:     MOV     R4,R2           ;SET UP TO ROTATE THE DATA PATTERN.
4113 023510  004767  176054                      JSR     PC,ROLDAP       ;ROTATE THE DATA PATTERN.
4114 023514  006205                              ASR     R5              ;CONVERT BACK TO LINE NUMBER FROM WORD OFFSET.
4115 023516  005205                              INC     R5              ;COUNT THIS LINE.
4116 023520  020527  000010                      CMP     R5,#NUMLNS      ;COMPARE LINE COUNT WITH NUMBER OF LINES.
4117 023524  002707                              BLT     2$              ;LOOP IF SOME LINES NOT DONE.
4118
4119 023526                             60$:     PASS                    ;RESTORE GPRS.
     023526  004736                                      JSR     PC,@(SP)+               ;RETURN TO PREG05 SUBRT.
4120 023530  000207                             RTS     PC
```

```
                                .SBTTL  GLOBAL SUBROUTINE                - WTWLNC -
                                ;++ ******************************************************************************
                                ;*                        - Line Control Register Setup Routine -
                                ;*      This subroutine is used to set the Device Under Test (DUT) Line
                                ;*      Control Registers (LNCTRL) to the specified state.  Only the LNCTRLS
                                ;*      for the specified lines are altered.
                                ;*
                                ;* INPUTS:      R0 - New line parameters.
                                ;*              R5 - Bit map of lines to be altered.
                                ;*              CSRA - Contains address of the DUT CSR.
                                ;*              IESTAT - Contains the current state of the TX and RX interrupt
                                ;*               enable bits in the CSR.
                                ;*              LNCTRA - Contains address of the DUT LNCTRL registers.
                                ;*
                                ;* OUTPUTS:     LNCTRL - Specified DUT Line Control Registers are altered.
                                ;*
                                ;* CALLING SEQUENCE:    JSR     PC,WTWLNC
                                ;*
                                ;* COMMENTS:
                                ;*
                                ;* SUBORDINATE ROUTINES CALLED: ALTFLD.
                                ;-- ******************************************************************************

023532                          WTWLNC:: SAVE                           ;SAVE CONTENTS OF GPRS R0 THRU R5.
023532  004567  160240                          JSR     R5,PREG05       ;CALL REGISTER SAVE SUBRT.
                                ;+
                                ; Set up the parameters for the call to ALTFLD.
                                ;-
023536  016701  156512                  MOV     LNCTRA,R1               ;SET UP THE REGISTER ADDRESS PARAMETER.
023542  010002                          MOV     R0,R2                   ;SET UP THE DESIRED REGISTER CONTENTS.
023544  010503                          MOV     R5,R3                   ;SET UP THE BIT MAP OF LINES TO ALTER.
023546  012704  177777                  MOV     #-1,R4                  ;SELECT ALL REGISTER BITS TO BE ALTERED.
                                ;+
                                ; Call the subroutine which alters the register contents.
                                ;-
023552  004767  174052                  JSR     PC,ALTFLD               ;ALTER THE REGISTER CONTENTS.

023556                          60$:    PASS                            ;RESTORE GPRS.
023556  004736                                  JSR     PC,@(SP)+               ;RETURN TO PREG05 SUBRT.
023560  000207                          RTS     PC
```

GLOBAL SUBROUTINE - WTWLNS -

```
                        .SBTTL  GLOBAL SUBROUTINE                - WTWLNS -
                        ;*****************************************************************************
                        ;*                        - Write Word to all Lines routine -
                        ;*      This subroutine writes a specified word to the specified DHV device
                        ;*      register for each of the DHV lines.  It could be used to clear all
                        ;*      of the LNCTRL registers or to initialize all of the LPR registers to
                        ;*      the same parameters.
                        ;*
                        ;* INPUTS:      R1 - Address of the specified registers.
                        ;*              R2 - Word to write into the specified registers.
                        ;*              IESTAT - Saved states of the TX.IE and RX.IE bits.
                        ;*              MAPLNS - Equated to bit map of lines on device (8 for DHV11).
                        ;*                CSRA.
                        ;*
                        ;* OUTPUTS:     DEVICE REGISTERS - Specified registers given new value.
                        ;*              CSR IND.ADR.REG field - Destroyed.
                        ;*              CSR Interrupt Enable bits - Set to states in IESTAT.
                        ;*
                        ;* CALLING SEQUENCE:    JSR     PC,WTWLNS
                        ;*
                        ;* COMMENTS:    Note that the specified registers for all lines are altered
                        ;*              by this routine.  This routine should NOT be used to alter
                        ;*              the states of partial register fields or to alter a register
                        ;*              for fewer than all of the lines.
                        ;*              The specified registers are read before being written.
                        ;*
                        ;* SUBROUTINES CALLED: ALTFLD.
                        ;*****************************************************************************

023562                  WTWLNS:: SAVE                           ;SAVE CONTENTS OF GPRS R0 THRU R5.
023562  004567  160210                          JSR     R5,PREG05       ;CALL REGISTER SAVE SUBRT.
                        ;+
                        ; Set up the bit map of lines to change and mask of bits to alter parameters.
                        ;-
023566  012703  000377          MOV     #MAPLNS,R3      ;GET THE BIT MAP OF LINES TO CHANGE.
023572  012704  177777          MOV     #-1,R4          ;INDICATE ALL 16 BITS TO BE CHANGED.
                        ;+
                        ; Call the subroutine to write the specified registers.
                        ;-
023576  004767  174026          JSR     PC,ALTFLD       ;CHANGE THE REGISTERS.

023602                  60$:    PASS                            ;RESTORE GPRS.
023602  004736                                  JSR     PC,@(SP)+               ;RETURN TO PREG05 SUBRT.
023604  000207          RTS     PC
```

```
GLOBAL SUBROUTINE                - WTWLPR -

                                 .SBTTL  GLOBAL SUBROUTINE                - WTWLPR -
                                 ;** ************************************************************************
                                 ;*                        - Line Parameter Register Setup Routine -
                                 ;*      This subroutine is used to set the Device Under Test (DUT) Line
                                 ;*      Parameter Registers (LPR) to the specified state.  Only the LPRs for
                                 ;*      the specified lines are altered.
                                 ;*
                                 ;* INPUTS:      R0 - New line parameters.
                                 ;*              R5 - Bit map of lines to be altered.
                                 ;*              CSRA - Contains address of the DUT CSR.
                                 ;*              IESTAT - Contains the current state of the TX and RX interrupt
                                 ;*               enable bits in the CSR.
                                 ;*              LPRA - Contains address of the DUT LPR.
                                 ;*
                                 ;* OUTPUTS:     LPR - Specified DUT Line Paramter Registers are altered.
                                 ;*
                                 ;* CALLING SEQUENCE:    JSR     PC,WTWLPR
                                 ;*
                                 ;* COMMENTS:
                                 ;*
                                 ;* SUBORDINATE ROUTINES CALLED: ALTFLD.
                                 ;-- ************************************************************************

023606                           WTWLPR:: SAVE                            ;SAVE CONTENTS OF GPRS R0 THRU R5.
023606  004567  160164                                JSR     R5,PREG05       ;CALL REGISTER SAVE SUBRT.
                                 ;+
                                 ; Set up the parameters for the call to ALTFLD.
                                 ;-
023612  016701  156432                   MOV     LPRA,R1         ;SET UP THE REGISTER ADDRESS PARAMETER.
023616  010002                   MOV     R0,R2           ;SET UP THE DESIRED REGISTER CONTENTS.
023620  010503                   MOV     R5,R3           ;SET UP THE BIT MAP OF LINES TO ALTER.
023622  012704  177777           MOV     #-1,R4          ;SELECT ALL REGISTER BITS TO BE ALTERED.
                                 ;+
                                 ; Call the subroutine which alters the register contents.
                                 ;-
023626  004767  173776           JSR     PC,ALTFLD       ;ALTER THE REGISTER CONTENTS.

023632                           60$:    PASS                             ;RESTORE GPRS.
023632  004736                                        JSR     PC,@(SP)+               ;RETURN TO PREG05 SUBRT.
023634  000207                   RTS     PC
```

INTERRUPT SERVICE ROUTINE - CACHRX -

```
                                .SBTTL  INTERRUPT SERVICE ROUTINE       - CACHRX -
                                ;++ ******************************************************************************
                                ;*      - Catch Receiver interrupt.
                                ;*      This routine is used in several tests,to log a count of the
                                ;*      number of receiver interupts that occur.
                                ;*
                                ;* INPUTS:      CSRA - Contains the address of the CSR.
                                ;*              RXINTC - Holds the count of the number of RX interrupts
                                ;*                       that occurred.
                                ;*
                                ;* OUTPUTS:     RXINTC - Contains the updated interrupt count.
                                ;*
                                ;*
                                ;* CALLING SEQUENCE:    Put the address of the label CACHRX in the vector
                                ;*                      location.
                                ;*
                                ;* COMMENTS:
                                ;*
                                ;* SUBORDINATE ROUTINES CALLED: none
                                ;-- ******************************************************************************

023636                          CACHRX::SAVE                    ;SAVE CONTENTS OF GPRS R0 THRU R5.
023636  004567  160134                        JSR     R5,PREG05       ;CALL REGISTER SAVE SUBRT.
023642  016701  156466                MOV     RXINTC,R1       ;GET THE RECEIVER INTERRUPT COUNT
023646  005201                        INC     R1              ;INCREMENT THE COUNT
023650  102001                        BVC     2$              ;BRANCH IF NO OVERFLOW OCCURRED
023652  005301                        DEC     R1              ;RESET THE COUNT TO 177777
023654  010167  156454        2$:     MOV     R1,RXINTC       ;SAVE NEW COUNT VALUE
023660                          60$:    PASS                    ;RESTORE GPRS.
023660  004736                                        JSR     PC,@(SP)+               ;RETURN TO PREG05 SUBRT.
023662  000002                        RTI
```

```
                                .SBTTL  INTERRUPT SERVICE ROUTINE       - CACHTX -
                                ;++ ******************************************************************************
                                ;*      - Catch Transmiter interrupt.
                                ;*      This routine is used in several tests,to log a count of the
                                ;*      number of transmission interrupts that occur.
                                ;*
                                ;* INPUTS:      CSRA - Contains the address of the CSR.
                                ;*               TXINTC - Holds the count of the number of TX interrupts
                                ;*                        that occurred.
                                ;*
                                ;* OUTPUTS:     TXINTC - Contains the updated interrupt count.
                                ;*
                                ;*
                                ;* CALLING SEQUENCE:    Put the address of the label CACHTX in the vector
                                ;*                      location.
                                ;*
                                ;* COMMENTS:
                                ;*
                                ;* SUBORDINATE ROUTINES CALLED: none
                                ;-- ******************************************************************************

023664                          CACHTX::SAVE                    ;SAVE CONTENTS OF GPRS R0 THRU R5.
023664  004567  160106                          JSR     R5,PREG05       ;CALL REGISTER SAVE SUBRT.
023670  016701  156444                  MOV     TXINTC,R1       ;GET THE TRANSMISSION INTERRUPT COUNT
023674  005201                          INC     R1              ;INCREMENT THE COUNT
023676  102001                          BVC     2$              ;BRANCH IF NO OVERFLOW OCCURRED
023700  005301                          DEC     R1              ;RESET THE COUNT TO 177777
023702  010167  156432          2$:     MOV     R1,TXINTC       ;SAVE NEW COUNT VALUE
023706                          60$:    PASS                    ;RESTORE GPRS.
023706  004736                                          JSR     PC,@(SP)+               ;RETURN TO PREG05 SUBRT.
023710  000002                  RTI
```

INTERRUPT SERVICE ROUTINE - CLKINT -

```
                        .SBTTL  INTERRUPT SERVICE ROUTINE       - CLKINT -
                        ;** ************************************************************************
                        ;*      This routine is executed CLKHRZ times per second.  It decrements the
                        ;*      two timer counters down to zero.
                        ;*
                        ;* INPUTS:      TIMER1 - Timer counter #1.
                        ;*              TIMER2 - Timer counter #2.
                        ;*              TIMER3 - Timer counter for call of BREAK macro.
                        ;*
                        ;* OUTPUTS:     The 2 timer counters are decremented if they are not zero.
                        ;*
                        ;* CALLING SEQUENCE:    Put #CLKINT in the clock interrupt vector slot.
                        ;*                      Put the desired time period (seconds times CLKHRZ) in
                        ;*                      either TIMER1 or TIMER2 and poll the respective timer
                        ;*                      counter to detect its going to 0 on time-out.
                        ;*
                        ;* COMMENTS:    The 2 counters will not wraparound but will stop at 0.  This
                        ;*              allows the detection of a time-out any time after the time-out
                        ;*              has occurred until the timer counter is set to another value.
                        ;*
                        ;* SUBORDINATE ROUTINES CALLED: None.
                        ;-- ************************************************************************

023712  005767  156446  CLKINT:: TST     TIMER1          ;CHECK FOR TIMER1 AT ZERO.
023716  001402                   BEQ     2$              ;BRANCH TO LEAVE IT AT ZERO IF IT IS ZERO.
023720  005367  156440           DEC     TIMER1          ;DECREMENT TIME COUNT.
023724  005767  156436  2$:      TST     TIMER2          ;CHECK FOR TIMER2 AT ZERO.
023730  001402                   BEQ     4$              ;BRANCH TO LEAVE IT ALONE IF IT'S ALREADY ZERO.
023732  005367  156430           DEC     TIMER2          ;DECREMENT TIME COUNT.
023736  005367  156426  4$:      DEC     TIMER3          ;DECREMENT THE BREAK COUNT.
023742  001006                   BNE     60$             ;EXIT IF NOT TIME TO CALL BREAK.
023744  016767  156422  156416   MOV     BCOUNT,TIMER3   ;SET UP TIME TILL NEXT BREAK.
023752  010046                   MOV     R0,-(SP)        ;SAVE CONTENTS OF R0 FROM BREAK MACRO.
023754                           BREAK                   ;CHECK FOR OPERATOR CONTROL/C.
023754  104422                                                   TRAP    C$BRK
023756  012600                   MOV     (SP)+,R0        ;RESTORE CONTENTS OF R0.
023760  000002           60$:    RTI
```

```
                        .SBTTL  INTERUPT SERVICE ROUTINE        - RXBRRT -
                        ;++ ******************************************************************************
                        ;*      - BR Level Test Receive Interrupt Service Routine -
                        ;*      This service routine handles Receive Interrupts during the Interrupt
                        ;*      BR Level Test.  This routine counts the interrupt and sets a flag
                        ;*      to indicate that the interrupt has occurred.  It also checks the
                        ;*      flag which indicates that a TX interrupt has occurred.  If the TX
                        ;*      interrupt flag is set, this routine sets an interrupt order error
                        ;*      flag indicating that a transmit interrupt was serviced before a
                        ;*      simultaneous receive interrupt.
                        ;*
                        ;* INPUTS:      RXINTC - Holds the count of the number of RX interupts.
                        ;*              RXINTF - RX Interrupt flags.
                        ;*
                        ;* OUTPUTS:     RXINTC - Contains the updated interupt count.
                        ;*              RXINTF - RX Int flags:
                        ;*                       (Bit 0 set, bit 14 set if TXINTF bit 0 is set.)
                        ;*
                        ;* CALLING SEQUENCE:    Put the address of the label RXBRRT in the vector
                        ;*                      location.
                        ;*
                        ;* COMMENTS:    NOTE: The FIFO is purged by this routine.
                        ;*
                        ;* SUBORDINATE ROUTINES CALLED: None.
                        ;-- ******************************************************************************

023762                  RXBRRT:: SAVE                           ;SAVE CONTENTS OF GPRS R0 THRU R5.
023762  004567  160010                         JSR     R5,PREG05       ;CALL REGISTER SAVE SUBRT.
023766  017700  156254          MOV     @RBUFA,R0       ;READ THE CHAR OUT OF THE FIFO.
023772  016701  156336          MOV     RXINTC,R1       ;GET THE INTERUPT COUNT.
023776  005201                  INC     R1              ;INCREMENT THE COUNT.
024000  001402                  BEQ     2$              ;BYPASS UPDATING COUNT IF OVERFLOW OCCURRED.
024002  010167  156326          MOV     R1,RXINTC       ;SAVE NEW COUNT VALUE.
024006  016701  156324  2$:     MOV     RXINTF,R1       ;GET THE RX INTERRUPT FLAGS.
024012  052701  000001          BIS     #BIT0,R1        ;SET THE RX INTERRUPT HAS OCCURRED FLAG.
024016  032767  000001  156316  BIT     #BIT0,TXINTF    ;TEST THE "TX INT HAS OCCURRED" FLAG.
024024  001402                  BEQ     4$              ;SKIP SETTING ERROR FLAG IF NO TX INT.
024026  052701  040000          BIS     #BIT14,R1       ;SET THE INTERRUPT ORDER ERROR FLAG.
                        ;+
                        ; 8 FIFO codes will cause 8 interrupts, after these 8 codes we don't want
                        ;  to check the interrupt order, because perhaps a BMP code has come in
                        ;  between the servicing of the 8 FIFO code interrupts and the servicing
                        ;  of one of the TX interrupts.
                        ;-
024032  026767  156276  153750  4$:     CMP     RXINTC,NUMLNS   ;TEST FOR ALL SELFTEST CODE INTS DONE.
024040  003002                  BGT     60$             ;SKIP UPDATING RX INT FLAGS IF EXTRA RX INTS.
024042  010167  156270          MOV     R1,RXINTF       ;UPDATE THE RX INTERRUPT FLAGS.
024046                  60$:    PASS                    ;RESTORE GPRS.
024046  004736                          JSR     PC,@(SP)+               ;RETURN TO PREG05 SUBRT.
024050  000002                  RTI
```

```
                                .SBTTL  INTERUPT SERVICE ROUTINE        - RXINPT -
                                ;** ************************************************************************
                                ;*      - Receive Character Input Interrupt Service Routine -
                                ;*      This service routine inputs a character from the DUT and loads the
                                ;*      char (complete with status flags) into a receive char buffer in
                                ;*      memory.  The interrupt is also counted.  The receive char buffer is
                                ;*      monitored to ensure that it does not overflow.
                                ;*
                                ;* INPUTS:      BUFEND - Labels the end of the host memory buffer.
                                ;*              BUFPTR - Contains address of next free buffer location.
                                ;*              CSRA - Contains the address of the DUT CSR.
                                ;*              RBUFA - Contains the address of the RBUF DUT register.
                                ;*              RXINTC - Holds the count of the number of RX interupts.
                                ;*              RXINTF - RX Interrupt flags.
                                ;*
                                ;* OUTPUTS:     BUFPTR - Contains updated address of next free buffer location.
                                ;*              RXINTC - Contains the updated interupt count.
                                ;*              RXINTF - RX Int flags (bit 15 set if RX.DATA.AVAIL is clear).
                                ;*
                                ;* CALLING SEQUENCE:    Put the address of the label RXINPT in the vector
                                ;*                      location.
                                ;*
                                ;* COMMENTS:    In case of overflow of the memory buffer, BUFPTR will be
                                ;*              maintained equal to BUFEND and the word at BURFPTR will be
                                ;*              the last word read from the DUT FIFO.
                                ;*              NOTE: This routine can destroy TX.ACTIONS by reading the CSR.
                                ;*
                                ;* SUBORDINATE ROUTINES CALLED: None.
                                ;-- ************************************************************************

4419 024052                     RXINPT:: SAVE                           ;SAVE CONTENTS OF GPRS R0 THRU R5.
     024052  004567  157720                      JSR     R5,PREG05      ;CALL REGISTER SAVE SUBRT.
4420 024056  032777  000200  156160      BIT     #BIT7,@CSRA            ;TEST RX.DATA.AVAIL BIT OF THE CSR (READS CSR).
4421 024064  001003              BNE     2$                             ;BRANCH AROUND SETTING FLAG IF BIT IS SET.
4422 024066  052767  100000  156242      BIS     #BIT15,RXINTF          ;SET THE RX.DATA.AVAIL CLEAR FLAG.
4423 024074  016701  156234  2$:         MOV     RXINTC,R1              ;GET THE INTERUPT COUNT.
4424 024100  005201              INC     R1                             ;INCREMENT THE COUNT.
4425 024102  001402              BEQ     4$                             ;BYPASS UPDATING COUNT IF OVERFLOW OCCURRED.
4426 024104  010167  156224      MOV     R1,RXINTC                      ;SAVE NEW COUNT VALUE.
4427 024110  016702  156210  4$:         MOV     BUFPTR,R2              ;GET THE POINTER TO NEXT FREE BUFFER WORD.
4428 024114  017722  156126              MOV     @RBUFA,(R2)+           ;READ A CHAR FROM THE FIFO INTO BUFFER.
4429 024120  020267  157602              CMP     R2,BUFEND              ;TEST FOR POINTER BEYOND END OF BUFFER.
4430 024124  103002              BHIS    60$                            ;SKIP THE PTR UPDATE IF PTR OUT OF BOUNDS.
4431 024126  010267  156172              MOV     R2,BUFPTR              ;UPDATE THE BUFFER POINTER.
4432 024132                     60$:    PASS                           ;RESTORE GPRS.
     024132  004736                              JSR     PC,@(SP)+      ;RETURN TO PREG05 SUBRT.
4433 024134  000002              RTI
```

```
                                .SBTTL  GLOBAL TRAP SERVICE ROUTINE     - TP4RTN -
                                ;*************************************************************************
                                ;*      Bus Time-out Trap (004 trap) Service Routine -
                                ;*      This routine is used during the Device Register Address Access Test.
                                ;*      It determines if the 004 trap was caused by an "expected" error or
                                ;*      not by examining the return PC value on the stack.  If the trap is
                                ;*      unexpected, this routine jumps to the normal Diagnostic Supervisor
                                ;*      004 trap handling routine.
                                ;*
                                ;* INPUTS:      SP - Points to the PC where the trap occured.
                                ;*              ADRPTR - Label at the address where "expected" traps occur.
                                ;*              TP4FLG - 004 trap flags.
                                ;*
                                ;* OUTPUTS:     TP4FLG - Bit 15 is set if "expected" trap occured.
                                ;*
                                ;* CALLING SEQUENCE:    Put address pointed to by TP4RTN in 004 vector.
                                ;*                      Occurence of 004 trap vectors to this routine.
                                ;*
                                ;* COMMENTS:    Any 004 trap which occurs at an address other than that labeled
                                ;*              ADRPTR will be handled by the normal 004 trap service routine.
                                ;*
                                ;* SUBORDINATE ROUTINES CALLED: None.
                                ;*************************************************************************

024136  021627  020140          TP4RTN:: CMP     (SP),#ADRPTR    ;COMPARE EXPECTED ADR AGAINST TRAP RET PC.
024142  001402                           BEQ     2$              ;IF THEY MATCH, CONTINUE THIS ROUTINE.
024144  000177  156174                   JMP     @TP4VEC         ;IF NOT,JUMP TO NORMAL 004 TRAP SERVICE RTN.
024150  052767  100000  156170  2$:      BIS     #BIT15,TP4FLG   ;SET THE 004 TRAP OCCURED FLAG.
024156  000002                           RTI                     ;ALL DONE, GO BACK TO THE TEST.
```

```
                        .SBTTL  INTERUPT SERVICE ROUTINE        - TXINTR -
                        ;** ************************************************************************
                        ;*      - Transmit Interrupt Service Routine -
                        ;*      This routine handles a transmit interrupt from the Device Under Test
                        ;*      (DUT) by counting the interrupt and reading the DUT CSR to clear the
                        ;*      interrupt request.  This routine also sets a flag to indicate that
                        ;*      a TX interrupt has occurred and sets a flag if the TX.ACTION bit is
                        ;*      not set in the read contents of the DUT CSR.
                        ;*
                        ;* INPUTS:      CSRA - Contains the address of the CSR.
                        ;*              TXINTC - Holds the count of the number of TX interupts.
                        ;*              TXINTF - TX Interrupt flags.
                        ;*
                        ;* OUTPUTS:     TXINTC - Contains the updated TX interupt count.
                        ;*              TXINTF - TX Int flags (bit 0 set, bit 15 set if TX.ACTION clr).
                        ;*
                        ;* CALLING SEQUENCE:    Put the address of the label TXINTR in the vector
                        ;*                      location.
                        ;*
                        ;* COMMENTS:
                        ;*
                        ;* SUBORDINATE ROUTINES CALLED: none
                        ;-- ************************************************************************

024160                  TXINTR:: SAVE                           ;SAVE CONTENTS OF GPRS R0 THRU R5.
024160  004567  157612                  JSR     R5,PREG05       ;CALL REGISTER SAVE SUBRT.
024164  016701  156150          MOV     TXINTC,R1               ;GET THE TX INTERUPT COUNT.
024170  005201                  INC     R1                      ;INCREMENT THE COUNT.
024172  102001                  BVC     2$                      ;BRANCH IF NO OVERFLOW OCCURRED.
024174  005301                  DEC     R1                      ;RESET THE COUNT TO 177777.
024176  010167  156136  2$:     MOV     R1,TXINTC               ;SAVE NEW COUNT VALUE.
024202  016703  156134          MOV     TXINTF,R3               ;GET THE TX INTERRUPT FLAGS.
024206  017702  156032          MOV     @CSRA,R2                ;READ THE CSR.
024212  100402                  BMI     4$                      ;SKIP SETTING OF FLAG IF TX.ACTION IS SET.
024214  052703  100000          BIS     #BIT15,R3               ;SET THE TX.ACTION CLEAR FLAG.
024220  052703  000001  4$:     BIS     #BIT0,R3                ;SET THE TX INT HAS OCCURRED FLAG.
024224  010367  156112          MOV     R3,TXINTF               ;UPDATE THE TX INTERRUPT FLAGS.
024230                  60$:    PASS                            ;RESTORE GPRS.
024230  004736                          JSR     PC,@(SP)+               ;RETURN TO PREG05 SUBRT.
024232  000002                  RTI
```

```
                        ;*****************************************************************************
**
                        ;
                        ;               VDHA.RPT
                        ;
                        ;*****************************************************************************



                        .SBTTL  REPORT CODING SECTION

                        ;++
                        ; THE REPORT CODING SECTION CONTAINS THE
                        ; "PRINTS" CALLS THAT GENERATE STATISTICAL REPORTS.
                        ;--

024234                          BGNRPT
024234                                                          L$RPT::

024234                          EXIT    RPT
024234  000167                                                          .WORD   J$JMP
024236  000000                                                          .WORD   L10017-2-.

                                .EVEN

024240                          ENDRPT
024240                                                          L10017:
024240  104425                                                          TRAP    C$RPT
```

```
                                        .SBTTL  PROTECTION TABLE

                                        ;*********************************************************************************
*
                                        ;
                                        ;              FVTSKL4.P11
                                        ;
                                        ;******************************************************************************



                                        ;++
                                        ; THIS TABLE IS USED BY THE RUNTIME SERVICES
                                        ; TO PROTECT THE LOAD MEDIA.
                                        ;--

        024242                                 BGNPROT
        024242                                                                         L$PROT::

        024242  177777                         -1              ;OFFSET INTO P-TABLE FOR CSR ADDRESS
        024244  177777                         -1              ;OFFSET INTO P-TABLE FOR MASSBUS ADDRESS
        024246  177777                         -1              ;OFFSET INTO P-TABLE FOR DRIVE NUMBER

        024250                                 ENDPROT
```

```
4565
4566                            ;*****************************************************************************
4567                            ;
4568                            ;               VDHA.INI
4569                            ;
4570                            ;*****************************************************************************
4571
4572
4573
4574                            .SBTTL  INITIALIZE SECTION
4575                            ;++
4576                            ;*****************************************************************************
4577                            ;*      This section contains the code which is performed at the beginning of
4578                            ;*      each pass or after a continue command.
4579                            ;*      This code performs the following actions:
4580                            ;*
4581                            ;*      Moves the information held in the hardware P-table into the global
4582                            ;*      data area.
4583                            ;*
4584                            ;*****************************************************************************
4585
4586 024250                             BGNINIT
    024250                                                              L$INIT::
4587
4588 024250                      ;SEE IF PROGRAM JUST STARTED, BR IF YES
                                        READEF  #EF.START
    024250  012700  000040                                                      MOV     #EF.START,R0
    024254  104447                                                              TRAP    C$REFG
4589 024256                             BCOMPLETE       NEWSTA
    024256  103416                                                              BCS     NEWSTA
4590
4591 024260                     ;SEE IF PROGRAM JUST RESTARTED, BR IF YES
                                        READEF  #EF.RESTART
    024260  012700  000037                                                      MOV     #EF.RESTART,R0
    024264  104447                                                              TRAP    C$REFG
4592 024266                             BCOMPLETE       NEWRES
    024266  103556                                                              BCS     NEWRES
4593
4594 024270                     ;SEE IF THIS IS A NEW PASS, BR IF YES
                                        READEF  #EF.NEW
    024270  012700  000035                                                      MOV     #EF.NEW,R0
    024274  104447                                                              TRAP    C$REFG
4595 024276                             BCOMPLETE       NEWPAS
    024276  103555                                                              BCS     NEWPAS
4596
4597 024300                     ;SEE IF PROGRAM WAS JUST CONTINUED
                                        READEF  #EF.CONTINUE
    024300  012700  000036                                                      MOV     #EF.CONTINUE,R0
    024304  104447                                                              TRAP    C$REFG
4598 024306                             BNCOMPLETE      GETPRM
    024306  103161                                                              BCC     GETPRM
4599 024310  000167  000552             JMP     ENDIT
4600 024314                     NEWSTA:
4601 024314                             BRESET                  ;RESET THE BUS TO PREVENT ILLEGAL INTERRUPTS.
    024314  104433                                                              TRAP    C$RESET
4602                            ;--
4603                            ; Set up for Line Time Clock interrupts.
4604                            ;-
4605 024316                             CLOCK   L,R1            ;GET THE CLOCK PARAMETERS.
    024316  012700  000114                                                      MOV     #'L,R0
    024322  104462                                                              TRAP    C$CLCK
```

INITIALIZE SECTION

```
                024324  010001                                                          MOV     R0,R1
4606            024326  012167  156022                  MOV     (R1)+,CLKCSR            ;STORE CLOCK CSR ADDRESS.
4607            024332  012167  156020                  MOV     (R1)+,CLKBRL            ;STORE CLOCK BUS REQ INT LEVEL.
4608            024336  012167  156016                  MOV     (R1)+,CLKVEC            ;STORE CLOCK INTERRUPT VECTOR.
4609            024342  012167  156014                  MOV     (R1)+,CLKHRZ            ;STORE CLOCK FREQUENCY.
4610            024346  026727  156010  000062          CMP     CLKHRZ,#50.             ;TEST FOR 50HZ LINE FREQUENCY.
4611            024354  001004                          BNE     2$                      ;BRANCH IF CLOCK IS NOT 50HZ.
4612            024356  012767  000024  156010          MOV     #20.,MSTICK             ;INDICATE 20MS PER CLOCK TICK.
4613            024364  000403                          BR      4$
4614            024366  012767  000021  156000  2$:     MOV     #17.,MSTICK             ;INDICATE 17 MS PER CLOCK TICK.
4615            024374                          4$:     SETVEC  CLKVEC,#CLKINT,#PRI06   ;INITIALIZE CLOCK INTERRUPT VECTOR.
                024374  012746  000300                                                          MOV     #PRI06,-(SP)
                024400  012746  023712                                                          MOV     #CLKINT,-(SP)
                024404  016746  155750                                                          MOV     CLKVEC,-(SP)
                024410  012746  000003                                                          MOV     #3,-(SP)
                024414  104437                                                                  TRAP    C$SVEC
                024416  062706  000010                                                          ADD     #10,SP
4616            024422  016700  155734                  MOV     CLKHRZ,R0               ;INITIALIZE THE BREAK COUNT
4617            024426  006200                          ASR     R0                      ; TO CAUSE A BREAK
4618            024430  010067  155736                  MOV     R0,BCOUNT               ; EVERY 1/2 SECOND.
4619            024434                                  SETPRI  #PRI05                  ;ALLOW CLOCK INTERRUPTS DISABLE OTHERS.
                024434  012700  000240                                                          MOV     #PRI05,R0
                024440  104441                                                                  TRAP    C$SPRI
4620                                            ;+
4621                                            ; Enable the Line Time Clock (LTC) checking to make sure that the CSR
4622                                            ; is accessable.
4623                                            ;    First set up to catch any 004 traps which occur:
4624                                            ;-
4625            024442  016767  153336  155674          MOV     4,TP4VEC        ;SAVE THE EXISTING 004 TRAP VECTOR.
4626            024450  012767  024136  153326          MOV     #TP4RTN,4       ;SET 004 TRAP VECTOR TO OUR SERVICE RTN ADR.
4627                                            ;+
4628                                            ;    Enable LTC checking for 004 trap in case CSR is not there.
4629                                            ;-
4630            024456  005067  155664                  CLR     TP4FLG          ;CLEAR THE 004 TRAP FLAG.
4631            024462  012767  000100  155660          MOV     #BIT6,WORD1     ;SET UP TO SET BIT6 OF THE LTC CSR.
4632            024470  012700  002350                  MOV     #WORD1,R0       ;SET UP WORD1 AS THE CKTRAP MOVE SOURCE.
4633            024474  016701  155654                  MOV     CLKCSR,R1       ;SET UP LTC CSR AS DESTINATION FOR CKTRAP MOVE.
4634            024500  004767  173422                  JSR     PC,CKTRAP       ;MOVE AND CHECK FOR TRAP.
4635            024504  016767  155634  153272          MOV     TP4VEC,4        ;RESTORE THE NORMAL 004 TRAP VECTOR.
4636            024512  103403                          BCS     6$              ;IF NO TRAP, LTC IS THERE SO CONTINUE.
4637            024514  005067  155642                  CLR     CLKHRZ          ;CLEAR LTC FREQUENCY WORD TO INDICATE NO LTC.
4638            024520  000402                          BR      8$              ;BYPASS THE FOLLOWING CALIBRATION PROCEDURES.
4639                                            ;+
4640                                            ; Calibrate the DELAY routine milli-second delay count value.
4641                                            ;-
4642            024522  004767  173154          6$:     JSR     PC,CALMSL
4643                                            ;+
4644                                            ; Check for Memmory Management present on this machine.
4645                                            ; If MEM MGT is present, disable it.
4646                                            ;-
4647            024526  016767  153252  155610  8$:     MOV     4,TP4VEC        ;SAVE THE EXISTING 004 TRAP VECTOR.
4648            024534  012767  024136  153242          MOV     #TP4RTN,4       ;SET 004 TRAP VECTOR TO OUR SERVICE RTN ADR.
4649            024542  005067  155600                  CLR     TP4FLG          ;CLEAR THE 004 TRAP FLAG.
4650            024546  005067  155576                  CLR     WORD1           ;PREPARE TO CLEAR THE MEM MGT SR0 REGISTER.
4651            024552  012700  002350                  MOV     #WORD1,R0       ;SELECT CLEARED WORD AS CKTRAP RTN SOURCE.
4652            024556  016701  155616                  MOV     MMSR0,R1        ;SELECT MEM MGT SR0 REGISTER AS DESTINATION.
4653            024562  005067  155614                  CLR     MMPRES          ;INDICATE NO MEM MGT PRESENT IN CASE IT ISN'T.
```

```
4654 024566  005067  155612                    CLR     MMENAB          ;INDICATE MEM MGT IS NOT ENABLED.
4655 024572  004767  173330                    JSR     PC,CKTRAP       ;CLEAR THE MEM MCT SRO REG AND CHECK FOR TRAP.
4656 024576  016767  155542  153200            MOV     TP4VEC,4        ;RESTORE THE NORMAL 004 TRAP VECTOR.
4657 024604  103003                            BCC     10$             ;SKIP INDICATING MEM MGT PRESENT IF IT ISN'T.
4658 024606  012767  000001  155566            MOV     #1,MMPRES       ;INDICATE THAT MEM MGT IS PRESENT.
4659 024614  005067  155512          10$:      CLR     PASCNT          ;CLR COUNTER USED IN REPORTING ROM VERSION #.
4660 024620  000167  000006                    JMP     NEWPAS          ;SKIP AROUND THE BUS RESET, IT'S BEEN DONE.
4661
4662 024624                          NEWRES:   BRESET                  ;RESET THE BUS TO PREVENT ILLEGAL INTERRUPTS.
     024624  104433                                                                  TRAP    C$RESET
4663 024626  005067  155500                    CLR     PASCNT          ;CLR COUNTER USED IN REPORTING ROM VERSION #.
4664 024632                          NEWPAS:
4665 024632  012767  177777  155400            MOV     #-1,UNITN       ;RESET LOGICAL DEVICE TO -1
4666                                 ;+
4667                                 ; Increment the pass counter, correct for any overflow.
4668                                 ;  This counter is used in the Rom version test.
4669                                 ;-
4670 024640  005267  155466                    INC     PASCNT          ;INCREMENT THE PASS COUNTER.
4671 024644  001002                            BNE     GETPRM          ;BRANCH IF WE HAVE NOT YET! OVERFLOWED.
4672 024646  005367  155460                    DEC     PASCNT          ;SET PASS COUNT TO 177777 OCTAL.
4673
4674                                 ; GET THE HARDWARE PARAMETERS FOR THIS UNIT.
4675 024652                          GETPRM:
4676 024652  005267  155362                    INC     UNITN           ;INCREMENT LOGICAL DEVICE NUMBER
4677 024656  026767  155356  155126            CMP     UNITN,L$UNIT    ;SEE IF MAXIMUM UNIT NO. EXCEEDED
4678 024664  002362                            BGE     NEWPAS          ;BR IF YES
4679
4680 024666                                    GPHARD  UNITN,R1        ;GET P-TABLE POINTER INTO R1
     024666  016700  155346                                                          MOV     UNITN,R0
     024672  104442                                                                  TRAP    C$GPHRD
     024674  010001                                                                  MOV     R0,R1
4681 024676                                    BCOMPLETE       30$     ;BR IF DEVICE AVAILABLE
     024676  103401                                                                  BCS     30$
4682 024700  000764                            BR      GETPRM          ;SKIP THIS DEVICE
4683
4684
4685                                           ;*********** HARDWARE PARAMETER MOVING CODE ***************
4686 024702  012167  155336          30$:      MOV     (R1)+,CSRA      ;STORE DHV11-M CSR ADDRESS IN DEV.REG.ADDRESS TABLE
4687 024706  012102                            MOV     (R1)+,R2        ;GET THE RX INTERRUPT VECTOR ADDRESS.
4688 024710  010267  155316                    MOV     R2,RXVECA       ;STORE RX INT VECTOR ADDRESS.
4689 024714  062702  000004                    ADD     #4,R2           ;CALCULATE TX INTERRUPT VECTOR ADDRESS.
4690 024720  010267  155310                    MOV     R2,TXVECA       ;STORE TX INT VECTOR ADDRESS.
4691 024724  012167  155306                    MOV     (R1)+,ACTLNS    ;STORE DHV11-M ACTIVE LINE BIT MAP
4692 024730  012702  000377                    MOV     #MAPLNS,R2      ;GET THE BIT MAP FOR ALL LINES.
4693 024734  005102                            COM     R2              ;GET A BIT MAP OF NON-EXISTANT LINES.
4694 024736  040267  155274                    BIC     R2,ACTLNS       ;CLEAR NON-EXISTANT LINES FROM ACTLNS.
4695 024742  112167  155274                    MOVB    (R1)+,BRLEVL    ;STORE DHV11-M INTERUPT BUS REQUEST LEVEL
4696                                 ;+
4697                                 ;       CALCULTATE DEVICE REGISTER ADDRESSES,AND PUT THEM IN THE
4698                                 ;       DEVICE REGISTER ADDRESS TABLE.
4699                                 ;-
4700 024746  016701  155272                    MOV     CSRA,R1         ;COPY CSR ADDRESS
4701 024752  005201                            INC     R1              ;INCREMENT CSR ADDRESS
4702 024754  005201                            INC     R1              ; COPY BY 2.
4703 024756  012703  000007                    MOV     #7,R3           ;SET UP REGISTER COUNT
4704 024762  012702  002246                    MOV     #RBUFA,R2       ;GET LOCATION WHERE RBUF ADDRESS GOES IN TABLE
4705 024766  010122                  12$:      MOV     R1,(R2)+        ;STORE REGISTER ADDRESS IN TABLE
```

```
INITIALIZE SECTION

 4706 024770  005201                        INC     R1              ;INCREMENT REGISTER ADDRESS
 4707 024772  005201                        INC     R1              ; BY 2,FOR THE NEXT DEVICE REGISTER.
 4708 024774  005303                        DEC     R3              ;DECREMENT REGISTER COUNT
 4709 024776  001373                        BNE     12$             ;LOOP IF NOT DONE
 4710
 4711                                ;+
 4712                                ; Initialise the BMP code queue.
 4713                                ;-
 4714 025000  012700  002526                 MOV     #BMPCQB,R0      ;GET THE START ADDRESS OF THE QUEUE.
 4715 025004  012701  002726                 MOV     #BMPCQE,R1      ;GET THE END ADDRESS OF THE QUEUE.
 4716 025010  010067  155510                 MOV     R0,BMPCQP       ;SET THE POINTER TO THE START OF THE QUEUE.
 4717 025014  005020                 14$:    CLR     (R0)+           ;CLEAR OUT THE CONTENTS OF THE QUEUE.
 4718 025016  020001                         CMP     R0,R1           ;CHECK IF END OF QUEUE HAS BEEN REACHED.
 4719 025020  103775                        BLO     14$             ;LOOP IF NOT ALL DONE.
 4720                                ;+
 4721                                ; Report the Unit number if the software P-table question was answered YES,
 4722                                ;  and the maximum unit number is greater than 1.
 4723                                ;-
 4724 025022  032767  000020  155176         BIT     #BIT4,OPTION    ;CHECK IF THE QUESTION WAS ANSWERED YES.
 4725 025030  001416                        BEQ     16$             ;SKIP REPORTING UNIT NUMBER IF IT IS DISABLED.
 4726 025032  026727  154754  000001         CMP     L$UNIT,#1       ;CHECK MAXIMUM NUMBER OF UNITS SELECTED.
 4727 025040  003412                        BLE     16$             ;DO NOT REPORT UNIT NUMBER IF MAX NUMBER < 1.
 4728 025042                                PRINTF  #MFUNIT,UNITN   ;REPORT UNIT NUMBER.
      025042  016746  155172                                                     MOV     UNITN,-(SP)
      025046  012746  004076                                                     MOV     #MFUNIT,-(SP)
      025052  012746  000002                                                     MOV     #2,-(SP)
      025056  010600                                                             MOV     SP,R0
      025060  104417                                                             TRAP    C$PNTF
      025062  062706  000006                                                     ADD     #6,SP
 4729 025066                         16$:
 4730
 4731 025066  005067  155260          ENDIT: CLR     CTRLCF          ;CLR THE CTRL-C TEST ABORT FLAG.
 4732                                ;+
 4733                                ; Set the processor priority to allow LTC interrupts but not others.
 4734                                ;-
 4735 025072                                SETPRI  #PRI05                  ;SET PROCESSOR PRIORITY TO 5.
      025072  012700  000240                                                     MOV     #PRI05,R0
      025076  104441                                                             TRAP    C$SPRI
 4736                                ;+
 4737                                ;    Enable Line Time Clock if one is available.
 4738                                ;-
 4739 025100  005767  155256                 TST     CLKHRZ          ;CHECK FOR A LTC BEING PRESENT.
 4740 025104  001403                        BEQ     18$             ;LTC PRESENT?  NO, SKIP LTC ENABLE.
 4741 025106  012777  000100  155240         MOV     #BIT6,@CLKCSR   ;YES, ENABLE THE LTC.
 4742 025114                         18$:
 4743
 4744 025114                                ENDINIT
      025114                                                             L10021:
      025114  104411                                                             TRAP    C$INIT
 4745
 4746         000000                        TNUM == 0               ;INITIALIZE THE ASSEMBLER TEST NUMBER VARIABLE.
```

INITIALIZE SECTION

```
                        ;*****************************************************************************
                        ;
                        ;               VDHA.ATD
                        ;
                        ;*****************************************************************************


                        .SBTTL  AUTODROP SECTION


                        ;++
                        ; THIS CODE IS EXECUTED IMMEDIATELY AFTER THE INITIALIZE CODE IF
                        ; THE "ADR" FLAG WAS SET.  THE UNIT(S) UNDER TEST ARE CHECKED TO
                        ; SEE IF THEY WILL RESPOND.  THOSE THAT DON'T ARE IMMEDIATELY
                        ; DROPPED FROM TESTING.
                        ;--

025116                          BGNAUTO
025116                                                          L$AUTO::

025116                          ENDAUTO
025116                                                          L10022:
025116  104461                                                          TRAP    C$AUTO
```

```

                                                 ;*************************************************************************
                                                 ;
                                                 ;                VDHA.CUC
                                                 ;
                                                 ;*************************************************************************



                                                 .SBTTL  CLEANUP CODING SECTION

                                                 ;++
                                                 ; THE CLEANUP CODING SECTION CONTAINS THE CODING THAT IS PERFORMED
                                                 ; AFTER THE HARDWARE TESTS HAVE BEEN PERFORMED.
                                                 ;--

     025120                                              BGNCLN
     025120                                                                                              L$CLEAN::

     025120  005767  155226                               TST     CTRLCF          ;DID WE GET HERE BY CTRL-C FROM TEST?
     025124  001404                                      BEQ     2$              ;CTRL-C FROM TEST?  NO, SKIP BUS RESET.
     025126                                              BRESET                  ;YES, CLR ANY DMAS OR OUTSTANDING INTERRUPTS.
     025126  104433                                                                                              TRAP    C$RESET
     025130                                              SETPRI  #PRI05          ;DISABLE DEVICE INTERRUPTS, ALLOW LTC INTS.
     025130  012700  000240                                                                                      MOV     #PRI05,R0
     025134  104441                                                                                              TRAP    C$SPRI
     025136                                      2$:
     025136  005767  155220                               TST     CLKHRZ
     025142  001402                                      BEQ     3$
     025144  005077  155204                              CLR     @CLKCSR
     025150                                      3$:
     025150                                              EXIT    CLN
     025150  104432                                                                                              TRAP    C$EXIT
     025152  000002                                                                                              .WORD   L10023-.


                                                         .EVEN

     025154                                              ENDCLN
     025154                                                                                              L10023:
     025154  104412                                                                                              TRAP    C$CLEAN
```

```
                                                ;*****************************************************************************
                                                ;
                                                ;               VDHA.DRP
                                                ;
                                                ;*************************************************************************

                                                .SBTTL  DROP UNIT SECTION

                                                ;++
                                                ; THE DROP-UNIT SECTION CONTAINS THE CODING THAT CAUSES A DEVICE
                                                ; TO NO LONGER BE TESTED.
                                                ;--

025156                                                  BGNDU
025156                                                                                          L$DU::

                                                ;**********************************************************************
                                                ;       INSERT DROP CODE HERE.  THIS CODE WILL BE EXECUTED AFTER
                                                ;       A "DROP" COMMAND OR A "DODU" MACRO EXECUTION.  THE PURPOSE
                                                ;       OF THIS CODE IS TO DO ANY NECESSARY HOUSEKEEPING AFTER A
                                                ;       UNIT HAS BEEN DROPPED.  THIS SECTION IS OPTIONAL.
                                                ;**********************************************************************

025156                                                  PRINTF #DROP,R0         ;REPORT UNIT THAT HAS BEEN DROPPED.
025156  010046                                                                                  MOV     R0,-(SP)
025160  012746  025202                                                                          MOV     #DROP,-(SP)
025164  012746  000002                                                                          MOV     #2,-(SP)
025170  010600                                                                                  MOV     SP,R0
025172  104417                                                                                  TRAP    C$PNTF
025174  062706  000006                                                                          ADD     #6,SP
025200  000427                                          BR      EDROP           ;BRANCH AROUND THE MESSAGE.

025202     045     101     040          DROP:   .ASCIZ/%A UNIT%D6%A DROPPED FROM FURTHER TESTING.%N/
025205     125     116     111
025210     124     045     104
025213     066     045     101
025216     040     104     122
025221     117     120     120
025224     105     104     040
025227     106     122     117
025232     115     040     106
025235     125     122     124
025240     110     105     122
025243     040     124     105
025246     123     124     111
025251     116     107     056
025254     045     116     000
                                                .EVEN
025260                                  EDROP:
025260                                                  EXIT    DU
025260  000167                                                                                  .WORD   J$JMP
025262  000000                                                                                  .WORD   L10024-2-.
```

DROP UNIT SECTION

```
   4865
   4866 025264                              ENDDU
        025264                                                  L10024:
        025264  104453                                                 TRAP    C$DU
```

```

                               ;*****************************************************************************
                               ;
                               ;               VDHA:ADD
                               ;
                               ;*****************************************************************************



                               .SBTTL  ADD UNIT SECTION

                               ;++
                               ; THE ADD-UNIT SECTION CONTAINS ANY CODE THE PROGRAMMER WISHES
                               ;  TO BE EXECUTED IN CONJUNCTION WITH THE ADDING OF A UNIT BACK
                               ;  TO THE TEST CYCLE.
                               ;--

 025266                                BGNAU
 025266                                                                    L$AU::

                               ;*****************************************************************************
                               ;       INSERT ADD CODE HERE.  THIS CODE WILL BE EXECUTED AFTER
                               ;       AN "ADD" COMMAND.  THE PURPOSE OF THIS CODE IS TO DO ANY
                               ;       HOUSEKEEPING THAT MAY BE NECESSARY AFTER A UNIT HAS BEEN ADDED.
                               ;       THIS SECTION IS OPTIONAL.
                               ;*****************************************************************************

 025266                                EXIT    AU
 025266  000167                                                                    .WORD   J$JMP
 025270  000000                                                                    .WORD   L10025-2-.


                                       .EVEN

 025272                                ENDAU
 025272                                                                    L10025:
 025272  104452                                                                    TRAP    C$AU

```

```
                                .SBTTL  HARDWARE TEST           - ADRA -
                                ;++
                                ;*****************************************************************************
                                ;*                          - REGISTER ADDRESS TEST -
                                ;*
                                ;*      This test verifies that the Q-bus can read and write to the DHV11
                                ;*      device registers.  If the DHV11 does not respond to the access
                                ;*      attempts (If the DHV11 is at the wrong address, for example) the
                                ;*      004 bus time-out trap is detected by this routine and an error
                                ;*      is reported.
                                ;*
                                ;*****************************************************************************
                                ;--

025274                                  BGNTST
025274                                                                  T1::
000001                          TNUM == TNUM + 1        ;INCREMENT THE ASSEMBLY TIME TEST COUNTER.
025274  012767  000001  155024   MOV    #TNUM,TSTNUM    ;SET UP THE TEST NUMBER.        (1)
025302  012767  177777  155042   MOV    #-1,CTRLCF      ;INDICATE THAT WE ARE IN A TEST.
                                ;+
                                ; Set up to catch any 004 traps which occur:
                                ;-
025310  016767  152470  155026   MOV    4,TP4VEC        ;SAVE THE EXISTING 004 TRAP VECTOR.
025316  012767  024136  152460   MOV    #TP4RTN,4       ;SET 004 TRAP VECTOR TO OUR SERVICE RTN ADR.
025324  005005                   CLR    R5              ;CLEAR THE ERROR FLAGS.

                                ;+
                                ; Set up for the initial iteration of the test loop:
                                ;-
025326  005004                   CLR    R4              ;CLEAR THE LINE COUNTER.

                                ;+
                                ; Here begins the loop to test the registers for a line.
                                ;    First test the CSR and set the IND.ADR.REG (I.A.R) field.
                                ;-
025330  005067  155012          2$:     CLR    TP4FLG          ;CLEAR THE 004 TRAP FLAG.
025334  016700  154704           MOV    CSRA,R0         ;SET UP CSR AS THE CKTRAP MOVE SOURCE.
025340  012701  025554           MOV    #52$,R1         ;SET UP DESTINATION LOCATION FOR CKTRAP MOVE.
025344  004767  172556          JSR     PC,CKTRAP       ;MOVE AND CHECK FOR TRAP.
025350  103402                  BCS     4$              ;IF NO TRAP, BYPASS ERROR.
025352  052705  100001           BIS    #100001,R5      ;SET FATAL READ ERROR FLAGS.
025356  042767  000017  000170  4$:     BIC    #17,52$         ;CLEAR THE I.A.R FIELD OF THE CSR DATA.
025364  050467  000164           BIS    R4,52$          ;OR IN THE LINE COUNTER TO THE I.A.R FIELD.
025370  010100                   MOV    R1,R0           ;USE OLD DESTINATION FOR SOURCE OF CKTRAP MOVE.
025372  016701  154646           MOV    CSRA,R1         ;SET UP CSR AS THE CKTRAP MOVE DESTINATION.
025376  004767  172524          JSR     PC,CKTRAP       ;MOVE AND CHECK FOR TRAP.
025402  103403                  BCS     6$              ;IF NO TRAP, BYPASS ERROR.
025404  052705  100002           BIS    #100002,R5      ;SET FATAL WRITE ERROR FLAGS.
025410  000440                  BR      40$             ;EXIT AND REPORT FATAL ERROR.
                                ;+
                                ;    Now, we test each register for this line.
                                ;-
025412  012702  000010          6$:     MOV    #10,R2          ;INIT REGISTER COUNTER TO 8.
025416  016767  154622  000126   MOV    CSRA,50$                ;INITIALIZE THE REGISTER POINTER.
025424  012700  025552          8$:     MOV    #50$,R0         ;SET UP REGISTER AS THE SOURCE FOR CKTRAP MOVE.
025430  012701  025554           MOV    #52$,R1         ;SET UP LOCAL STORAGE AS THE DES FOR CKTRAP.
025434  004767  172466          JSR     PC,CKTRAP       ;PERFORM THE MOVE, CHECK FOR TRAP.
```

```
 4958 025440  103402                    BCS     10$             ;IF NO TRAP, BYPASS THE SETTING OF ERROR FLAGS.
 4959 025442  052705  100001             BIS     #100001,R5      ;SET FATAL READ ERROR FLAGS.
 4960 025446  010100              10$:   MOV     R1,R0           ;USE OLD DEST AS SRC FOR CKTRAP MOVE.
 4961 025450  012701  025552             MOV     #50$,R1         ;SET UP REGISTER AS THE DEST FOR CKTRAP MOVE.
 4962 025454  004767  172446            JSR     PC,CKTRAP       ;PERFORM THE MOVE, CHECK FOR TRAP.
 4963 025460  103402                    BCS     12$             ;IF NO TRAP, BYPASS THE SETTING OF ERROR FLAGS.
 4964 025462  052705  100002             BIS     #100002,R5      ;SET FATAL WRITE ERROR FLAGS.
 4965 025466  005267  000060      12$:   INC     50$             ;INCREMENT THE REGISTER
 4966 025472  005267  000054             INC     50$             ; POINTER BY 2.
 4967 025476  005302                    DEC     R2              ;COUNT THE REGISTER.
 4968 025500  001351                    BNE     8$              ;LOOP TO TEST THE NEXT REGISTER ADDRESS.
 4969
 4970                              ;+
 4971                              ; Now we set up to test the next line, or to exit if we are done.
 4972                              ;-
 4973 025502  005204                     INC     R4              ;INCREMENT THE LINE COUNTER.
 4974 025504  020427  000010             CMP     R4,#NUMLNS      ;COMPARE LINE COUNTER AGAINST NUMBER OF LINES.
 4975 025510  002707                    BLT     2$              ;LOOP TO TEST THE NEXT LINE IF WE'RE NOT DONE.
 4976
 4977                              ;+
 4978                              ; Done checking device register addresses.
 4979                              ;    Report any errors and exit.
 4980                              ;-
 4981 025512  016767  154626  152264 40$:     MOV     TP4VEC,4        ;RESTORE THE NORMAL 004 TRAP VECTOR.
 4982 025520  005705                     TST     R5              ;CHECK THE ERROR FLAGS.
 4983 025522  100015                    BPL     60$             ;EXIT ROUTINE IF NO ERRORS.
 4984                                ; REPORT "DEVICE REGISTER ACCESS ERRORS"
 4985 025524                             ERRDF   101,EM0103,ER0101;              >>>>> ERROR #101 <<<<<.
      025524  104455                                                                TRAP    C$ERDF
      025526  000145                                                                .WORD   101
      025530  006067                                                                .WORD   EM0103
      025532  016070                                                                .WORD   ER0101
 4986
 4987 025534                             DODU    UNITN           ;DROP THIS UNIT FROM FUTHER TESTING.
      025534  016700  154500                                                        MOV     UNITN,R0
      025540  104451                                                                TRAP    C$DODU
 4988 025542  005067  154604             CLR     CTRLCF          ;INDICATE NO CTRL-C ABORT FROM TEST.
 4989 025546                             DOCLN                   ;ABORT THIS SUB PASS.
      025546  104444                                                                TRAP    C$DCLN
 4990 025550  000402                    BR      60$             ;
 4991                              ;+
 4992                              ; Local storage.
 4993                              ;-
 4994 025552  000000              50$:   .WORD   0       ;STORAGE FOR THE SOURCE OR DEST OF THE CKTRAP MOVE.
 4995 025554  000000              52$:   .WORD   0       ;STORAGE FOR THE SOURCE OR DEST OF THE CKTRAP MOVE.
 4996 025556  005067  154570      60$:    CLR     CTRLCF          ;INDICATE THAT WE ARE NOT WITHIN A TEST.
 4997 025562                             ENDTST
      025562                                                                    L10026:
      025562  104401                                                                TRAP    C$ETST
```

```
                                        .SBTTL  HARDWARE TEST           - MRSTA -
                                        ;++ ******************************************************************************
                                        ;*              - Master Reset With Selftest Test -
                                        ;*      This test verifies that the Master Reset bit will clear after a device
                                        ;*      reset and the performance of the DUT ROM based selftest.
                                        ;*
                                        ;-- ******************************************************************************
025564                                          BGNTST
025564                                                                                  T2::
000002                                          TNUM == TNUM + 1        ;INCREMENT THE ASSEMBLY TIME TEST COUNTER.
025564  012767  000002  154534                   MOV     #TNUM,TSTNUM    ;SET UP THE TEST NUMBER.        (2)
025572  012767  177777  154552                   MOV     #-1,CTRLCF      ;INDICATE THAT WE ARE IN A TEST.
025600  012767  000001  156160                   MOV     #1,ERRTYP       ;SET ERROR TYPE AS FATAL IN ERROR TABLE.
025606  012767  006125  156156                   MOV     #EM0201,ERRMSG  ;SET ERROR MESSAGE ADDRESS IN ERROR TABLE.
025614  012767  016406  156152                   MOV     #ER0201,ERRBLK  ;SET ERROR ROUTINE ADDRESS IN ERROR TABLE.
                                        ;+
                                        ; Wait up to 5 seconds for the DUT Master Reset bit to clear.
                                        ;-
025622  012701  011610                          MOV     #5000.,R1       ;TIME-OUT VALUE IS 5.0 SECONDS.
025626  012702  000040                          MOV     #BIT05,R2       ;WAITING FOR MASTER RESET BIT.
025632  005003                                  CLR     R3              ;WAITING FOR BIT TO CLEAR.
025634  016704  154404                          MOV     CSRA,R4         ;BIT IS IN THE DUT'S CSR.
025640  004767  172474                         JSR     PC,MSLGET       ;WAIT FOR DUT_CSR_MR BIT TO CLEAR.
025644  103410                                  BCS     2$              ;SKIP TO RESET DUT IF MR CLEAR.
                                        ;+
                                        ; DUT Master Reset bit did not go clear.  Device may be stuck in some
                                        ;  odd state.  Try to reset device with a bus reset.
                                        ;-
025646                                          BRESET                  ;NO, TRY TO JOG DEVICE WITH BUS RESET.
025646  104433                                                                  TRAP    C$RESET
025650  004767  174462                         JSR     PC,SKPSTS       ;TRY TO SKIP THE SELFTEST.
025654  012701  011610                          MOV     #5000.,R1       ;TIME-OUT VALUE IS 5.0 SECONDS.
025660  004767  172454                         JSR     PC,MSLGET       ;WAIT FOR DUT_CSR_MR BIT TO CLEAR.
025664  103016                                  BCC     4$              ;GO REPORT ERROR IF MR BIT DID NOT CLEAR.
                                        ;+
                                        ; Set the Master Reset bit and verify that it clears within the proper time.
                                        ;-
025666  012701  011610                  2$:     MOV     #5000.,R1       ;TIME-OUT VALUE IS 5.0 SECONDS.
025672  010214                                  MOV     R2,(R4)         ;SET THE DUT MASTER RESET BIT.
025674  004767  172440                         JSR     PC,MSLGET       ;WAIT FOR DUT_CSR_MR BIT TO CLEAR.
025700  103010                                  BCC     4$              ;GO REPORT ERROR IF MR BIT DID NOT CLEAR.
025702  012702  011610                          MOV     #5000.,R2
025706  160102                                  SUB     R1,R2           ;CALCULATE # OF MS FOR MR TO CLEAR.
025710  001413                                  BEQ     6$              ;GO REPORT ERROR IF MR CLEAR IMMEDIATELY.
025712  020227  000764                          CMP     R2,#500.
025716  002417                                  BLT     8$              ;GO REPORT ERROR IF MR CLEAR IN < 1/2 SECOND.
025720  000424                                  BR      60$             ;EXIT THE TEST WITHOUT ERROR.
                                        ;+
                                        ; Error reports:
                                        ;-
                                            ;Report MR bit would not clear after a DUT reset.
025722  012767  000311  156040          4$:     MOV     #201.,ERRNBR    ;SET THE ERROR NUMBER IN ERROR TABLE.
025730  012701  006173                          MOV     #EM0202,R1      ;SELECT ERROR MESSAGE.
025734                                          ERROR                   ;REPORT ERROR.          >>>>> ERROR #201 <<<<<
025734  104460                                                                  TRAP    C$ERROR
025736  000415                                  BR      60$             ;EXIT THE TEST.
```

HARDWARE TEST - MRSTA -

```
5053                                        ;Report MR bit clear immediately after DUT reset.
5054 025740  012767  000312  156022  6$:     MOV     #202.,ERRNBR    ;SET THE ERROR NUMBER IN ERROR TABLE.
5055 025746  012701  006346                  MOV     #EM0203,R1      ;SELECT ERROR MESSAGE.
5056 025752                                  ERROR                   ;REPORT ERROR.          >>>>> ERROR #202 <<<<<
     025752  104460                                                                              TRAP    C$ERROR
5057 025754  000406                          BR      60$             ;EXIT THE TEST.
5058
5059                                        ;Report MR clear within 1/2 second of DUT reset.
5060 025756  012767  000313  156004  8$:     MOV     #203.,ERRNBR    ;SET THE ERROR NUMBER IN ERROR TABLE.
5061 025764  012701  006511                  MOV     #EM0204,R1      ;SELECT ERROR MESSAGE.
5062 025770                                  ERROR                   ;REPORT ERROR.          >>>>> ERROR #203 <<<<<
     025770  104460                                                                              TRAP    C$ERROR
5063
5064 025772  005067  154354          60$:    CLR     CTRLCF          ;INDICATE THAT WE COMPLETED THE TEST.
5065
5066 025776                                  ENDTST
     025776                                                                          L10027:
     025776  104401                                                                              TRAP    C$ETST
```

```
                                .SBTTL  HARDWARE TEST           - MRSSTA -
                                ;** ****************************************************************************
                                ;*              - Master Reset With Skip Selftest Test -
                                ;*      This test verifies that the Master Reset bit will clear after a device
                                ;*      reset and the skipping of the DUT ROM based selftest.
                                ;*
                                ;-- ****************************************************************************
026000                                  BGNTST
026000                                                                          T3::
        000003                          TNUM == TNUM + 1        ;INCREMENT THE ASSEMBLY TIME TEST COUNTER.
026000  012767  000003  154320          MOV     #TNUM,TSTNUM    ;SET UP THE TEST NUMBER.        (3)
026006  012767  177777  154336          MOV     #-1,CTRLCF      ;INDICATE THAT WE ARE IN A TEST.
026014  012767  000001  155744          MOV     #1,ERRTYP       ;SET ERROR TYPE AS FATAL IN ERROR TABLE.
026022  012767  006670  155742          MOV     #EM0301,ERRMSG  ;SET ERROR MESSAGE ADDRESS IN ERROR TABLE.
026030  012767  016406  155736          MOV     #ER0201,ERRBLK  ;SET ERROR ROUTINE ADDRESS IN ERROR TABLE.
                                ;+
                                ; Wait up to 5 seconds for the DUT Master Reset bit to clear.
                                ;-
026036  012701  011610                  MOV     #5000.,R1       ;TIME-OUT VALUE IS 5.0 SECONDS.
026042  012702  000040                  MOV     #BIT05,R2       ;WAITING FOR MASTER RESET BIT.
026046  005003                          CLR     R3              ;WAITING FOR BIT TO CLEAR.
026050  016704  154170                  MOV     CSRA,R4         ;BIT IS IN THE DUT'S CSR.
026054  004767  172260                  JSR     PC,MSLGET       ;WAIT FOR DUT_CSR_MR BIT TO CLEAR.
026060  103410                          BCS     2$              ;SKIP TO RESET DUT IF MR CLEAR.
                                ;+
                                ; DUT Master Reset bit did not go clear.  Device may be stuck in some
                                ;  odd state.  Try to reset device with a bus reset.
                                ;-
026062                                  BRESET                  ;NO, TRY TO JOG DEVICE WITH BUS RESET.
026062  104433                                                                  TRAP    C$RESET
026064  004767  174246                  JSR     PC,SKPSTS       ;TRY TO SKIP THE SELFTEST.
026070  012701  011610                  MOV     #5000.,R1       ;TIME-OUT VALUE IS 5.0 SECONDS.
026074  004767  172240                  JSR     PC,MSLGET       ;WAIT FOR DUT_CSR_MR BIT TO CLEAR.
026100  103024                          BCC     6$              ;GO REPORT ERROR IF MR BIT DID NOT CLEAR.
                                ;+
                                ; Set the Master Reset bit, try to skip the selftest, and verify that the
                                ;  MR bit clears within 1/5 second.
                                ;-
026102  012701  000310          2$:     MOV     #200.,R1        ;TIME-OUT VALUE IS 1/5 SECOND.
026106  010214                          MOV     R2,(R4)         ;SET THE DUT MASTER RESET BIT.
026110  004767  174222                  JSR     PC,SKPSTS       ;TRY TO SKIP THE SELFTEST.
026114  004767  172220                  JSR     PC,MSLGET       ;WAIT FOR DUT_CSR_MR BIT TO CLEAR.
026120  103007                          BCC     4$              ;GO FIND OUT WHAT IS WRONG IF MR NOT CLEAR.
026122  012702  000310                  MOV     #200.,R2
026126  160102                          SUB     R1,R2           ;CALCULATE # OF MS FOR MR TO CLEAR.
026130  020227  000012                  CMP     R2,#10.
026134  002415                          BLT     8$              ;GO REPORT ERROR IF MR CLEAR IN < 10 MS.
026136  000431                          BR      60$             ;EXIT THE TEST WITHOUT ERROR.
                                ;+
                                ; MR did not clear within 1/5 second, see if it clears within 5 seconds.
                                ;-
026140  012701  011300          4$:     MOV     #4800.,R1       ;TIME-OUT VALUE IS 5 SECONDS MINUS 1/5 SECOND.
026144  004767  172170                  JSR     PC,MSLGET       ;WAIT FOR DUT_CSR_MR BIT TO CLEAR.
026150  103416                          BCS     10$             ;GO REPORT ERROR IF MR CLEARED FINALLY.
                                ;+
                                ; Error reports:
                                ;-
```

```
 5123
 5124 026152  012767  000455  155610  6$:     ;Report MR bit would not clear after a DUT reset.
                                               MOV     #0301.,ERRNBR   ;SET THE ERROR NUMBER IN ERROR TABLE.
 5125 026160  012701  006173                   MOV     #EM0202,R1      ;SELECT ERROR MESSAGE.
 5126 026164                                   ERROR                   ;REPORT ERROR.          >>>>> ERROR #0301 <<<<<
      026164  104460                                                                                 TRAP    C$ERROR
 5127 026166  000415                           BR      60$             ;EXIT THE TEST.
 5128
 5129                                          ;Report MR bit clear within 10 ms after DUT reset.
 5130 026170  012767  000456  155572  8$:     MOV     #0302.,ERRNBR   ;SET THE ERROR NUMBER IN ERROR TABLE.
 5131 026176  012701  006733                   MOV     #EM0302,R1      ;SELECT ERROR MESSAGE.
 5132 026202                                   ERROR                   ;REPORT ERROR.          >>>>> ERROR #0302 <<<<<
      026202  104460                                                                                 TRAP    C$ERROR
 5133 026204  000406                           BR      60$             ;EXIT THE TEST.
 5134
 5135                                          ;Report MR cleared between 1/5 second and 5 seconds of DUT reset.
 5136 026206  012767  000457  155554  10$:    MOV     #0303.,ERRNBR   ;SET THE ERROR NUMBER IN ERROR TABLE.
 5137 026214  012701  007073                   MOV     #EM0303,R1      ;SELECT ERROR MESSAGE.
 5138 026220                                   ERROR                   ;REPORT ERROR.          >>>>> ERROR #0303 <<<<<
      026220  104460                                                                                 TRAP    C$ERROR
 5139
 5140 026222  005067  154124          60$:     CLR     CTRLCF          ;INDICATE THAT WE COMPLETED THE TEST.
 5141
 5142 026226                                   ENDTST
      026226                                                                          L10030:
      026226  104401                                                                         TRAP    C$ETST
```

```
                                .SBTTL  HARDWARE TEST           - RXCHRA -
                                ;** ************************************************************************
                                ;*              - RBUF Register RX Character Field Test -
                                ;*      This test verifies that the RX Character Field of the DUT RBUF register
                                ;*      appears to be functioning correctly.  This test uses the codes which
                                ;*      should be in the FIFO after a board reset and skip selftest sequence.
                                ;*
                                ;-- ************************************************************************
                                    BGNTST
                                                                                        T4::
                                     TNUM == TNUM + 1           ;INCREMENT THE ASSEMBLY TIME TEST COUNTER.
026230  012767  000004  154070     MOV     #TNUM,TSTNUM       ;SET UP THE TEST NUMBER.        (4)
026236  012767  177777  154106     MOV     #-1,CTRLCF         ;INDICATE THAT WE ARE WITHIN A TEST.
026244  012767  000001  155514     MOV     #1,ERRTYP          ;SET ERROR TYPE AS FATAL IN ERROR TABLE.
026252  012767  007252  155512     MOV     #EM0401,ERRMSG     ;SET ERROR MESSAGE ADDRESS IN ERROR TABLE.
026260  012767  016406  155506     MOV     #ER0201,ERRBLK     ;SET ERROR ROUTINE ADDRESS IN ERROR TABLE.
                                ;+
                                ; Set the DUT CSR Master Reset (MR) bit, perform the skip selftest sequence,
                                ;  and wait up to 5 seconds for the MR bit to clear.
                                ;-
026266  012701  011610             MOV     #5000.,R1          ;TIME-OUT VALUE IS 5.0 SECONDS.
026272  012702  000040             MOV     #BIT05,R2          ;WAITING FOR MASTER RESET BIT.
026276  005003                     CLR     R3                 ;WAITING FOR BIT TO CLEAR.
026300  016704  153740             MOV     CSRA,R4            ;BIT IS IN THE DUT'S CSR.
026304  010214                     MOV     R2,(R4)            ;SET THE DUT MASTER RESET BIT.
026306  004767  174024            JSR     PC,SKPSTS          ;SKIP THE SELFTEST.
026312  004767  172022            JSR     PC,MSLGET          ;WAIT FOR DUT_CSR_MR BIT TO CLEAR.
026316  103015                    BCC     4$                 ;GO REPORT ERROR IF MR DID NOT CLEAR.
                                ;+
                                ; Read 6 characters from the DUT and verify that they are valid selftest
                                ;  codes.
                                ;-
026320  012400                      MOV     (R4)+,R0           ;INCREMENT POINTER TO POINT TO DUT RBUF REGSTR.
026322  012701  000006              MOV     #6,R1              ;INITIALIZE THE LOOP COUNTER.
026326  011402              2$:     MOV     (R4),R2            ;READ A CHARACTER FROM THE DUT RBUF REGISTER.
026330  010200                      MOV     R2,R0
026332  042700  177476              BIC     #177476,R0         ;REMOVE ALL BUT BITS SPECIFIC TO SELFTEST CODE.
026336  020027  000201              CMP     R0,#201            ;CHECK THAT BITS 0,6, AND 7 ARE CORRECT.
026342  001012                     BNE     6$                 ;GO REPORT ERROR IF CODE IS NOT SELFTEST CODE.
026344  005301                      DEC     R1                 ;COUNT THIS LOOP ITERATION.
026346  001367                     BNE     2$                 ;LOOP IF NOT ALL LINES DONE.
026350  000415                     BR      60$                ;EXIT TEST, NO ERROR FOUND.
                                ;+
                                ; Error reports:
                                ;-
                                    ;Report MR bit would not clear after a DUT reset.
026352  012767  000621  155410  4$:      MOV     #0401.,ERRNBR  ;SET THE ERROR NUMBER IN ERROR TABLE.
026360  012701  006173                   MOV     #EM0202,R1     ;SELECT ERROR MESSAGE.
026364                                   ERROR                  ;REPORT ERROR.          >>>>> ERROR #0401 <<<<<
026364  104460                                                                             TRAP    C$ERROR
026366  000406                           BR      60$            ;EXIT THE TEST.
                                    ;Report improper code found in DUT RBUF after reset (skip selftest).
026370  012767  000622  155372  6$:      MOV     #0402.,ERRNBR  ;SET THE ERROR NUMBER IN ERROR TABLE.
026376  012701  007321                   MOV     #EM0402,R1     ;SELECT ERROR MESSAGE.
026402                                   ERROR                  ;REPORT ERROR.          >>>>> ERROR #0402 <<<<<
```

```
HARDWARE TEST            - RXCHRA -

        026402  104460                                                          TRAP    C$ERROR
   5199
   5200 026404  005067  153742          60$:    CLR     CTRLCF          ;INDICATE THAT WE COMPLETED THE TEST.
   5201
   5202 026410                          ENDTST
        026410                                                          L10031:
        026410  104401                                                          TRAP    C$ETST
```

HARDWARE TEST - RXFFDA -

```
                                        .SBTTL  HARDWARE TEST           - RXFFDA -
                                        ;++ ******************************************************************************
                                        ;*              - RBUF Register RX Flag Field Test -
                                        ;*      This test verifies that the Field of 3 flag bits in the RBUF reads
                                        ;*      as all ones when the Selftest codes are being read from the DUT
                                        ;*      after a board reset and skip selftest sequence.
                                        ;*
                                        ;-- ******************************************************************************
 026412                                         BGNTST
 026412                                                                                 T5::
          000005                                 TNUM == TNUM + 1        ;INCREMENT THE ASSEMBLY TIME TEST COUNTER.
 026412   012767   000005   153706              MOV     #TNUM,TSTNUM    ;SET UP THE TEST NUMBER.        (5)
 026420   012767   177777   153724              MOV     #-1,CTRLCF      ;INDICATE THAT WE ARE WITHIN A TEST.
 026426   012767   000001   155332              MOV     #1,ERRTYP       ;SET ERROR TYPE AS FATAL IN ERROR TABLE.
 026434   012767   007471   155330              MOV     #EM0501,ERRMSG  ;SET ERROR MESSAGE ADDRESS IN ERROR TABLE.
 026442   012767   016406   155324              MOV     #ER0201,ERRBLK  ;SET ERROR ROUTINE ADDRESS IN ERROR TABLE.
                                        ;+
                                        ; Set the DUT CSR Master Reset (MR) bit, perform the skip selftest sequence,
                                        ;  and wait up to 5 seconds for the MR bit to clear.
                                        ;-
 026450   012701   011610                      MOV     #5000.,R1       ;TIME-OUT VALUE IS 5.0 SECONDS.
 026454   012702   000040                      MOV     #BIT05,R2       ;WAITING FOR MASTER RESET BIT.
 026460   005003                              CLR     R3              ;WAITING FOR BIT TO CLEAR.
 026462   016704   153556                      MOV     CSRA,R4         ;BIT IS IN THE DUT'S CSR.
 026466   010214                              MOV     R2,(R4)         ;SET THE DUT MASTER RESET BIT.
 026470   004767   173642                     JSR     PC,SKPSTS       ;SKIP THE SELFTEST.
 026474   004767   171640                     JSR     PC,MSLGET       ;WAIT FOR DUT_CSR_MR BIT TO CLEAR.
 026500   103013                             BCC     4$              ;GO REPORT ERROR IF MR DID NOT CLEAR.
                                        ;+
                                        ; Read 8 characters from the DUT and verify that all 3 RX error flags are
                                        ;  set for each characters.
                                        ;-
 026502   012400                              MOV     (R4)+,R0        ;INCREMENT POINTER TO POINT TO DUT RBUF REGSTR.
 026504   012701   000010                      MOV     #8.,R1          ;INITIALIZE THE LOOP COUNTER.
 026510   011402                     2$:      MOV     (R4),R2         ;READ A CHARACTER FROM THE DUT RBUF REGISTER.
 026512   012700   070000                      MOV     #70000,R0
 026516   040200                              BIC     R2,R0           ;CALCULATE BIT MAP OF CLEAR RX ERROR FLAGS.
 026520   001012                             BNE     6$              ;GO REPORT ERROR IF NOT ALL RX ERROR FLAGS SET.
 026522   005301                              DEC     R1              ;COUNT THIS LOOP ITERATION.
 026524   001371                             BNE     2$              ;LOOP IF NOT ALL LINES DONE.
 026526   000415                             BR      60$             ;EXIT TEST, NO ERROR FOUND.

                                        ;+
                                        ; Error reports:
                                        ;-
                                            ;Report MR bit would not clear after a DUT reset.
 026530   012767   000765   155232  4$:      MOV     #0501.,ERRNBR   ;SET THE ERROR NUMBER IN ERROR TABLE.
 026536   012701   006173                      MOV     #EM0202,R1      ;SELECT ERROR MESSAGE.
 026542                                      ERROR                   ;REPORT ERROR.          >>>>> ERROR #0501 <<<<<
 026542   104460                                                                                     TRAP    C$ERROR
 026544   000406                             BR      60$             ;EXIT THE TEST.

                                            ;Report one or more RX error flags found set with selftest code.
 026546   012767   000766   155214  6$:      MOV     #0502.,ERRNBR   ;SET THE ERROR NUMBER IN ERROR TABLE.
 026554   012701   007537                      MOV     #EM0502,R1      ;SELECT ERROR MESSAGE.
 026560                                      ERROR                   ;REPORT ERROR.          >>>>> ERROR #0502 <<<<<
 026560   104460                                                                                     TRAP    C$ERROR
```

```
HARDWARE TEST            - RXFFDA -

   5258
   5259 026562  005067  153564          60$:    CLR     CTRLCF          ;INDICATE THAT WE COMPLETED THE TEST.
   5260
   5261 026566                                  ENDTST
        026566                                                          L10032:
        026566  104401                                                          TRAP    C$ETST
```

```
                                .SBTTL  HARDWARE TEST           - RDAA -
                                ;++ ******************************************************************************
                                ;*              - CSR RX Data Available Bit Test -
                                ;*      This test verifies that the DUT CSR RX Data Available Bit is set by the
                                ;*      inclusion of the selftest codes in the DUT FIFO and that the bit clears
                                ;*      after the FIFO has been emptied.
                                ;*
                                ;-- ******************************************************************************
                                        BGNTST
                                                                                        T6::
                                         TNUM == TNUM + 1       ;INCREMENT THE ASSEMBLY TIME TEST COUNTER.
026570  012767  000006  153530          MOV     #TNUM,TSTNUM    ;SET UP THE TEST NUMBER.        (6)
026576  012767  177777  153546          MOV     #-1,CTRLCF      ;INDICATE THAT WE ARE WITHIN A TEST.
026604  012767  000001  155154          MOV     #1,ERRTYP       ;SET ERROR TYPE AS FATAL IN ERROR TABLE.
026612  012767  010073  155152          MOV     #EM0601,ERRMSG  ;SET ERROR MESSAGE ADDRESS IN ERROR TABLE.
026620  012767  016406  155146          MOV     #ER0201,ERRBLK  ;SET ERROR ROUTINE ADDRESS IN ERROR TABLE.
                                ;+
                                ; Set the DUT CSR Master Reset (MR) bit, perform the skip selftest sequence,
                                ;  and wait up to 5 seconds for the MR bit to clear.
                                ;-
026626  012701  011610                  MOV     #5000.,R1       ;TIME-OUT VALUE IS 5.0 SECONDS.
026632  012702  000040                  MOV     #BIT05,R2       ;WAITING FOR MASTER RESET BIT.
026636  005003                          CLR     R3              ;WAITING FOR BIT TO CLEAR.
026640  016704  153400                  MOV     CSRA,R4         ;BIT IS IN THE DUT'S CSR.
026644  010214                          MOV     R2,(R4)         ;SET THE DUT MASTER RESET BIT.
026646  004767  173464                 JSR     PC,SKPSTS       ;SKIP THE SELFTEST.
026652  004767  171462                 JSR     PC,MSLGET       ;WAIT FOR DUT_CSR_MR BIT TO CLEAR.
026656  103016                         BCC     4$              ;GO REPORT ERROR IF MR DID NOT CLEAR.
                                ;+
                                ; Check that the RX Data Available bit is set.
                                ;-
026660  032714  000200                  BIT     #BIT7,(R4)      ;TEST THE DUT RX.DATA.AVAIL BIT.
026664  001422                         BEQ     6$              ;GO REPORT ERROR IF BIT IS NOT SET.
                                ;+
                                ; Read characters from the DUT RX FIFO and wait for RX.DATA.AVAIL to go clear.
                                ;-
026666  012705  001130                  MOV     #600.,R5        ;ALLOW READING 600 CHARS BEFORE ERROR.
026672  010403                          MOV     R4,R3
026674  012300                          MOV     (R3)+,R0        ;CALCULATE THE RBUF ADDRESS.
026676  011300                  2$:     MOV     (R3),R0         ;READ A CHARACTER FROM THE RX FIFO.
026700  032714  000200                  BIT     #BIT7,(R4)      ;TEST THE DUT RX.DATA.AVAIL BIT.
026704  001427                         BEQ     60$             ;EXIT TEST WITHOUT ERROR IF RX.DATA.AVAIL CLR.
026706  005305                          DEC     R5              ;COUNT THE CHARACTER JUST READ.
026710  001372                         BNE     2$              ;LOOP IF NOT TOO MANY CHARS READ FROM FIFO.
026712  000416                          BR     8$              ;GO REPORT ERROR IF RX.DATA.AVAIL WOULDN'T CLR.

                                ;+
                                ; Error reports:
                                ;-
                                    ;Report MR bit would not clear after a DUT reset.
026714  012767  001131  155046  4$:      MOV     #0601.,ERRNBR   ;SET THE ERROR NUMBER IN ERROR TABLE.
026722  012701  006173                   MOV     #EM0202,R1      ;SELECT ERROR MESSAGE.
026726                                  ERROR                   ;REPORT ERROR.          >>>>> ERROR #0601 <<<<<
026726  104460                                                                                  TRAP    C$ERROR
026730  000415                          BR      60$             ;EXIT THE TEST.

                                    ;Report that RX.DATA.AVAIL bit was not set after a reset completion.
```

HARDWARE TEST - RDAA -

```
 5318 026732  012767  001132  155030  6$:     MOV     #0602.,ERRNBR   ;SET THE ERROR NUMBER IN ERROR TABLE.
 5319 026740  012701  010127                  MOV     #EM0602,R1      ;SELECT ERROR MESSAGE.
 5320 026744                                  ERROR                   ;REPORT ERROR.          >>>>> ERROR #0602 <<<<<
      026744  104460                                                                              TRAP    C$ERROR
 5321 026746  000406                          BR      60$             ;EXIT THE TEST.
 5322
 5323                                 ;Report that RX.DATA.AVAIL bit could not be cleared by purging FIFO.
 5324 026750  012767  001133  155012  8$:     MOV     #0603.,ERRNBR   ;SET THE ERROR NUMBER IN ERROR TABLE.
 5325 026756  012701  010307                  MOV     #EM0603,R1      ;SELECT ERROR MESSAGE.
 5326 026762                                  ERROR                   ;REPORT ERROR.          >>>>> ERROR #0603 <<<<<
      026762  104460                                                                              TRAP    C$ERROR
 5327
 5328 026764  005067  153362          60$:    CLR     CTRLCF          ;INDICATE THAT WE COMPLETED THE TEST.
 5329
 5330 026770                                  ENDTST
      026770                                                                          L10033:
      026770  104401                                                                          TRAP    C$ETST
```

```
                                .SBTTL  HARDWARE TEST           - RDVA -
                                ;++ ******************************************************************************
                                ;*              - RBUF RX Data Valid Bit Test -
                                ;*      This test verifies that the DUT RBUF RX Data Valid Bit is set by the
                                ;*      inclusion of the selftest codes in the DUT FIFO and that the bit clears
                                ;*      after the FIFO has been emptied.
                                ;*
                                ;-- ******************************************************************************
                                        BGNTST
                                                                                        T7::
                                 TNUM == TNUM + 1       ;INCREMENT THE ASSEMBLY TIME TEST COUNTER.
026772 012767 000007 153326      MOV    #TNUM,TSTNUM    ;SET UP THE TEST NUMBER.        (7)
027000 012767 177777 153344      MOV    #-1,CTRLCF      ;INDICATE THAT WE ARE WITHIN A TEST.
027006 012767 000001 154752      MOV    #1,ERRTYP       ;SET ERROR TYPE AS FATAL IN ERROR TABLE.
027014 012767 010472 154750      MOV    #EM0701,ERRMSG  ;SET ERROR MESSAGE ADDRESS IN ERROR TABLE.
027022 012767 016406 154744      MOV    #ER0201,ERRBLK  ;SET ERROR ROUTINE ADDRESS IN ERROR TABLE.
                                ;+
                                ; Set the DUT CSR Master Reset (MR) bit, perform the skip selftest sequence,
                                ;  and wait up to 5 seconds for the MR bit to clear.
                                ;-
027030 012701 011610             MOV    #5000.,R1       ;TIME-OUT VALUE IS 5.0 SECONDS.
027034 012702 000040             MOV    #BIT05,R2       ;WAITING FOR MASTER RESET BIT.
027040 005003                    CLR    R3              ;WAITING FOR BIT TO CLEAR.
027042 016704 153176             MOV    CSRA,R4         ;BIT IS IN THE DUT'S CSR.
027046 010214                    MOV    R2,(R4)         ;SET THE DUT MASTER RESET BIT.
027050 004767 173262            JSR     PC,SKPSTS       ;SKIP THE SELFTEST.
027054 004767 171260            JSR     PC,MSLGET       ;WAIT FOR DUT_CSR_MR BIT TO CLEAR.
027060 103012                   BCC     4$              ;GO REPORT ERROR IF MR DID NOT CLEAR.
                                ;+
                                ; Check that the RX Data Valid bit is set.
                                ;-
027062 012400                    MOV    (R4)+,R0        ;INCREMENT POINTER TO PNT TO DUT RBUF REG.
027064 005714                    TST    (R4)            ;TEST THE DUT RX.DATA.VALID BIT.
027066 100016                   BPL     6$              ;GO REPORT ERROR IF BIT IS NOT SET.
                                ;+
                                ; Read characters from the DUT RX FIFO and wait for RX.DATA.VALID to go clear.
                                ;-
027070 012705 001130             MOV    #600.,R5        ;ALLOW READING 600 CHARS BEFORE ERROR.
027074 011400           2$:      MOV    (R4),R0         ;READ A CHARACTER FROM THE RX FIFO.
027076 100027                   BPL     60$             ;EXIT TEST WITHOUT ERROR IF BIT IS CLEAR.
027100 005305                    DEC    R5              ;COUNT THE CHARACTER JUST READ.
027102 001374                   BNE     2$              ;LOOP IF NOT TOO MANY CHARS READ FROM FIFO.
027104 000416                    BR     8$              ;GO REPORT ERROR IF RX.DATA.VALID WOULDN'T CLR.
                                ;+
                                ; Error reports:
                                ;-
                                    ;Report MR bit would not clear after a DUT reset.
027106 012767 001275 154654 4$:      MOV    #0701.,ERRNBR   ;SET THE ERROR NUMBER IN ERROR TABLE.
027114 012701 006173                 MOV    #EM0202,R1      ;SELECT ERROR MESSAGE.
027120                              ERROR                  ;REPORT ERROR.          >>>>> ERROR #0701 <<<<<
027120 104460                                                                               TRAP    C$ERROR
027122 000415                       BR      60$            ;EXIT THE TEST.
                                    ;Report that RX.DATA.VALID bit was not set after a reset completion.
027124 012767 001276 154636 6$:      MOV    #0702.,ERRNBR   ;SET THE ERROR NUMBER IN ERROR TABLE.
027132 012701 010527                 MOV    #EM0702,R1      ;SELECT ERROR MESSAGE.
```

```
5387 027136                                ERROR                ;REPORT ERROR.          >>>>> ERROR #0702 <<<<<
     027136  104460                                                                              TRAP    C$ERROR
5388 027140  000406                        BR       60$         ;EXIT THE TEST.
5389
5390                                  ;Report that RX.DATA.VALID bit could not be cleared by purging FIFO.
5391 027142  012767  001277  154620  8$:  MOV      #0703.,ERRNBR  ;SET THE ERROR NUMBER IN ERROR TABLE.
5392 027150  012701  010707              MOV      #EM0703,R1     ;SELECT ERROR MESSAGE.
5393 027154                              ERROR                   ;REPORT ERROR.          >>>>> ERROR #0703 <<<<<
     027154  104460                                                                              TRAP    C$ERROR
5394
5395 027156  005067  153170        60$:  CLR      CTRLCF         ;INDICATE THAT WE COMPLETED THE TEST.
5396
5397 027162                              ENDTST
     027162                                                                    L10034:
     027162  104401                                                                              TRAP    C$ETST
```

```
                                .SBTTL  HARDWARE TEST           - RLNA -
                                ;++ ******************************************************************************
                                ;*              - RBUF RX Line Number Field Test -
                                ;*      This test verifies that the DUT RBUF RX Line Number field is working
                                ;*      correctly by utilizing the selftest codes which are put in the RX
                                ;*      FIFO after a board reset.
                                ;*
                                ;-- ******************************************************************************
027164                                  BGNTST
027164                                                                          T8::
        000010                   TNUM == TNUM + 1       ;INCREMENT THE ASSEMBLY TIME TEST COUNTER.
027164  012767  000010  153134   MOV    #TNUM,TSTNUM    ;SET UP THE TEST NUMBER.        (8)
027172  012767  177777  153152   MOV    #-1,CTRLCF      ;INDICATE THAT WE ARE WITHIN A TEST.
027200  012767  000001  154560   MOV    #1,ERRTYP       ;SET ERROR TYPE AS FATAL IN ERROR TABLE.
027206  012767  011072  154556   MOV    #EM0801,ERRMSG  ;SET ERROR MESSAGE ADDRESS IN ERROR TABLE.
                                ;+
                                ; Set the DUT CSR Master Reset (MR) bit, perform the skip selftest sequence,
                                ;  and wait up to 5 seconds for the MR bit to clear.
                                ;-
027214  012701  011610           MOV    #5000.,R1       ;TIME-OUT VALUE IS 5.0 SECONDS.
027220  012702  000040           MOV    #BIT05,R2       ;WAITING FOR MASTER RESET BIT.
027224  005003                   CLR    R3              ;WAITING FOR BIT TO CLEAR.
027226  016704  153012           MOV    CSRA,R4         ;BIT IS IN THE DUT'S CSR.
027232  010214                   MOV    R2,(R4)         ;SET THE DUT MASTER RESET BIT.
027234  004767  173076-          JSR    PC,SKPSTS       ;SKIP THE SELFTEST.
027240  004767  171074           JSR    PC,MSLGET       ;WAIT FOR DUT_CSR_MR BIT TO CLEAR.
027244  103016                   BCC    4$              ;GO REPORT ERROR IF MR DID NOT CLEAR.
                                ;+
                                ; Read characters from the DUT RX FIFO and verify that the line numbers are
                                ;  correct.
                                ; One character is read from the FIFO for each possible line on the DUT.
                                ;-
027246  005001                    CLR    R1              ;CLEAR THE LINE COUNTER.
027250  012400                    MOV    (R4)+,R0        ;INCREMENT POINTER TO PNT TO THE DUT RBUF REG.
027252  011402                2$: MOV    (R4),R2         ;READ A CHARACTER FROM THE DUT RX FIFO.
027254  010203                    MOV    R2,R3
027256  000303                   SWAB   R3
027260  042703  177760            BIC    #177760,R3      ;REMOVE ALL BUT LINE NUMBER BITS.
027264  020301                    CMP    R3,R1           ;COMPARE WITH EXPECTED LINE NUMBER.
027266  001017                   BNE    6$              ;GO REPORT ERROR IF LINE NUMBERS DON'T MATCH.
027270  005201                    INC    R1              ;INCREMENT THE EXPECTED LINE NUMBER.
027272  020127  000010            CMP    R1,#NUMLNS      ;COMPARE WITH NUMBER OF LINES ON DUT.
027276  001365                   BNE    2$              ;LOOP UNTIL CODES FOR ALL LINES ARE READ.
027300  000423                    BR     60$             ;EXIT TEST WITHOUT ERROR.

                                ;+
                                ; Error reports:
                                ;-
                                    ;Report MR bit would not clear after a DUT reset.
027302  012767  001441  154460  4$:    MOV    #0801.,ERRNBR   ;SET THE ERROR NUMBER IN ERROR TABLE.
027310  012767  016470  154456         MOV    #ER0503,ERRBLK  ;SET ERROR ROUTINE ADDRESS IN ERROR TABLE.
027316  012701  006173                 MOV    #EM0202,R1      ;SELECT ERROR MESSAGE.
027322                                 ERROR                  ;REPORT ERROR.          >>>>> ERROR #0801 <<<<<
027322  104460                                                                                  TRAP    C$ERROR
027324  000411                         BR     60$             ;EXIT THE TEST.

                                    ;Report that RX Line Number field is wrong for selftest code.
```

HARDWARE TEST - RLNA -

```
 5454 027326  012767  001442  154434  6$:     MOV     #0802.,ERRNBR   ;SET THE ERROR NUMBER IN ERROR TABLE.
 5455 027334  012767  016406  154432          MOV     #ER0201,ERRBLK  ;SET ERROR ROUTINE ADDRESS IN ERROR TABLE.
 5456 027342  012701  011132                  MOV     #EM0802,R1      ;SELECT ERROR MESSAGE.
 5457 027346                                  ERROR                   ;REPORT ERROR.          >>>>> ERROR #0802 <<<<<
      027346  104460                                                                              TRAP    C$ERROR
 5458
 5459 027350  005067  152776          60$:    CLR     CTRLCF          ;INDICATE THAT WE COMPLETED THE TEST.
 5460
 5461 027354                                  ENDTST
      027354                                                                          L10035:
      027354  104401                                                                          TRAP    C$ETST
```

```
                                        .SBTTL  HARDWARE TEST           - BMPCHK -
                                        ;** ************************************************************************
                                        ;*              - BMP check Test -
                                        ;*      This test is used to verify that the DUT does not immediately fail
                                        ;*      the on-board background-monitor program, and hence invalidate
                                        ;*      succeeding tests.
                                        ;*      This test looks for BMP codes in the fifo for a set period immediately
                                        ;*      after the self-test is skipped.
                                        ;*      Any BMP codes that are found are saved on the queue and are also
                                        ;*      reported in this test.
                                        ;*
                                        ;-- ************************************************************************
027356                                      BGNTST
027356                                                                                  T9::
        000011                               TNUM == TNUM + 1       ;INCREMENT THE ASSEMBLY TIME TEST COUNTER.
027356  012767  000011  152742             MOV     #TNUM,TSTNUM   ;SET UP THE TEST NUMBER.        (9)
027364  012767  177777  152760             MOV     #-1,CTRLCF     ;INDICATE THAT WE ARE WITHIN A TEST.
027372  012767  000001  154366             MOV     #1,ERRTYP      ;SET ERROR TYPE AS FATAL IN ERROR TABLE.
027400  012767  001605  154362             MOV     #0901.,ERRNBR  ;SET THE ERROR NUMBER.
                                        ;+
                                        ; Wait up to 3 seconds for the DUT Master Reset bit to clear.
                                        ;  If time-out occurs, then exit this test.
                                        ;-
027406  012701  005670                      MOV     #3000.,R1      ;TIME-OUT VALUE IS 3.0 SECONDS.
027412  012702  000040                      MOV     #BIT05,R2      ;WAITING FOR MASTER RESET BIT.
027416  005003                             CLR     R3             ;WAITING FOR BIT TO CLEAR.
027420  016704  152620                      MOV     CSRA,R4        ;BIT IS IN THE DUT'S CSR.
027424  004767  170710                     JSR     PC,MSLGET      ;WAIT FOR DUT_CSR_MR BIT TO CLEAR.
027430  103027                             BCC     50$            ;ABORT THE TEST IF MR DID NOT CLEAR.
                                        ;+
                                        ; Reset the DUT, skip the self-test.
                                        ;-
027432  010214                              MOV     R2,(R4)        ;SET THE DUT MASTER RESET BIT.
027434  004767  172676                     JSR     PC,SKPSTS      ;WRITE THE SKIP SELFTEST CODES TO THE DUT.
                                        ;+
                                        ; Wait for Master reset to clear. Delay for 500 milli-secs before purging
                                        ; the fifo.
                                        ;-
027440  012704  000764                      MOV     #500.,R4       ;TIME-OUT VALUE IS 500 MILLI-SECONDS.
027444  004767  170630                     JSR     PC,DELAY       ;WAIT FOR BMP TO BEGIN EXECUTION.
027450  004767  171242                     JSR     PC,PUFIFO      ;PURGE THE FIFO, SAVING ANY BMP CODES.
027454  103015                             BCC     50$            ;ABORT THE TEST IF THE FIFO DID NOT CLEAR.
                                        ;+
                                        ; Report the error if any BMP codes were found.
                                        ;-
027456  016702  153042                      MOV     BMPCQP,R2      ;GET THE CONTENTS OF THE POINTER TO THE BMP Q.
027462  012703  002526                      MOV     #BMPCQB,R3     ;GET THE START ADDRESS OF THE QUEUE.
027466  020203                             CMP     R2,R3          ;SEE IF THE POINTER HAS MOVED FROM THE BASE.
027470  001414                            BEQ     60$            ;EXIT NO CODES IN THE QUEUE.
                                        ;+
                                        ; There is at least one BMP code in the queue. Report the error.
                                        ;-
                                            ;Report error BMP CODE FOUND IN TEST nn, BMP CODE:nnnnnn"
027472  012701  011236                      MOV     #EM0902,R1     ;PASS THE MESSAGE TO BE REPORTED.
027476                                     ERRDF   0901,EM0901,ER9301 ;            >>>>> ERROR #0901 <<<<<.
027476  104455                                                                            TRAP    C$ERDF
027500  001605                                                                          .WORD   901
```

```
        027502  011205                                                          .WORD   EM0901
        027504  017450                                                          .WORD   ER9301
  5517  027506  000405                          BR      60$
  5518
  5519  027510  012767  001606  154252  50$:    MOV     #902.,ERRNBR    ;SET >>>>> ERROR #0902 <<<<<.
  5520  027516  004767  172742                  JSR     PC,TSABRT       ;REPORT NON-TEST RELATED ERROR.
  5521
  5522  027522  005067  152624          60$:    CLR     CTRLCF          ;INDICATE THAT WE COMPLETED THE TEST.
  5523
  5524  027526                          ENDTST
        027526                                                          L10036:
        027526  104401                                                          TRAP    C$ETST
```

```
 5526
 5527
 5528                                   .SBTTL  HARDWARE TEST           - SKSELF -
 5529                                   ;** ************************************************************************
 5530                                   ;*              - Skip Self-test Test -
 5531                                   ;*      This test verifies that the DUT skips the self-test within the
 5532                                   ;*      time allowed, and that the fifo contains the correct codes after its
 5533                                   ;*      completion.
 5534                                   ;*
 5535                                   ;-- ************************************************************************
 5536 027530                                    BGNTST
      027530                                                                                    T10::
 5537            000012                  TNUM == TNUM + 1        ;INCREMENT THE ASSEMBLY TIME TEST COUNTER.
 5538 027530    012767  000012  152570        MOV     #TNUM,TSTNUM    ;SET UP THE TEST NUMBER.        (10)
 5539 027536    012767  177777  152606        MOV     #-1,CTRLCF      ;INDICATE THAT WE ARE WITHIN A TEST.
 5540 027544    012767  000001  154214        MOV     #1,ERRTYP       ;SET ERROR TYPE AS FATAL IN ERROR TABLE.
 5541 027552    012767  011272  154212        MOV     #EM1001,ERRMSG  ;SET ERROR MESSAGE ADDRESS IN ERROR TABLE.
 5542 027560    012767  016470  154206        MOV     #ER0503,ERRBLK  ;SET ERROR ROUTINE ADDRESS IN ERROR TABLE.
 5543                                   ;+
 5544                                   ; Wait up to 3 seconds for the DUT Master Reset bit to clear.
 5545                                   ;  If time-out occurs, then exit this test.
 5546                                   ;-
 5547 027566    012701  005670                MOV     #3000.,R1       ;TIME-OUT VALUE IS 3.0 SECONDS.
 5548 027572    012702  000040                MOV     #BIT05,R2       ;WAITING FOR MASTER RESET BIT.
 5549 027576    005003                        CLR     R3              ;WAITING FOR BIT TO CLEAR.
 5550 027600    016704  152440                MOV     CSRA,R4         ;BIT IS IN THE DUT'S CSR.
 5551 027604    004767  170530               JSR     PC,MSLGET       ;WAIT FOR DUT_CSR_MR BIT TO CLEAR.
 5552 027610    103037                        BCC     50$             ;ABORT THE TEST IF MR DID NOT CLEAR.
 5553                                   ;+
 5554                                   ; Determine if the DUT takes too short or too long a time to skip the self-test
 5555                                   ;  Set-up a time-out of 50 milli-second, if MR is clear in less than 10 milli
 5556                                   ;   -second, or greater than 50 milli-seconds, report the error.
 5557                                   ;-
 5558 027612    012701  000062                MOV     #50.,R1         ;TIME-OUT VALUE IS 50 MILLI-SECONDS.
 5559 027616    010214                        MOV     R2,(R4)         ;SET THE DUT MASTER RESET BIT.
 5560 027620    004767  172512               JSR     PC,SKPSTS       ;WRITE THE SKIP SELFTEST CODES TO THE DUT.
 5561 027624    004767  170510               JSR     PC,MSLGET       ;WAIT FOR DUT_CSR_MR BIT TO CLEAR.
 5562 027630    103011                       BCC     2$              ;GO REPORT ERR IF SKIPPING STEST TOOK TOO LONG.
 5563 027632    020127  000050                CMP     R1,#40.
 5564 027636    003015                       BGT     4$              ;GO REP ERR IF SELFTEST COMPLETED IN < 10 MS.
 5565                                   ;+
 5566                                   ; Self-test completed within 10 milli-sec to 50 milli-seconds.
 5567                                   ;  Verify that the self-test codes in the fifo are "good" codes ,ie the DUT
 5568                                   ;  successfully completed the self-test.
 5569                                   ; This subroutine reports errors with numbers >>>>> 1003 thru 1007 <<<<<.
 5570                                   ;-
 5571 027640    012767  001753  154122        MOV     #1003.,ERRNBR   ;SET ERROR NUMBER TO 1003.
 5572 027646    004767  171750               JSR     PC,RSTRPT       ;CHECK SELF-TEST CODES IN THE FIFO.
 5573 027652    000423                       BR      60$             ;EXIT TEST.
 5574                                   ;+
 5575                                   ; Error reports:
 5576                                   ;-
 5577                                       ;Report Skip Self-test took too long.
 5578 027654    012767  001751  154106  2$:       MOV     #1001.,ERRNBR   ;SET THE ERROR NUMBER IN THE ERROR TABLE.
 5579 027662    012701  011336                MOV     #EM1002,R1      ;SELECT ERROR MESSAGE.
 5580 027666                                  ERROR                   ;REPORT ERROR.          >>>>> ERROR #1001 <<<<<
      027666    104460                                                                              TRAP    C$ERROR
```

```
5581 027670  000414                          BR      60$             ;EXIT THE TEST.
5582
5583                                    ;Report Skip Self-test completed too soon.
5584 027672  012767  001752  154070  4$:     MOV     #1002.,ERRNBR   ;SET THE ERROR NUMBER IN THE ERROR TABLE.
5585 027700  012701  011423                  MOV     #EM1003,R1      ;SELECT ERROR MESSAGE.
5586 027704                                  ERROR                   ;REPORT ERROR.          >>>>> ERROR #1002 <<<<<
     027704  104460                                                                              TRAP    C$ERROR
5587 027706  000405                          BR      60$             ;EXIT THE TEST.
5588
5589 027710  012767  001753  154052  50$:    MOV     #1003.,ERRNBR   ;SET ERROR NUMBER.
5590 027716  004767  172542                  JSR     PC,TSABRT       ;REPORT NON-TEST RELATED ERROR.
5591
5592 027722  005067  152424          60$:    CLR     CTRLCF          ;INDICATE THAT WE COMPLETED THE TEST.
5593
5594 027726                                  ENDTST
     027726                                                                  L10037:
     027726  104401                                                                  TRAP    C$ETST
```

```
                                .SBTTL  HARDWARE TEST           - DFSKST -
                                ;++ ************************************************************************
                                ;*              - Diagnostic fail bit, skip self-test test -
                                ;*      This test verifies that the diagnostic fail bit of the DUT, correctly
                                ;*      changes state as the on-boared selftest is skipped.
                                ;*
                                ;-- ************************************************************************
                                        BGNTST
                                                                                        T11::
                                 TNUM == TNUM + 1       ;INCREMENT THE ASSEMBLY TIME TEST COUNTER.
027730  012767  000013  152370        MOV     #TNUM,TSTNUM    ;SET UP THE TEST NUMBER.        (11)
027736  012767  177777  152406        MOV     #-1,CTRLCF      ;INDICATE THAT WE ARE WITHIN A TEST.
027744  012767  000001  154014        MOV     #1,ERRTYP       ;SET ERROR TYPE AS FATAL IN ERROR TABLE.
027752  012767  011501  154012        MOV     #EM1101,ERRMSG  ;SET ERROR MESSAGE ADDRESS IN ERROR TABLE.
027760  012767  016470  154006        MOV     #ER0503,ERRBLK  ;SET ERROR ROUTINE ADDRESS IN ERROR TABLE.
                                ;+
                                ; Wait up to 3 seconds for the DUT Master Reset bit to clear.
                                ;  If time-out occurs, then exit this test.
                                ;-
027766  012701  005670                MOV     #3000.,R1       ;TIME-OUT VALUE IS 3.0 SECONDS.
027772  012702  000040                MOV     #BIT05,R2       ;WAITING FOR MASTER RESET BIT.
027776  005003                        CLR     R3              ;WAITING FOR BIT TO CLEAR.
030000  016704  152240                MOV     CSRA,R4         ;BIT IS IN THE DUT'S CSR.
030004  004767  170330               JSR     PC,MSLGET       ;WAIT FOR DUT_CSR_MR BIT TO CLEAR.
030010  103044                        BCC     50$             ;ABORT THE TEST IF MR DID NOT CLEAR.
                                ;+
                                ; Reset the DUT, skip the self-test.
                                ;-
030012  010214                        MOV     R2,(R4)         ;SET THE DUT MASTER RESET BIT.
030014  004767  172316               JSR     PC,SKPSTS       ;WRITE THE SKIP SELFTEST CODES TO THE DUT.
                                ;+
                                ; Set time out of 5 milli seconds, wait for Diag_fail bit to set.
                                ;  If time-out occurs go report the error.
                                ;-
030020  012701  000005                MOV     #5,R1           ;TIME-OUT VALUE IS 5 MILLI-SECONDS.
030024  012702  020000                MOV     #BIT13,R2       ;WAITING FOR DIAGNOSTIC FAIL BIT.
030030  010203                        MOV     R2,R3           ;WAITING FOR BIT TO SET.
030032  016704  152206                MOV     CSRA,R4         ;BIT IS IN THE DUT'S CSR.
030036  004767  170276               JSR     PC,MSLGET       ;WAIT FOR DUT_CSR_DF BIT TO CLEAR.
030042  103020                       BCC     4$              ;IF DIAG_FAIL DID NOT SET, GO REPORT ERROR.

                                ;+
                                ; Set time-out of 15 milli-secs, wait for Diag_Fail to clear.
                                ;  If time-out occurs go report the error.
                                ;  Verify the Diag_fail bit is in a stable state before continuing.  Loop
                                ;  back if the state was transitory, using the remainder of the 15 ms time-out.
                                ;-
030044  012701  000017                MOV     #15.,R1         ;TIME-OUT VALUE IS 15 MILLI-SECONDS.
030050  005003               2$:      CLR     R3              ;WAITING FOR BIT TO CLEAR.
030052  004767  170262               JSR     PC,MSLGET       ;WAIT FOR DUT_CSR_DF BIT TO CLEAR.
030056  103012                        BCC     4$              ;IF DIAG_FAIL DID NOT CLEAR, GO REPORT ERROR.
030060  010105                        MOV     R1,R5           ;SAVE THE REMAINING TIME-OUT VALUE.
030062  012701  000001                MOV     #1,R1           ;SET TIME-OUT OF 1 MILLI-SECOND.
030066  052703  020000                BIS     #BIT13,R3       ;WAIT FOR BIT TO SET.
030072  004767  170242               JSR     PC,MSLGET       ;DOUBLE CHECK TO ELIMINATE NOISE PROBLEMS.
```

HARDWARE TEST - DFSKST -

```
 5652 030076  103016                          BCC     60$             ;EXIT IF DIAG_FAIL BIT STILL CLEAR.
 5653 030100  010501                           MOV     R5,R1           ;PASS THE REMAINING TIME-OUT VALUE.
 5654 030102  000762                          BR      2$              ;LOOP TO CHECK AGAIN.
 5655                                ;+
 5656                                ; Error reports:
 5657                                ;-
 5658                                    ;Report Diagnostic fail bit bad.
 5659 030104  012767  002115  153656  4$:      MOV     #1101.,ERRNBR   ;SET THE ERROR NUMBER IN THE ERROR TABLE.
 5660 030112  012701  011742                   MOV     #EM1205,R1      ;SELECT ERROR MESSAGE.
 5661 030116                                  ERROR                   ;REPORT ERROR.          >>>>> ERROR #1101 <<<<<
      030116  104460                                                                                  TRAP    C$ERROR
 5662 030120  000405                          BR      60$             ;EXIT THE TEST.
 5663
 5664 030122  012767  002116  153640  50$:     MOV     #1102.,ERRNBR   ;SET THE ERROR NUMBER FOR TSABRT RTN.
 5665 030130  004767  172330                  JSR     PC,TSABRT       ;REPORT NON-TEST RELATED ERROR.
 5666
 5667 030134  005067  152212          60$:    CLR     CTRLCF          ;INDICATE THAT WE COMPLETED A TEST.
 5668
 5669 030140                                  ENDTST
      030140                                                                          L10040:
      030140  104401                                                                          TRAP    C$ETST
```

```
                                .SBTTL  HARDWARE TEST           - SELFTS -
                                ;++ ******************************************************************************
                                ;*              - Self-test Test -
                                ;*      This test verifies that the DUT's Self-Test executes within the
                                ;*      time allowed, and that the fifo contains the correct codes after its
                                ;*      completion.
                                ;*
                                ;-- ******************************************************************************
030142                                  BGNTST
030142                                                                          T12::
                 000014                  TNUM == TNUM + 1        ;INCREMENT THE ASSEMBLY TIME TEST COUNTER.
030142  012767  000014  152156           MOV     #TNUM,TSTNUM    ;SET UP THE TEST NUMBER.        (12)
030150  012767  177777  152174           MOV     #-1,CTRLCF      ;INDICATE THAT WE ARE WITHIN A TEST.
030156  012767  000001  153602           MOV     #1,ERRTYP       ;SET ERROR TYPE AS FATAL IN ERROR TABLE.
030164  012767  011525  153600           MOV     #EM1201,ERRMSG  ;SET ERROR MESSAGE ADDRESS IN ERROR TABLE.
030172  012767  016470  153574           MOV     #ER0503,ERRBLK  ;SET ERROR ROUTINE ADDRESS IN ERROR TABLE.
                                ;+
                                ; Wait up to 3 seconds for the DUT Master Reset bit to clear.
                                ;  If time-out occurs, then exit this test.
                                ;-
030200  012701  005670                   MOV     #3000.,R1       ;TIME-OUT VALUE IS 3.0 SECONDS.
030204  012702  000040                   MOV     #BIT05,R2       ;WAITING FOR MASTER RESET BIT.
030210  005003                           CLR     R3              ;WAITING FOR BIT TO CLEAR.
030212  016704  152026                   MOV     CSRA,R4         ;BIT IS IN THE DUT'S CSR.
030216  004767  170116                   JSR     PC,MSLGET       ;WAIT FOR DUT_CSR_MR BIT TO CLEAR.
030222  103062                           BCC     50$             ;ABORT THE TEST IF MR DID NOT CLEAR.
                                ;+
                                ; Determine if the Self-test takes too short or too long a time to complete.
                                ;  Set-up a time-out of 3 second, if MR is clear in less than 1/2 second, or
                                ;  greater than 3 seconds, report the error.
                                ;-
030224  012701  005670                   MOV     #3000.,R1       ;TIME-OUT VALUE IS 3.0 SECONDS.
030230  010214                           MOV     R2,(R4)         ;SET THE DUT MASTER RESET BIT.
030232  004767  170102                   JSR     PC,MSLGET       ;WAIT FOR DUT_CSR_MR BIT TO CLEAR.
030236  103030                           BCC     4$              ;GO REPORT ERROR SELFTEST TOOK TOO LONG.
030240  012702  005670                   MOV     #3000.,R2
030244  160102                           SUB     R1,R2           ;CALCULATE # OF MS SELFTEST TO COMPLETE.
030246  020227  000062                   CMP     R2,#50.
030252  002431                           BLT     6$              ;SELFTEST SKIPPED?  YES, GO REPORT ERROR.
030254  020227  000764                   CMP     R2,#500.
030260  002434                           BLT     8$              ;GO REP ERR IF SELFTEST COMPLETED IN < 1/2 SEC.
                                ;+
                                ; Self-test completed within 1sec to 3 seconds.
                                ;  Check the state of the Diagnostic Fail bit, report error if it is set.
                                ;-
030262  032714  020000                   BIT     #BIT13,(R4)     ;DETERMINE IF THE DIAG_FAIL BIT IS CLEAR.
030266  001406                           BEQ     2$              ;SKIP ERROR REPORT IF BIT IS CLEAR.
                                    ;Report Diagnostic fail bit bad.
030270  012767  002264  153472           MOV     #1204.,ERRNBR   ;SET ERROR NUMBER TO IN ERROR TABLE.
030276  012701  011742                   MOV     #EM1205,R1      ;SELECT THE ERROR MESSAGE.
030302                                   ERROR                   ;               >>>>> ERROR #1204 <<<<<
030302  104460                                                                   TRAP    C$ERROR
                                ;+
                                ; Verify that the self-test codes in the fifo are "good" codes ,ie the DUT
                                ; successfully completed the self-test.
                                ; This subroutine reports errors with numbers >>>>> 1205 thru 1209 <<<<<.
                                ;-
```

```
HARDWARE TEST            - SELFTS -

 5726 030304  012767  002265  153456  2$:     MOV     #1205.,ERRNBR   ;SET ERROR NUMBER TO 1205.
 5727 030312  004767  171304                  JSR     PC,RSTRPT       ;CHECK SELF-TEST CODES IN THE FIFO.
 5728 030316  000431                          BR      60$             ;EXIT TEST.
 5729                                 ;+
 5730                                 ; Error reports:
 5731                                 ;-
 5732                                     ;Report Self-test took too long to complete.
 5733 030320  012767  002261  153442  4$:     MOV     #1201.,ERRNBR   ;SET THE ERROR NUMBER IN THE ERROR TABLE.
 5734 030326  012701  011544                  MOV     #EM1202,R1      ;SELECT ERROR MESSAGE.
 5735 030332                                  ERROR                   ;REPORT ERROR.          >>>>> ERROR #1201 <<<<<
      030332  104460                                                                              TRAP    C$ERROR
 5736 030334  000422                          BR      60$             ;EXIT THE TEST.
 5737
 5738                                     ;Report Self-test did not execute after DUT reset.
 5739 030336  012767  002262  153424  6$:     MOV     #1202.,ERRNBR   ;SET THE ERROR NUMBER IN ERROR TABLE.
 5740 030344  012701  011706                  MOV     #EM1204,R1      ;SELECT ERROR MESSAGE.
 5741 030350                                  ERROR                   ;REPORT ERROR.          >>>>> ERROR #1202 <<<<<
      030350  104460                                                                              TRAP    C$ERROR
 5742
 5743                                     ;Report Self-test competed too soon.
 5744 030352  012767  002263  153410  8$:     MOV     #1203.,ERRNBR   ;SET THE ERROR NUMBER IN THE ERROR TABLE.
 5745 030360  012701  011630                  MOV     #EM1203,R1      ;SELECT ERROR MESSAGE.
 5746 030364                                  ERROR                   ;REPORT ERROR.          >>>>> ERROR #1203 <<<<<
      030364  104460                                                                              TRAP    C$ERROR
 5747 030366  000405                          BR      60$             ;EXIT THE TEST.
 5748
 5749 030370  012767  002272  153372  50$:    MOV     #1210.,ERRNBR   ;SET THE ERROR NUMBER FOR TSABRT RTN.
 5750 030376  004767  172062                  JSR     PC,TSABRT       ;REPORT NON-TEST RELATED ERROR.
 5751
 5752 030402  005067  151744          60$:    CLR     CTRLCF          ;INDICATE THAT WE COMPLETED THE TEST.
 5753
 5754 030406                                  ENDTST
      030406                                                          L10041:
      030406  104401                                                          TRAP    C$ETST
```

```
                                .SBTTL  HARDWARE TEST           - STFAIL -
                                ;++ ******************************************************************************
                                ;*              - Self-test fail test -
                                ;*      This test verifies that the DUT will report selftest errors via the
                                ;*      fifo.  And that the Diagnostic fail bit will indicate the error.
                                ;*      This is accomplished via a software 'hook' in the self-test, which
                                ;*      forces a "Proc1 to ram error" to be placed in the fifo.
                                ;*
                                ;-- ******************************************************************************
030410                                  BGNTST
030410                                                                          T13::
        000015                           TNUM == TNUM + 1       ;INCREMENT THE ASSEMBLY TIME TEST COUNTER.
030410  012767  000015  151710         MOV     #TNUM,TSTNUM   ;SET UP THE TEST NUMBER.        (13)
030416  012767  177777  151726         MOV     #-1,CTRLCF     ;INDICATE THAT WE ARE WITHIN A TEST.
030424  012767  000001  153334         MOV     #1,ERRTYP      ;SET ERROR TYPE AS FATAL IN ERROR TABLE.
030432  012767  011766  153332         MOV     #EM1301,ERRMSG ;SET ERROR MESSAGE ADDRESS IN ERROR TABLE.
030440  012767  016470  153326         MOV     #ER0503,ERRBLK ;SET ERROR ROUTINE ADDRESS IN ERROR TABLE.
030446  012767  002425  153314         MOV     #1301.,ERRNBR  ;SET ERROR NUMBER TO 1301.
                                ;+
                                ; Wait up to 3 seconds for the DUT Master Reset bit to clear.
                                ;  If time-out occurs, then exit this test.
                                ;-
030454  012701  005670                  MOV     #3000.,R1      ;TIME-OUT VALUE IS 3.0 SECONDS.
030460  012702  000040                  MOV     #BIT05,R2      ;WAITING FOR MASTER RESET BIT.
030464  005003                          CLR     R3             ;WAITING FOR BIT TO CLEAR.
030466  016704  151552                  MOV     CSRA,R4        ;BIT IS IN THE DUT'S CSR.
030472  004767  167642                 JSR     PC,MSLGET      ;WAIT FOR DUT_CSR_MR BIT TO CLEAR.
030476  103120                          BCC     50$            ;GO REPORT ERROR IF MR DID NOT CLEAR.
                                ;+
                                ; Reset the DUT, check for rom version 0.
                                ;  If Version 0 is found then exit this test.
                                ;-
030500  010214                          MOV     R2,(R4)        ;RESET THE DUT.
030502  004767  171630                 JSR     PC,SKPSTS      ;SKIP THE SELFTEST.
030506  012701  000764                  MOV     #500.,R1       ;PASS TIME-OUT VALUE OF 500 MILLISECS.
030512  004767  167622                 JSR     PC,MSLGET      ;WAIT FOR MR BIT TO CLEAR.
030516  103110                         BCC     50$            ;GO REPORT ERROR IF TIME-OUT OCCURRED.
030520  005267  153244                  INC     ERRNBR         ;SET ERROR NUMBER TO 1302.
030524  012700  000010                  MOV     #8.,R0         ;SET MAXIMUM READ COUNT.
030530  005003                          CLR     R3             ;CLEAR THE ROM VERSION 0 FLAG.
030532  016704  151510                  MOV     RBUFA,R4       ;GET ADDRESS OF THE RECEIVER BUFFER REGISTER.
030536  011402                 2$:      MOV     (R4),R2        ;READ A CODE FROM THE FIFO.
030540  100077                         BPL     50$            ;GO REPORT ERROR IF THE FIFO IS EMPTY.
030542  042702  007402                  BIC     #7402,R2       ;REMOVE THE LINE NUMBER AND PROC INDICATOR.
030546  020227  170001                  CMP     R2,#170001     ;COMPARE WITH ROM VERSION #0 CODE.
030552  001002                         BNE     4$             ;ROM VERSION #0?  NO, SKIP SETTING FLAG.
030554  012703  177777                  MOV     #-1,R3         ;YES, SET THE ROM VERSION #0 FLAGS.
030560  005300                 4$:      DEC     R0             ;DECREMENT MAX READ COUNTER.
030562  001365                         BNE     2$             ;LOOP IF 8 CODES HAVE NOT BEEN READ.
030564  005703                          TST     R3             ;CHECK THE ROM VERSION #1 INDICATOR.
030566  100466                          BMI     60$            ;ROM VERSION 0 IN EITHER PROCESSOR?  YES, EXIT.

                                ;+
                                ; Reset the DUT, delay for 25 milli-seconds before writing the Fail_self_test
                                ; code to TBUFFCT register on channel 0.
                                ;-
```

```
 5812 030570  012777  000040  151446          MOV     #BIT05,@CSRA    ;SET DUT MASTER RESET BIT, SELECT CHANNEL 0.
 5813 030576  012704  000031                  MOV     #25.,R4         ;PASS DELAY PERIOD OF 25 MILLI SECS.
 5814 030602  004767  167472                  JSR     PC,DELAY        ;WAIT FOR SELFTEST TO INITIALISE.
 5815 030606  012777  146314  151446          MOV     #146314,@TXBFCA ;WRITE THE FAIL SELF-TEST CODE TO TBUFFCT REG.
 5816                                 ;+
 5817                                 ; Wait up to 2 seconds for the self-test to complete.
 5818                                 ;  If time-out occurs, then exit this test.
 5819                                 ;-
 5820 030614  005267  153150                  INC     ERRNBR          ;SET ERROR NUMBER TO 1303.
 5821 030620  012701  003720                  MOV     #2000.,R1       ;TIME-OUT VALUE IS 2.0 SECONDS.
 5822 030624  012702  000040                  MOV     #BIT05,R2       ;PASS THE BIT MAP OF THE BIT TO TEST.
 5823 030630  005003                          CLR     R3              ;SET UP THE EXPECTED STATE.
 5824 030632  016704  151406                  MOV     CSRA,R4         ;BIT IS IN THE DUT'S CSR.
 5825 030636  004767  167476                  JSR     PC,MSLGET       ;WAIT FOR DUT_CSR_MR BIT TO CLEAR.
 5826 030642  103036                          BCC     50$             ;GO REPORT ERROR IF MR DID NOT CLEAR.
 5827                                 ;+
 5828                                 ; Verify the diagnostic fail bit is set, indicating the error.
 5829                                 ; Report error if diagnostic fail bit is clear.
 5830                                 ;-
 5831 030644  005267  153120                  INC     ERRNBR          ;SET ERROR NUMBER TO 1304.
 5832 030650  032714  020000                  BIT     #BIT13,(R4)     ;CHECK THE STATE OF THE DIAG_FAIL BIT.
 5833 030654  001425                          BEQ     10$             ;GO REPORT ERROR IF DIAG_FAIL BIT CLEAR.
 5834                                 ;+
 5835                                 ; Remove the 8 self-test codes form the fifo, and verify that at least
 5836                                 ; one is a Proc1 to ram error code (231).
 5837                                 ;-
 5838 030656  005267  153106                  INC     ERRNBR          ;SET ERROR NUMBER TO 1305.
 5839 030662  012700  000010                  MOV     #8.,R0          ;SET MAXIMUM READ COUNT.
 5840 030666  005001                          CLR     R1              ;CLEAR THE CORRECT CODE COUNTER.
 5841 030670  016704  151352                  MOV     RBUFA,R4        ;GET ADDRESS OF THE RECEIVER BUFFER REGISTER.
 5842 030674  011402                  6$:     MOV     (R4),R2         ;READ A CODE FROM THE FIFO.
 5843 030676  100020                          BPL     50$             ;GO REPORT ERROR IF THE FIFO IS EMPTY.
 5844 030700  042702  007400                  BIC     #7400,R2        ;REMOVE THE LINE NUMBER FROM THE CODE.
 5845 030704  120227  170231                  CMPB    R2,#170231      ;IS IT THE CORRECT ERROR CODE?.
 5846 030710  001001                          BNE     8$              ;SKIP NEXT INSTRUCTION, IF NOT A 231 CODE.
 5847 030712  005201                          INC     R1              ;INCREMENT COUNTER.
 5848 030714  005300                  8$:     DEC     R0              ;DECREMENT MAX READ COUNTER.
 5849 030716  001366                          BNE     6$              ;LOOP IF 8 CODES HAVE NOT BEEN READ.
 5850 030720  005701                          TST     R1              ;WERE ANY 231 CODES FOUND?.
 5851 030722  001010                          BNE     60$             ;YES, THEN EXIT.
 5852 030724  005267  153040                  INC     ERRNBR          ;NO, SET ERROR NUMBER TO 1306 AND REPORT ERROR.
 5853                             ;Report Self-test error reporting bad.
 5854 030730  012701  012012          10$:    MOV     #EM1302,R1      ;SELECT ERROR MESSAGE.
 5855 030734                                  ERROR                   ;REPORT ERROR.          >>>>> ERROR <<<<<
      030734  104460                                                                              TRAP    C$ERROR
 5856 030736  000402                          BR      60$             ;EXIT THE TEST.
 5857
 5858 030740  004767  171520          50$:    JSR     PC,TSABRT       ;REPORT NON-RELATED TEST ERROR.
 5859
 5860 030744  005067  151402          60$:    CLR     CTRLCF          ;INDICATE THAT WE COMPLETED THE TEST.
 5861
 5862 030750                                  ENDTST
      030750                                                                          L10042:
      030750  104401                                                                          TRAP    C$ETST
```

```
                                .SBTTL  HARDWARE TEST           - ROMVER -
                                ;++ ******************************************************************************
                                ;*              - Rom Version Test -
                                ;*      This test verifies that the DUT's Self-Test places valid Rom version
                                ;*      numbers in the fifo after it has been skipped.  The Rom version numbers
                                ;*      will be reported (on the first pass only), if an affirmative answer
                                ;*      was given to the software P-table question.
                                ;*
                                ;-- ******************************************************************************
030752                          BGNTST
030752                                                                  T14::
        000016                   TNUM == TNUM + 1       ;INCREMENT THE ASSEMBLY TIME TEST COUNTER.
030752  012767  000016  151346   MOV    #TNUM,TSTNUM    ;SET UP THE TEST NUMBER.        (14)
030760  012767  177777  151364   MOV    #-1,CTRLCF      ;INDICATE THAT WE ARE WITHIN A TEST.
030766  012767  000001  152772   MOV    #1,ERRTYP       ;SET ERROR TYPE AS FATAL IN ERROR TABLE.
030774  012767  012051  152770   MOV    #EM1401,ERRMSG  ;SET ERROR MESSAGE ADDRESS IN ERROR TABLE.
031002  012767  016470  152764   MOV    #ER0503,ERRBLK  ;SET ERROR ROUTINE ADDRESS IN ERROR TABLE.
                                ;+
                                ; Wait up to 3 seconds for the DUT Master Reset bit to clear.
                                ;  If time-out occurs, then exit this test.
                                ;-
031010  012701  005670           MOV    #3000.,R1       ;TIME-OUT VALUE IS 3.0 SECONDS.
031014  012702  000040           MOV    #BIT05,R2       ;WAITING FOR MASTER RESET BIT.
031020  005003                   CLR    R3              ;WAITING FOR BIT TO CLEAR.
031022  016704  151216           MOV    CSRA,R4         ;BIT IS IN THE DUT'S CSR.
031026  004767  167306          JSR     PC,MSLGET       ;WAIT FOR DUT_CSR_MR BIT TO CLEAR.
031032  103131                   BCC    50$             ;ABORT THE TEST IF MR DID NOT CLEAR.
                                ;+
                                ; Set the Master Reset bit, and skip the self test.
                                ;-
031034  010214                   MOV    R2,(R4)         ;SET THE MASTER RESET BIT.
031036  004767  171274          JSR     PC,SKPSTS       ;SKIP THE SELF TEST.
031042  012701  005670           MOV    #3000.,R1       ;TIME-OUT VALUE IS 3.0 SECONDS.
031046  004767  167266          JSR     PC,MSLGET       ;WAIT FOR DUT_CSR_MR BIT TO CLEAR.
031052  103121                   BCC    50$             ;ABORT THE TEST IF MR DID NOT CLEAR.
                                ;+
                                ; Remove characters from the FIFO until either;
                                ; (a) The FIFO is purged, go report the error.
                                ; (b) The maximum try counter is zero, go report the error.
                                ; (c) PROC_1's rom version number was found before PROC_2's, go report error.
                                ; (d) Both ROM version numbers have been found.
                                ;-
031054  012705  000040           MOV    #4*NUMLNS,R5    ;SET MAXIMUM TRY COUNTER.
031060  012703  000143           MOV    #99.,R3         ;SET AN INVALID ROM VERSION NUMBER FOR PROC_1.
031064  010304                   MOV    R3,R4           ;SET AN INVALID ROM VERSION NUMBER FOR PROC_2.
031066  012767  002571  152674   MOV    #1401.,ERRNBR   ;SET THE ERROR NUMBER TO 1401.
031074  012701  012101           MOV    #EM1402,R1      ;SELECT MESSAGE TO BE REPORTED IF FIFO EMPTY.

031100  017702  151142  2$:      MOV    @RBUFA,R2       ;READ THE NEXT CHAR FROM THE FIFO.
031104  100077                  BPL     12$             ;GO REPORT ERROR IF FIFO EMPTY.
                                ;+
                                ; Check if the read data is a BMP code.
                                ;-
031106  012700  000301           MOV    #301,R0         ;SET-UP A BIT MASK OF A BMP CODE.
031112  040200                   BIC    R2,R0           ;TRY TO CLEAR THE BIT MASK WITH THE READ DATA.
```

```
 5920 031114  001003                        BNE     4$              ;BRANCH IF NOT A BMP CODE.
 5921 031116  004767  171146                JSR     PC,SAVBMP       ;SAVE THE BMP CODE ON THE QUEUE.
 5922 031122  000435                        BR      8$              ;
 5923                                ;+
 5924                                ; Check if the read data is a self-test code.
 5925                                ;-
 5926 031124  012700  000201          4$:    MOV     #201,R0         ;SET-UP A BIT MASK OF A SELFTEST CODE.
 5927 031130  040200                        BIC     R2,R0           ;TRY TO CLEAR THE BIT MASK WITH THE READ DATA.
 5928 031132  001431                       BEQ     8$              ;BRANCH IF IT IS A SELFTEST CODE.
 5929
 5930                                ;+
 5931                                ; The read data is a ROM version number, determine which one it is.
 5932                                ;-
 5933 031134  032702  000002                BIT     #BIT1,R2        ;CHECK THE PROCESSOR NUMBER BIT IN THE CODE.
 5934 031140  001407                       BEQ     6$              ;BRANCH IF IT IS PROC_1 ROM VERSION NUMBER.
 5935 031142  010204                        MOV     R2,R4           ;SAVE PROC_2 ROM VERSION NUMBER.
 5936 031144  042704  177603                BIC     #177603,R4      ;CLEAR ANY UNWANTED BITS.
 5937 031150  000241                        CLC                     ;CLEAR THE CARRY BIT.
 5938 031152  006004                        ROR     R4              ;SHIFT THE CODES ALONG TO GET THE ROM
 5939 031154  006004                        ROR     R4              ; VERSION NUMBER IN THE LOW 5 BITS.
 5940 031156  000417                       BR      8$              ;
 5941 031160  010203                  6$:   MOV     R2,R3           ;SAVE PROC_1 ROM VERSION NUMBER.
 5942 031162  042703  177603                BIC     #177603,R3      ;CLEAR ANY UNWANTED BITS.
 5943 031166  000241                        CLC                     ;CLEAR THE CARRY BIT.
 5944 031170  006003                        ROR     R3              ;SHIFT THE CODE ALONG TO GET THE ROM
 5945 031172  006003                        ROR     R3              ; VERSION NUMBER IN THE LOW 5 BITS.
 5946 031174  020427  000143                CMP     R4,#99.         ;CHECK IF WE HAVE RECEIVE PROC_2 ROM CODE.
 5947 031200  001016                       BNE     10$             ;GO REPORT BOTH ROM VERSION NUMBERS.
 5948                                ;+
 5949                                ; Received ROM version numbers out of sequence.
 5950                                ;  ie, Proc_1's ROM version number found in the fifo before Proc_2's.
 5951                                ;-
 5952 031202  012701  012167                 MOV     #EM1403,R1      ;SELECT THE ERROR MESSAGE TO BE REPORTED.
 5953 031206  012767  002572  152554         MOV     #1402.,ERRNBR   ;SET THE ERROR NUMBER.
 5954 031214  000433                        BR      12$             ;GO REPORT ERROR.
 5955
 5956 031216  005305                  8$:    DEC     R5              ;DECREMENT THE MAX TRY COUNTER.
 5957 031220  001327                       BNE     2$              ;LOOP TO GET THE NEXT CHAR FROM THE FIFO.
 5958 031222  012701  012242                 MOV     #EM1404,R1      ;SELECT THE ERROR MESSAGE TO BE REPORTED.
 5959 031226  012767  002573  152534         MOV     #1403.,ERRNBR   ;SET THE ERROR NUMBER.
 5960 031234  000423                        BR      12$             ;GIVE UP, GO REPORT ERROR.
 5961                                ;+
 5962                                ; If this is the first pass, and software P-table question was answered YES,
 5963                                ; then report the rom version numbers to the operator.
 5964                                ;-
 5965 031236  032767  000001  150762  10$:    BIT     #BIT0,OPTION    ;CHECK ON THE STATE OF THE SOFTWARE SWITCH.
 5966 031244  001431                       BEQ     60$             ;EXIT IF NO ROM VERSION PRINTOUT WAS REQUESTED.
 5967 031246  026727  151060  000001         CMP     PASCNT,#1       ;CHECK IF THIS IS THE FIRST PASS.
 5968 031254  003025                       BGT     60$             ;EXIT IF ROM VERS HAVE ALREADY BEEN REPORTED.
 5969 031256                                PRINTB #EF1401,R3,R4    ;PRINT THE ROM VERSION NUMBERS.
      031256  010446                                                                    MOV     R4,-(SP)
      031260  010346                                                                    MOV     R3,-(SP)
      031262  012746  004214                                                            MOV     #EF1401,-(SP)
      031266  012746  000003                                                            MOV     #3,-(SP)
      031272  010600                                                                    MOV     SP,R0
      031274  104414                                                                    TRAP    C$PNTB
      031276  062706  000010                                                            ADD     #10,SP
```

```
 5970 031302  000412                          BR      60$             ;EXIT THIS TEST.
 5971                                ;-
 5972                                ; Error reports:
 5973                                ;-
 5974 031304  012767  016562  152462  12$:     MOV     #ER1401,ERRBLK  ;SELECT THE ERROR REPORTING ROUTINE.
 5975 031312                                   ERROR                   ;REPORT ERROR.          >>>>> ERROR <<<<<
      031312  104460                                                                                TRAP    C$ERROR
 5976 031314  000405                          BR      60$
 5977
 5978 031316  012767  002575  152444  50$:     MOV     #1405.,ERRNBR   ;SET UP ERROR NUMBER FOR TSABRT RTN.
 5979 031324  004767  171134                   JSR     PC,TSABRT       ;REPORT NON-TEST RELATED ERROR.
 5980
 5981 031330  005067  151016          60$:     CLR     CTRLCF          ;INDICATE THAT WE COMPLETED THE TEST.
 5982
 5983 031334                                   ENDTST
      031334                                                                          L10043:
      031334  104401                                                                          TRAP    C$ETST
```

```
                                .SBTTL  HARDWARE TEST           - REGWRW -
                                ;++ ******************************************************************************
                                ;*              - Device Register Word Access Read and Write Test -
                                ;*
                                ;* This test verifies that the device registers can be read and written
                                ;* correctly using word accesses.
                                ;*
                                ;-- ******************************************************************************

                                        BGNTST
                                                                                                        T15::
                 000017                  TNUM == TNUM + 1       ;INCREMENT THE ASSEMBLY TIME TEST COUNTER.
031336  012767  000017  150762          MOV     #TNUM,TSTNUM   ;SET UP THE TEST NUMBER.        (16)
031344  012767  177777  151000          MOV     #-1,CTRLCF     ;INDICATE THAT WE ARE WITHIN A TEST.
031352  012767  000001  152406          MOV     #1,ERRTYP      ;SET UP DEVICE FATAL INDICATOR IN ERROR TYPE.
031360  012767  003101  152402          MOV     #1601.,ERRNBR  ;SET UP ERROR NUMBER IN THE ERROR TABLE.
031366  012767  012445  152376          MOV     #EM1604,ERRMSG ;SET UP ERROR MESSAGE FOR TEST IN ERROR TABLE.
031374  005067  151062                  CLR     ERSMRF         ;CLEAR THE ERROR SUMMARY FLAGS.
031400  012700  002464                  MOV     #ERCNTB,R0
031404  004767  166570                  JSR     PC,CLR16W      ;CLEAR THE ERROR COUNTER TABLE.
                                ;+
                                ; Reset the DUT to a known state, do not remove the status codes from the fifo.
                                ;  Clear TX and RX interrupt enable bits in the CSR.
                                ; This subroutine reports errors >>>>> 1601 <<<<<.
                                ;-
031410  004767  170042                  JSR     PC,RESETT      ;RESET THE DHV11-M, REPORT ANY ERRORS FOUND.
031414  103402                          BCS     .+6            ;FATAL RESET ERROR?  NO, CONTINUE WITH TEST.
031416  000167  000116                  JMP     60$            ;YES,  EXIT THE TEST.
                                ;+
                                ; Verify read/write capability to indirect address field of CSR
                                ;-
031422  005267  152342                  INC     ERRNBR         ;SET THE ERROR REPORT NUMBER TO 1602.
031426  012702  000017                  MOV     #17,R2         ;SET LOOP COUNT.
031432  016704  150606                  MOV     CSRA,R4        ;GET CSR ADDRESS.
031436  010214                  2$:     MOV     R2,(R4)        ;WRITE COUNT TO CSR.
031440  011401                          MOV     (R4),R1        ;READ BACK THE CONTENTS OF THE CSR
031442  042701  177760                  BIC     #177760,R1     ;MASK OUT ALL BUT THE IND.ADR.REG FIELD.
031446  020102                          CMP     R1,R2          ;CHECK FOR CORRECT DATA WRITTEN/READ.
031450  001406                          BEQ     4$             ;IS EXPECTED DATA BAD?  NO, SKIP ERROR REPORT.
                                    ;Report "BAD BIT(S) IN DEVICE CSR REGISTER FOR LINE  0 (D)."
031452  012767  016712  152314          MOV     #ER1601,ERRBLK ;SELECT THE PROPER ERROR REPORT ROUTINE.
031460  005003                          CLR     R3             ;SET OFFSET TO 0 TO CAUSE REPORT OF CSR REG.
031462  005005                          CLR     R5             ;CAUSE REPORT OF LINE 0.
031464                                  ERROR                  ;  >>>>> ERROR # 1602 <<<<<
031464  104460                                                                          TRAP    C$ERROR
031466  005302                  4$:     DEC     R2             ;DECREMENT LOOP COUNT/IND.ADD.REG ADDRESS.
031470  002362                          BGE     2$             ;LOOP BACK TO TEST NEXT ADDRESS IF NOT DONE.
                                ;+
                                ; Write and verify 16 data patterns in all used bits of all registers on all
                                ;   active lines.  Before writing each pattern, clear all the bits.
                                ;    REGTST routine reports errors with numbers  >>>>> ERROR 1603 - 1605 <<<<<.
                                ;-
031472  005267  152272                  INC     ERRNBR         ;SET THE ERROR NUMBER TO 1603.
031476  005003                          CLR     R3             ;INDICATE THAT WORD ACCESSES ARE TO BE USED.
031500  012704  000002                  MOV     #2,R4          ;INDICATE R/W ACCESS, CLEAR FIRST.
031504  004767  167510                  JSR     PC,REGTST      ;WRITE AND VERIFY DATA PATTERNS.
                                ;+
```

HARDWARE TEST - REGWRW -

```
                                        ; Write and verify 16 data patterns in all used bits of all registers on all
                                        ;   active lines.  Before writing each pattern, set all the bits.
                                        ;    REGTST routine reports errors with numbers  >>>>> ERROR 1606 - 1608 <<<<<.
                                        ;-
031510  012767  003106  152252                 MOV     #1606.,ERRNBR   ;SET UP ERROR NUMBER FOR REGTST ROUTINE.
031516  005003                                 CLR     R3              ;INDICATE THAT WORD ACCESSES ARE TO BE USED.
031520  005404                                 NEG     R4              ;INDICATE R/W ACCESS, SET FIRST.
031522  004767  167472                       JSR     PC,REGTST       ;WRITE AND VERIFY DATA PATTERNS.
                                        ;*
                                        ; Print error summary reports if necessary.
                                        ;   The following routine reports errors with number >>>>> ERROR # 1609 <<<<<
                                        ;-
031526  012767  003111  152234                 MOV     #1609.,ERRNBR   ;SET UP ERROR NUMBER FOR NEXT RTN.
031534  004767  167670                       JSR     PC,REPSMR       ;REPORT ERROR SUMMARY IF NECESSARY.
031540  005067  150606               60$:     CLR     CTRLCF          ;INDICATE THAT WE COMPLETED THE TEST.
031544                                       ENDTST
031544                                                                                   L10044:
031544  104401                                                                                   TRAP    C$ETST
```

```
                                .SBTTL  HARDWARE TEST           - REGWRM -
                                ;** ************************************************************************
                                ;*      - Device Register Word Access Read/Modify/Write Test -
                                ;*
                                ;* This test verifies that the device registers can be written correctly
                                ;* using word read/modify/write accesses.
                                ;*
                                ;-- ************************************************************************

031546                                  BGNTST
031546                                                                          T16::
000020                           TNUM == TNUM + 1       ;INCREMENT THE ASSEMBLY TIME TEST COUNTER.
031546  012767  000020  150552    MOV     #TNUM,TSTNUM   ;SET UP THE TEST NUMBER.        (17)
031554  012767  177777  150570    MOV     #-1,CTRLCF     ;INDICATE THAT WE ARE WITHIN A TEST.
031562  012767  000001  152176    MOV     #1,ERRTYP      ;SET UP DEVICE FATAL INDICATOR IN ERROR TYPE.
031570  012767  003245  152172    MOV     #1701.,ERRNBR  ;SET UP ERROR NUMBER IN THE ERROR TABLE.
031576  012767  012513  152166    MOV     #EM1701,ERRMSG ;SET UP ERROR MESSAGE FOR TEST IN ERROR TABLE.
031604  005067  150652            CLR     ERSMRF         ;CLEAR THE ERROR SUMMARY FLAGS.
031610  012700  002464            MOV     #ERCNTB,R0
031614  004767  166360            JSR     PC,CLR16W      ;CLEAR THE ERROR COUNTER TABLE.
                                ;+
                                ; Reset the DUT to a known state, do not remove the status codes from the fifo.
                                ;  Clear TX and RX interrupt enable bits in the CSR.
                                ; This subroutine reports errors >>>>> 1701 <<<<<.
                                ;-
031620  004767  167632            JSR     PC,RESETT      ;RESET THE DHV11-M, REPORT ANY ERRORS FOUND.
031624  103402                    BCS     .+6            ;FATAL RESET ERROR?  NO, CONTINUE WITH TEST.
031626  000167  000122            JMP     60$            ;YES,  EXIT THE TEST.
                                ;+
                                ; Verify read/modify/write capability to indirect address field of CSR
                                ;-
031632  005267  152132            INC     ERRNBR         ;SET THE ERROR REPORT NUMBER TO 1702.
031636  012702  000017            MOV     #17,R2         ;SET LOOP COUNT.
031642  016704  150376            MOV     CSRA,R4        ;GET CSR ADDRESS.
031646  042714  000017    2$:     BIC     #17,(R4)       ;CLEAR THE DUT CSR USING READ/MODIFY/WRITE.
031652  050214                    BIS     R2,(R4)        ;WRITE COUNT TO CSR USING READ/MODIFY/WRITE.
031654  011401                    MOV     (R4),R1        ;READ BACK THE CONTENTS OF THE CSR
031656  042701  177760            BIC     #177760,R1     ;MASK OUT ALL BUT THE IND.ADR.REG FIELD.
031662  020102                    CMP     R1,R2          ;CHECK FOR CORRECT DATA WRITTEN/READ.
031664  001406                  BEQ     4$             ;IS EXPECTED DATA BAD?  NO, SKIP ERROR REPORT.
                                ;Report "BAD BIT(S) IN DEVICE CSR REGISTER FOR LINE  0 (D)."
031666  012767  016712  152100      MOV     #ER1601,ERRBLK ;SELECT THE PROPER ERROR REPORT ROUTINE.
031674  005003                    CLR     R3             ;SET OFFSET TO 0 TO CAUSE REPORT OF CSR REG.
031676  005005                    CLR     R5             ;CAUSE REPORT OF LINE 0.
031700                            ERROR                  ;  >>>>> ERROR # 1702 <<<<<
031700  104460                                                                  TRAP    C$ERROR
031702  005302            4$:     DEC     R2             ;DECREMENT LOOP COUNT/IND.ADD.REG ADDRESS.
031704  002360                  BGE     2$             ;LOOP BACK TO TEST NEXT ADDRESS IF NOT DONE.
                                ;+
                                ; Write and verify 16 data patterns in all used bits of all registers on all
                                ;   active lines using R/M/W.  Before writing each pattern, clear all the bits.
                                ;    REGTST routine reports errors with numbers  >>>>> ERROR 1703 - 1705 <<<<<.
                                ;-
031706  005267  152056            INC     ERRNBR         ;SET THE ERROR NUMBER TO 1703.
031712  005003                    CLR     R3             ;INDICATE THAT WORD ACCESSES ARE TO BE USED.
031714  012704  000001            MOV     #1,R4          ;INDICATE R/M/W ACCESS, CLEAR FIRST.
031720  004767  167274            JSR     PC,REGTST      ;WRITE AND VERIFY DATA PATTERNS.
```

```
                                        ;+
                                        ; Write and verify 16 data patterns in all used bits of all registers on all
                                        ;   active lines using R/M/W.  Before writing each pattern, set all the bits.
                                        ;    REGTST routine reports errors with numbers  >>>>> ERROR 1706 - 1708 <<<<<.
                                        ;-
031724  012767  003252  152036                MOV     #1706.,ERRNBR   ;SET UP ERROR NUMBER FOR REGTST ROUTINE.
031732  005003                              CLR     R3              ;INDICATE THAT WORD ACCESSES ARE TO BE USED.
031734  005404                              NEG     R4              ;INDICATE R/M/W ACCESS, SET FIRST.
031736  004767  167256                      JSR     PC,REGTST       ;WRITE AND VERIFY DATA PATTERNS.
                                        ;+
                                        ; Print error summary reports if necessary.
                                        ;   The following routine reports errors with number >>>>> ERROR # 1709 <<<<<
                                        ;-
031742  012767  003255  152020                MOV     #1709.,ERRNBR   ;SET UP ERROR NUMBER FOR NEXT RTN.
031750  004767  167454                      JSR     PC,REPSMR       ;REPORT ERROR SUMMARY IF NECESSARY.
031754  005067  150372            60$:      CLR     CTRLCF          ;INDICATE THAT WE COMPLETED THE TEST.
031760                                      ENDTST
031760                                                                      L10045:
031760  104401                                                                      TRAP    C$ETST
```

```
                                .SBTTL  HARDWARE TEST           - REGBRW -
                                ;** ************************************************************************
                                ;*              - Device Register Byte Access Read and Write Test -
                                ;*
                                ;* This test verifies that the device registers can be read and written
                                ;* correctly using byte accesses.
                                ;*
                                ;-- ************************************************************************

                                        BGNTST
                                                                                        T17::
                                         TNUM == TNUM + 1       ;INCREMENT THE ASSEMBLY TIME TEST COUNTER.
031762  012767  000021  150336         MOV     #TNUM,TSTNUM    ;SET UP THE TEST NUMBER.        (18)
031770  012767  177777  150354         MOV     #-1,CTRLCF      ;INDICATE THAT WE ARE WITHIN A TEST.
031776  012767  000001  151762         MOV     #1,ERRTYP       ;SET UP DEVICE FATAL INDICATOR IN ERROR TYPE.
032004  012767  003411  151756         MOV     #1801.,ERRNBR   ;SET UP ERROR NUMBER IN THE ERROR TABLE.
032012  012767  012570  151752         MOV     #EM1801,ERRMSG  ;SET UP ERROR MESSAGE FOR TEST IN ERROR TABLE.
032020  005067  150436                 CLR     ERSMRF          ;CLEAR THE ERROR SUMMARY FLAGS.
032024  012700  002464                 MOV     #ERCNTB,R0
032030  004767  166144                JSR     PC,CLR16W       ;CLEAR THE ERROR COUNTER TABLE.
                                ;+
                                ; Reset the DUT to a known state, do not remove the status codes from the fifo.
                                ;  Clear TX and RX interrupt enable bits in the CSR.
                                ; This subroutine reports errors >>>>> 1801 <<<<<.
                                ;-
032034  004767  167416                JSR     PC,RESETT       ;RESET THE DHV11-M, REPORT ANY ERRORS FOUND.
032040  103402                       BCS     .+6             ;FATAL RESET ERROR?  NO, CONTINUE WITH TEST.
032042  000167  000152                JMP     60$             ;YES,  EXIT THE TEST.
032046  012767  003412  151714         MOV     #1802.,ERRNBR   ;SET THE ERROR REPORT NUMBER TO 1802.
                                ;+
                                ; Verify read/write capability to indirect address field of CSR.
                                ; Use byte accesses.
                                ;-
032054  012702  000017                  MOV     #17,R2          ;SET LOOP COUNT.
032060  016704  150160                  MOV     CSRA,R4         ;GET CSR ADDRESS.
032064  110214                 2$:      MOVB    R2,(R4)         ;WRITE COUNT TO CSR.
032066  111401                          MOVB    (R4),R1         ;READ BACK THE CONTENTS OF THE CSR
032070  042701  177760                  BIC     #177760,R1      ;MASK OUT ALL BUT THE IND.ADR.REG FIELD.
032074  020102                          CMP     R1,R2           ;CHECK FOR CORRECT DATA WRITTEN/READ.
032076  001406                        BEQ     4$              ;IS EXPECTED DATA BAD?  NO, SKIP ERROR REPORT.
                                    ;Report "BAD BIT(S) IN DEVICE CSR REGISTER FOR LINE  0 (D)."
032100  012767  016712  151666          MOV     #ER1601,ERRBLK  ;SELECT THE PROPER ERROR REPORT ROUTINE.
032106  005003                          CLR     R3              ;SET OFFSET TO 0 TO CAUSE REPORT OF CSR REG.
032110  005005                          CLR     R5              ;CAUSE REPORT OF LINE 0.
032112                                  ERROR                   ;  >>>>> ERROR # 1802 <<<<<
032112  104460                                                                  TRAP    C$ERROR
032114  005302                 4$:      DEC     R2              ;DECREMENT LOOP COUNT/IND.ADD.REG ADDRESS.
032116  002362                        BGE     2$              ;LOOP BACK TO TEST NEXT ADDRESS IF NOT DONE.
                                ;+
                                ; Write and verify 16 data patterns in all used bits of all lower bytes of all
                                ;   registers on all active lines.  Use READ/WRITE accesses.  Before writing
                                ;   each pattern, clear all the used bits of all active registers.
                                ;    REGTST routine reports errors with numbers  >>>>> ERROR 1803 - 1805 <<<<<.
                                ;-
032120  005267  151644                  INC     ERRNBR          ;SET THE ERROR NUMBER TO 1803.
032124  012703  177777                  MOV     #-1,R3          ;INDICATE THAT LO BYTE ACCESSES ARE TO BE USED.
032130  012704  000002                  MOV     #2,R4           ;INDICATE R/W ACCESS, CLEAR FIRST.
```

```
 6185 032134  004767  167060                JSR     PC,REGTST       ;WRITE AND VERIFY DATA PATTERNS.
 6186                                    ;+
 6187                                    ; Write and verify 16 data patterns in all used bits of all high bytes of all
 6188                                    ;   registers on all active lines.  Use READ/WRITE accesses.  Before writing
 6189                                    ;   each pattern, clear all the used bits of all active registers.
 6190                                    ;    REGTST routine reports errors with numbers  >>>>> ERROR 1806 - 1808 <<<<<.
 6191                                    ;-
 6192 032140  012767  003416  151622           MOV     #1806.,ERRNBR   ;SET UP ERROR NUMBER FOR REGTST ROUTINE.
 6193 032146  005403                           NEG     R3              ;INDICATE THAT HI BYTE ACCESSES ARE TO BE USED.
 6194 032150  004767  167044                JSR     PC,REGTST       ;WRITE AND VERIFY DATA PATTERNS.
 6195                                    ;+
 6196                                    ; Write and verify 16 data patterns in all used bits of all lower bytes of all
 6197                                    ;   registers on all active lines.  Use READ/WRITE accesses.  Before writing
 6198                                    ;   each pattern, set all the used bits of all active registers.
 6199                                    ;    REGTST routine reports errors with numbers  >>>>> ERROR 1809 - 1811 <<<<<.
 6200                                    ;-
 6201 032154  012767  003421  151606           MOV     #1809.,ERRNBR   ;SET UP ERROR NUMBER FOR REGTST ROUTINE.
 6202 032162  005403                           NEG     R3              ;INDICATE THAT LO BYTE ACCESSES ARE TO BE USED.
 6203 032164  005404                           NEG     R4              ;INDICATE R/W ACCESS, SET FIRST.
 6204 032166  004767  167026                JSR     PC,REGTST       ;WRITE AND VERIFY DATA PATTERNS.
 6205                                    ;+
 6206                                    ; Write and verify 16 data patterns in all used bits of all high bytes of all
 6207                                    ;   registers on all active lines.  Use READ/WRITE accesses.  Before writing
 6208                                    ;   each pattern, set all the used bits of all active registers.
 6209                                    ;    REGTST routine reports errors with numbers  >>>>> ERROR 1812 - 1814 <<<<<.
 6210                                    ;-
 6211 032172  012767  003424  151570           MOV     #1812.,ERRNBR   ;SET UP ERROR NUMBER FOR REGTST ROUTINE.
 6212 032200  005403                           NEG     R3              ;INDICATE THAT HI BYTE ACCESSES ARE TO BE USED.
 6213 032202  004767  167012                JSR     PC,REGTST       ;WRITE AND VERIFY DATA PATTERNS.
 6214                                    ;+
 6215                                    ; Print error summary reports if necessary.
 6216                                    ;   The following routine reports errors with number >>>>> ERROR # 1815 <<<<<
 6217                                    ;-
 6218 032206  012767  003427  151554           MOV     #1815.,ERRNBR   ;SET UP ERROR NUMBER FOR NEXT RTN.
 6219 032214  004767  167210                JSR     PC,REPSMR       ;REPORT ERROR SUMMARY IF NECESSARY.
 6220 032220  005067  150126          60$:     CLR     CTRLCF          ;INDICATE THAT WE COMPLETED THE TEST.
 6221 032224                                ENDTST
      032224                                                                  L10046:
      032224  104401                                                                TRAP    C$ETST
```

```
                        .SBTTL  HARDWARE TEST           - REGBRM -
                        ;++ ******************************************************************************
                        ;*              - Device Register Byte Access Read/Modify/Write Test -
                        ;*
                        ;* This test verifies that the device registers can be read and written
                        ;* correctly using byte accesses in Read/Modify/Write mode.
                        ;*
                        ;-- ******************************************************************************

                              BGNTST
                                                                                T18::
            000022          TNUM == TNUM + 1        ;INCREMENT THE ASSEMBLY TIME TEST COUNTER.
032226  012767  000022  150072  MOV     #TNUM,TSTNUM    ;SET UP THE TEST NUMBER.        (19)
032234  012767  177777  150110  MOV     #-1,CTRLCF      ;INDICATE THAT WE ARE WITHIN A TEST.
032242  012767  000001  151516  MOV     #1,ERRTYP       ;SET UP DEVICE FATAL INDICATOR IN ERROR TYPE.
032250  012767  003555  151512  MOV     #1901.,ERRNBR   ;SET UP ERROR NUMBER IN THE ERROR TABLE.
032256  012767  012636  151506  MOV     #EM1901,ERRMSG  ;SET UP ERROR MESSAGE FOR TEST IN ERROR TABLE.
032264  005067  150172          CLR     ERSMRF          ;CLEAR THE ERROR SUMMARY FLAGS.
032270  012700  002464          MOV     #ERCNTB,R0
032274  004767  165700          JSR     PC,CLR16W       ;CLEAR THE ERROR COUNTER TABLE.
                        ;+
                        ; Reset the DUT to a known state, do not remove the status codes from the fifo.
                        ;  Clear TX and RX interrupt enable bits in the CSR.
                        ; This subroutine reports errors >>>>> 1901 <<<<<.
                        ;-
032300  004767  167152          JSR     PC,RESETT       ;RESET THE DHV11-M, REPORT ANY ERRORS FOUND.
032304  103402                  BCS     .+6             ;FATAL RESET ERROR?  NO, CONTINUE WITH TEST.
032306  000167  000156          JMP     60$             ;YES,  EXIT THE TEST.
032312  012767  003556  151450  MOV     #1902.,ERRNBR   ;SET THE ERROR REPORT NUMBER TO 1902.
                        ;+
                        ; Verify read/write capability to indirect address field of CSR.
                        ; Use byte accesses.
                        ;-
032320  012702  000017          MOV     #17,R2          ;SET LOOP COUNT.
032324  016704  147714          MOV     CSRA,R4         ;GET CSR ADDRESS.
032330  142714  000017  2$:     BICB    #17,(R4)        ;CLEAR THE DUT CSR USING READ/MODIFY/WRITE.
032334  150214                  BISB    R2,(R4)         ;WRITE COUNT TO CSR USING READ/MODIFY/WRITE.
032336  111401                  MOVB    (R4),R1         ;READ BACK THE CONTENTS OF THE CSR
032340  042701  177760          BIC     #177760,R1      ;MASK OUT ALL BUT THE IND.ADR.REG FIELD.
032344  020102                  CMP     R1,R2           ;CHECK FOR CORRECT DATA WRITTEN/READ.
032346  001406                  BEQ     4$              ;IS EXPECTED DATA BAD?  NO, SKIP ERROR REPORT.
                              ;Report "BAD BIT(S) IN DEVICE CSR REGISTER FOR LINE  0 (D)."
032350  012767  016712  151416  MOV     #ER1601,ERRBLK  ;SELECT THE PROPER ERROR REPORT ROUTINE.
032356  005003                  CLR     R3              ;SET OFFSET TO 0 TO CAUSE REPORT OF CSR REG.
032360  005005                  CLR     R5              ;CAUSE REPORT OF LINE 0.
032362                          ERROR                   ;  >>>>> ERROR # 1902 <<<<<
032362  104460                                                          TRAP    C$ERROR
032364  005302          4$:     DEC     R2              ;DECREMENT LOOP COUNT/IND.ADD.REG ADDRESS.
032366  002360                  BGE     2$              ;LOOP BACK TO TEST NEXT ADDRESS IF NOT DONE.
                        ;+
                        ; Write and verify 16 data patterns in all used bits of all lower bytes of all
                        ;   registers on all active lines.  Use READ/MODIFY/WRITE accesses.  Before
                        ;   writing each pattern, clear all the used bits of all active registers.
                        ;    REGTST routine reports errors with numbers  >>>>> ERROR 1903 - 1905 <<<<<.
                        ;-
032370  005267  151374          INC     ERRNBR          ;SET THE ERROR NUMBER TO 1903.
032374  012703  177777          MOV     #-1,R3          ;INDICATE THAT LO BYTE ACCESSES ARE TO BE USED.
```

```
 6278 032400  012704  000001                    MOV    #1,R4          ;INDICATE R/M/W ACCESS, CLEAR FIRST.
 6279 032404  004767  166610                    JSR    PC,REGTST      ;WRITE AND VERIFY DATA PATTERNS.
 6280                                 ;+
 6281                                 ; Write and verify 16 data patterns in all used bits of all high bytes of all
 6282                                 ;   registers on all active lines.  Use READ/MODIFY/WRITE accesses.  Before
 6283                                 ;   writing each pattern, clear all the used bits of all active registers.
 6284                                 ;    REGTST routine reports errors with numbers  >>>>> ERROR 1906 - 1908 <<<<<.
 6285                                 ;-
 6286 032410  012767  003562  151352          MOV    #1906.,ERRNBR  ;SET UP ERROR NUMBER FOR REGTST ROUTINE.
 6287 032416  005403                          NEG    R3             ;INDICATE THAT HI BYTE ACCESSES ARE TO BE USED.
 6288 032420  004767  166574                  JSR    PC,REGTST      ;WRITE AND VERIFY DATA PATTERNS.
 6289                                 ;+
 6290                                 ; Write and verify 16 data patterns in all used bits of all lower bytes of all
 6291                                 ;   registers on all active lines.  Use READ/MODIFY/WRITE accesses.  Before
 6292                                 ;   writing each pattern, set all the used bits of all active registers.
 6293                                 ;    REGTST routine reports errors with numbers  >>>>> ERROR 1909 - 1911 <<<<<.
 6294                                 ;-
 6295 032424  012767  003565  151336          MOV    #1909.,ERRNBR  ;SET UP ERROR NUMBER FOR REGTST ROUTINE.
 6296 032432  005403                          NEG    R3             ;INDICATE THAT LO BYTE ACCESSES ARE TO BE USED.
 6297 032434  005404                          NEG    R4             ;INDICATE R/M/W ACCESS, SET FIRST.
 6298 032436  004767  166556                  JSR    PC,REGTST      ;WRITE AND VERIFY DATA PATTERNS.
 6299                                 ;+
 6300                                 ; Write and verify 16 data patterns in all used bits of all high bytes of all
 6301                                 ;   registers on all active lines.  Use READ/MODIFY/WRITE accesses.  Before
 6302                                 ;   writing each pattern, set all the used bits of all active registers.
 6303                                 ;    REGTST routine reports errors with numbers  >>>>> ERROR 1912 - 1914 <<<<<.
 6304                                 ;-
 6305 032442  012767  003570  151320          MOV    #1912.,ERRNBR  ;SET UP ERROR NUMBER FOR REGTST ROUTINE.
 6306 032450  005403                          NEG    R3             ;INDICATE THAT HI BYTE ACCESSES ARE TO BE USED.
 6307 032452  004767  166542                  JSR    PC,REGTST      ;WRITE AND VERIFY DATA PATTERNS.
 6308                                 ;+
 6309                                 ; Print error summary reports if necessary.
 6310                                 ;   The following routine reports errors with number >>>>> ERROR # 1915 <<<<<
 6311                                 ;-
 6312 032456  012767  003573  151304          MOV    #1915.,ERRNBR  ;SET UP ERROR NUMBER FOR NEXT RTN.
 6313 032464  004767  166740                  JSR    PC,REPSMR      ;REPORT ERROR SUMMARY IF NECESSARY.
 6314 032470  005067  147656          60$:    CLR    CTRLCF         ;INDICATE THAT WE COMPLETED THE TEST.
 6315 032474                                  ENDTST
      032474                                                                  L10047:
      032474  104401                                                              TRAP    C$ETST
```

```
                                .SBTTL  HARDWARE TEST           - IDBIT -
                                ;++ ******************************************************************************
                                ;*              - Device Register ID Bit Test -
                                ;*
                                ;*      This test verifies that the DUT STAT register ID bit reads as clear.
                                ;*
                                ;-- ******************************************************************************

032476                                  BGNTST
032476                                                                          T19::
000023                           TNUM == TNUM + 1       ;INCREMENT THE ASSEMBLY TIME TEST COUNTER.
032476  012767  000023  147622         MOV    #TNUM,TSTNUM    ;SET UP THE TEST NUMBER.        (20)
032504  012767  177777  147640         MOV    #-1,CTRLCF      ;INDICATE THAT WE ARE IN A TEST.
032512  012767  000001  151246         MOV    #1,ERRTYP       ;SET UP DEVICE FATAL INDICATOR IN ERROR TYPE.
032520  012767  003721  151242         MOV    #2001.,ERRNBR   ;SET UP ERROR NUMBER IN THE ERROR TABLE.
032526  012767  012713  151236         MOV    #EM2001,ERRMSG  ;SET UP ERROR MESSAGE FOR TEST IN ERROR TABLE.
                                ;+
                                ; Reset the DUT to a known state, do not remove the status codes from the fifo.
                                ;  Clear TX and RX interrupt enable bits in the CSR.
                                ; This subroutine reports errors >>>>> 2001 <<<<<.
                                ;-
032534  004767  166716                 JSR    PC,RESETT       ;RESET THE DHV11-M, REPORT ANY ERRORS FOUND.
032540  103016                         BCC    60$             ;FATAL RESET ERROR?  YES,  EXIT THE TEST.
                                ;+
                                ; Read the STAT register ID bit and verify that it is clear.
                                ;-
032542  017701  147504         MOV    @STATA,R1       ;READ THE STAT REGISTER CONTENTS.
032546  032701  000400         BIT    #BIT8,R1        ;CHECK THE ID BIT.
032552  001411                BEQ    60$             ;ID BIT CLEAR?  YES, EXIT THE TEST.
032554  012767  003722  151206         MOV    #2002.,ERRNBR   ;NO,  SET THE ERROR REPORT NUMBER TO 2002.
032562  012701  012755         MOV    #EM2002,R1      ;GET THE PROPER ERROR MESSAGE.
032566  012767  016470  151200         MOV    #ER0503,ERRBLK  ;SELECT THE PROPER ERROR REPORT ROUTINE.
032574                          ERROR                  ;ERROR NUMBER >>>>> 2002 <<<<<
032574  104460                                                          TRAP    C$ERROR
032576  005067  147550  60$:    CLR    CTRLCF          ;INDICATE THAT WE COMPLETED THE TEST.
032602                          ENDTST
032602                                                          L10050:
032602  104401                                                          TRAP    C$ETST
```

```
                                .SBTTL  HARDWARE TEST           - NOTXDV -
                                ;++ ******************************************************************************
                                ;*                          - No TX_DATA_VALID/No TX_ACTION Test -
                                ;*      This test verifies that if a data word is written without the
                                ;*      TX_DATA_VALID bit set, no TX_ACTION will be generated.
                                ;*      To ensure data is not accidentally transmitted, the test is performed
                                ;*      in internal loopback, and on all active lines.
                                ;*
                                ;-- ******************************************************************************
 032604                                 BGNTST
 032604                                                                                 T20::
        000024                          TNUM == TNUM + 1        ;INCREMENT THE ASSEMBLY TIME TEST COUNTER.
 032604  012767  000024  147514          MOV    #TNUM,TSTNUM    ;SET UP THE TEST NUMBER.        (21)
 032612  012767  177777  147532          MOV    #-1,CTRLCF      ;INDICATE THAT WE ARE IN A TEST.
 032620  012767  000001  151140          MOV    #1,ERRTYP       ;SET ERROR TYPE AS FATAL IN ERROR TABLE.
 032626  012767  004065  151134          MOV    #2101.,ERRNBR   ;SET THE FIRST ERROR NUMBER IN ERROR TABLE.
 032634  012767  013030  151130          MOV    #EM2101,ERRMSG  ;SET ERROR MESSAGE ADDRESS IN ERRTBL.
 032642  012767  017422  151124          MOV    #ER9101,ERRBLK  ;SELECT THE CORRECT ERROR REPORTING ROUTINE.
                                ;+
                                ; Reset the DUT to a known state, remove the status codes from the fifo.
                                ;  Clear TX and RX interrupt enable bits in the CSR.
                                ; This subroutine reports error >>>>> 2101 <<<<<.
                                ;-
 032650  004767  165302                 JSR     PC,CLNRST       ;RESET THE DHV11-M, REPORT ANY ERRORS FOUND.
 032654  103054                        BCC     60$             ;RESET FAILURE?, ABORT THIS TEST.
 032656  005267  151106                 INC     ERRNBR          ;SET THE ERROR NUMBER TO 2102.
                                ;+
                                ; Set internal loopback on all active lines.
                                ; Set LPR on all lines to 38.4k baud, 8 bits per character, odd parity,
                                ; 2 stop bits.
                                ; Disable transmitters on all active lines.
                                ;-
 032662  016705  147350                  MOV     ACTLNS,R5       ;PASS THE ACTIVE LINE BIT MAP.
 032666  012700  000200                  MOV     #200,R0         ;PASS THE LNCTRL CONTENTS.
 032672  004767  170634                 JSR     PC,WTWLNC       ;INITIALISE THE LNCTRL REGISTERS.
 032676  012700  177670                  MOV     #177670,R0      ;PASS THE LPR CONTENTS.
 032702  004767  170700                 JSR     PC,WTWLPR       ;INITIALSE THE LPR REGISTERS ON ALL LINES.
 032706  012704  000012                  MOV     #10.,R4         ;PASS DELAY TIME OF 10 MILLI SECS.
 032712  004767  165362                 JSR     PC,DELAY        ;WAIT FOR LNCTRL AND LPR REGS TO BE UPDATED.
 032716  004767  167654                 JSR     PC,TXDSBL       ;DISABLE TRANSMITTERS ON ALL ACTIVE LINES.
                                ;+
                                ; Test all active lines individually.
                                ; Write a data word to the TXCHAR register with TX_DATA_VALID clear.
                                ; Verify no TX_ACTION is generated.
                                ;-
 032722  016705  147310                  MOV     ACTLNS,R5       ;GET THE ACTIVE LINE BIT MAP.
 032726  005004                          CLR     R4              ;CLEAR THE LINE NUMBER COUNTER.
 032730  000241                 2$:      CLC                     ;CLEAR THE CARRY BIT PRIOR TO SHIFTING BIT MAP.
 032732  006005                          ROR     R5              ;SHIFT THE BIT MAP INTO THE CARRY BIT.
 032734  103020                         BCC     4$              ;DO NOT TEST THE LINE IF IT IS INACTIVE.
                                    ;+
                                    ; Select the line under test.
                                    ;  Write data word (ASCII <LF>) to TXCHR register with the most significant
                                    ;  bit (TX_DATA_VALID) clear.
                                    ;-
 032736  010477  147302                      MOV     R4,@CSRA        ;SELECT THE LINE CURRENTLY UNDER TEST.
 032742  012777  000012  147276              MOV     #12,@TXCHA      ;WRITE THE DATA WORD TO THE DUT'S TXCHAR REG.
```

HARDWARE TEST - NOTXDV -

```
6408                                    ;+
6409                                    ; Wait for a TX_ACTION to be returned, report error if TX_ACTION found
6410                                    ; before time-out occurs.
6411                                    ;-
6412 032750  012701  170002              MOV    #170002,R1      ;TEST BIT 15, TIMEOUT OF 2 MILLI SECS.
6413 032754  016702  147264              MOV    CSRA,R2         ;PASS THE ADDRESS OF THE REGISTER TO TEST.
6414 032760  004767  170276             JSR     PC,WAIBIS       ;WAIT FOR TX_ACTION TO COME BACK.
6415 032764  103004                     BCC     4$              ;SKIP ERROR REPORT IF TX-ACTION NOT FOUND.
6416
6417 032766  010401                      MOV    R4,R1           ;PASS THE NUMBER OF CURRENT LINE UNDER TEST.
6418 032770  012702  013073              MOV    #EM2102,R2      ;PASS THE ERROR MESSAGE TO BE REPORTED.
6419                                                            ;"TX_ACT FOUND AFTER INVALID DATA WORD WRITTEN"
6420 032774                             ERROR                   ;                >>>>> ERROR #4102 <<<<<.
     032774  104460                                                                          TRAP    C$ERROR
6421                                ;+
6422                                ; Verify all active lines have been tested.
6423                                ;-
6424 032776  005204                 4$:     INC    R4           ;INCREMENT THE LINE NUMBER COUNTER.
6425 033000  005705                         TST    R5           ;ARE THERE ANY MORE ACTIVE LINES TO TEST?.
6426 033002  001352                        BNE     2$           ;YES; BRANCH TO TEST THE NEXT LINE.
6427 033004  000400                        BR      60$          ;NO; EXIT THIS TEST.
6428
6429 033006  005067  147340         60$:     CLR    CTRLCF       ;INDICATE THAT WE ARE NOT WITHIN A TEST.
6430 033012                             ENDTST
     033012                                                                        L10051:
     033012  104401                                                                        TRAP    C$ETST
```

```
                                .SBTTL  HARDWARE TEST           - TXDVAL-
                                ;** ************************************************************************
                                ;*                      - TX_DATA_VALID/TX_ACTION Test -
                                ;*      This test verifies that if a data word is written to the TXCHAR register
                                ;*      with the TX_DATA_VALID bit set, a corresponding TX_ACTION will be
                                ;*      generated.
                                ;*      To ensure data is not accidentally transmitted, the test is performed
                                ;*      in internal loopback, and on all active lines.
                                ;*
                                ;-- ************************************************************************

033014                                  BGNTST
033014                                                                          T21::
        000025                           TNUM == TNUM + 1       ;INCREMENT THE ASSEMBLY TIME TEST COUNTER.
033014  012767  000025  147304           MOV    #TNUM,TSTNUM    ;SET UP THE TEST NUMBER.        (22)
033022  012767  177777  147322           MOV    #-1,CTRLCF      ;INDICATE THAT WE ARE IN A TEST.
033030  012767  000001  150730           MOV    #1,ERRTYP       ;SET ERROR TYPE AS FATAL IN ERROR TABLE.
033036  012767  004231  150724           MOV    #2201.,ERRNBR   ;SET THE FIRST ERROR NUMBER IN ERROR TABLE.
033044  012767  013167  150720           MOV    #EM2201,ERRMSG  ;SET ERROR MESSAGE ADDRESS IN ERRTBL.
033052  012767  017422  150714           MOV    #ER9101,ERRBLK  ;SELECT THE CORRECT ERROR REPORTING ROUTINE.
                                ;+
                                ; Reset the DUT to a known state, remove the status codes from the fifo.
                                ;  Clear TX and RX interrupt enable bits in the CSR.
                                ; This subroutine reports error >>>>> 2201 <<<<<.
                                ;-
033060  004767  165072                   JSR    PC,CLNRST       ;RESET THE DHV11-M, REPORT ANY ERRORS FOUND.
033064  103066                           BCC    60$             ;RESET FAILURE?, ABORT THIS TEST.
                                ;+
                                ; Set internal loopback on all active lines.
                                ; Set LPR on all lines to 38.4k baud, 8 bits per character, odd parity,
                                ; 2 stop bits.
                                ; Disable transmitters on all active lines.
                                ;-
033066  016705  147144                    MOV    ACTLNS,R5       ;PASS THE ACTIVE LINE BIT MAP.
033072  012700  000200                    MOV    #200,R0         ;PASS THE LNCTRL CONTENTS.
033076  004767  170430                   JSR    PC,WTWLNC       ;INITIALISE THE LNCTRL REGISTERS.
033102  012700  177670                    MOV    #177670,R0      ;PASS THE LPR CONTENTS.
033106  004767  170474                   JSR    PC,WTWLPR       ;INITIALSE THE LPR REGISTERS ON ALL LINES.
033112  012704  000012                    MOV    #10.,R4         ;PASS DELAY TIME OF 10 MILLI-SECONDS.
033116  004767  165156                   JSR    PC,DELAY        ;WAIT FOR LNCTR AND LPR REGS TO BE UPDATED.
033122  004767  167450                   JSR    PC,TXDSBL       ;DISABLE TRANSMITTERS ON ALL ACTIVE LINES.
                                ;+
                                ; Test all active lines individually.
                                ; Write a data word to the TXCHAR register with TX_DATA_VALID set.
                                ; Verify that a corresponding TX_ACTION is generated.
                                ;-
033126  016705  147104                    MOV    ACTLNS,R5       ;GET THE ACTIVE LINE BIT MAP.
033132  005004                            CLR    R4              ;CLEAR THE LINE NUMBER COUNTER.
033134  012767  004232  150626  2$:       MOV    #2202.,ERRNBR   ;SET THE ERROR NUMBER TO 2202.
033142  000241                            CLC                    ;CLEAR THE CARRY BIT PRIOR TO SHIFTING BIT MAP.
033144  006005                            ROR    R5              ;SHIFT THE BIT MAP INTO THE CARRY BIT.
033146  103032                           BCC    8$              ;DO NOT TEST THE LINE IF IT IS INACTIVE.
                                    ;+
                                    ; Select the line under test.
                                    ;  Write data word (ASCII <LF>) to TXCHR register with the most significant
                                    ;  bit (TX_DATA_VALID) set.
                                    ;-
```

```
HARDWARE TEST            - TXDVAL-

 6488 033150  010477  147070                    MOV     R4,@CSRA          ;SELECT THE LINE CURRENTLY UNDER TEST.
 6489 033154  012777  100012  147064            MOV     #100012,@TXCHA    ;WRITE THE DATA WORD TO THE DUT'S TXCHAR REG.
 6490                                          ;+
 6491                                          ; Wait for a TX_ACTION to be returned, report error if no TX_ACTION
 6492                                          ; found before time-out occurs.
 6493                                          ;-
 6494 033162  012701  170002                    MOV     #170002,R1        ;TEST BIT 15, TIMEOUT OF 2 MILLI SECS.
 6495 033166  016702  147052                    MOV     CSRA,R2           ;PASS THE ADDRESS OF THE REGISTER TO TEST.
 6496 033172  004767  170064                   JSR     PC,WAIBIS         ;WAIT FOR TX_ACTION TO COME BACK.
 6497 033176  103403                           BCS     4$                ;SKIP ERROR REPORT IF TX-ACTION FOUND.
 6498 033200  012702  013224                    MOV     #EM2202,R2        ;PASS THE ERROR MESSAGE TO BE REPORTED.
 6499                                                                     ;"NO TX_ACT FOUND AFTER VALID DATA WORD TX'D".
 6500 033204  000411                           BR      6$                ;GO REPORT THE ERROR.
 6501                                          ;+
 6502                                          ; Verify TX_ACTION returned from correct line.
 6503                                          ;-
 6504 033206  005267  150556          4$:       INC     ERRNBR            ;INCREMENT ERROR NUMBER TO 2103.
 6505 033212  000302                            SWAB    R2                ;GET THE LINE NUMBER IN THE LOW BYTE.
 6506 033214  042702  177760                    BIC     #177760,R2        ;CLEAR THE UNWANTED BITS.
 6507 033220  020204                            CMP     R2,R4             ;IS IT THE CORRECT LINE NUMBER?.
 6508 033222  001404                           BEQ     8$                ;YES; SKIP THE ERROR REPORT.
 6509 033224  012702  013316                    MOV     #EM2203,R2        ;PASS THE ERROR MESSAGE TO BE REPORTED.
 6510                                                                     ; "INCORRECT LINE # RETURNED WITH TX_ACT"
 6511 033230  010401                  6$:       MOV     R4,R1             ;PASS THE NUMBER OF CURRENT LINE UNDER TEST.
 6512 033232                                    ERROR                     ;                >>>>> ERROR <<<<<.
      033232  104460                                                                        TRAP    C$ERROR
 6513
 6514                                          ;+
 6515                                          ; Verify all active lines have been tested.
 6516                                          ;-
 6517 033234  005204                  8$:       INC     R4                ;INCREMENT THE LINE NUMBER COUNTER.
 6518 033236  005705                            TST     R5                ;ARE THERE ANY MORE ACTIVE LINES TO TEST?.
 6519 033240  001335                           BNE     2$                ;YES; BRANCH TO TEST THE NEXT LINE.
 6520
 6521 033242  005067  147104          60$:      CLR     CTRLCF            ;INDICATE THAT WE ARE NOT WITHIN A TEST.
 6522 033246                                    ENDTST
      033246                                                                          L10052:
      033246  104401                                                                          TRAP    C$ETST
```

```
                                .SBTTL  HARDWARE TEST           - TXENBI-
                                ;** ****************************************************************************
                                ;*                          - TX_ENABLE (Inactive) Test -
                                ;*      This test verifies that when the line under test's TX_ENABLE bit is
                                ;*      clear, transmission will not take place on that line.
                                ;*      This test is performed in internal loopback, and on all active lines.
                                ;*
                                ;-- ****************************************************************************

033250                                  BGNTST
033250                                                                          T22::
        000026                   TNUM == TNUM + 1       ;INCREMENT THE ASSEMBLY TIME TEST COUNTER.
033250  012767  000026  147050    MOV     #TNUM,TSTNUM   ;SET UP THE TEST NUMBER.        (23)
033256  012767  177777  147066    MOV     #-1,CTRLCF     ;INDICATE THAT WE ARE IN A TEST.
033264  012767  000001  150474    MOV     #1,ERRTYP      ;SET ERROR TYPE AS FATAL IN ERROR TABLE.
033272  012767  004375  150470    MOV     #2301.,ERRNBR  ;SET THE FIRST ERROR NUMBER IN ERROR TABLE.
033300  012767  013423  150464    MOV     #EM2301,ERRMSG ;SET ERROR MESSAGE ADDRESS IN ERRTBL.
033306  012767  017422  150460    MOV     #ER9101,ERRBLK ;SELECT THE CORRECT ERROR REPORTING ROUTINE.
                                ;+
                                ; Reset the DUT to a known state, remove the status codes from the fifo.
                                ;  Clear TX and RX interrupt enable bits in the CSR.
                                ; This subroutine reports error >>>>> 2301 <<<<<.
                                ;-
033314  004767  164636                  JSR     PC,CLNRST      ;RESET THE DHV11-M, REPORT ANY ERRORS FOUND.
033320  103110                        BCC     60$            ;RESET FAILURE?, ABORT THIS TEST.
                                ;+
                                ; Set internal loopback on all active lines.
                                ; Set LPR on all lines to 38.4k baud, 8 bits per character, odd parity,
                                ; 2 stop bits.
                                ; Enable transmitters on all lines.
                                ;-
033322  016705  146710                   MOV     ACTLNS,R5      ;PASS THE ACTIVE LINE BIT MAP.
033326  012700  000200                   MOV     #200,R0        ;PASS THE LNCTRL CONTENTS.
033332  004767  170174                  JSR     PC,WTWLNC      ;INITIALISE THE LNCTRL REGISTERS.
033336  012700  177670                   MOV     #177670,R0     ;PASS THE LPR CONTENTS.
033342  004767  170240                  JSR     PC,WTWLPR      ;INITIALSE THE LPR REGISTERS ON ALL LINES.
033346  012704  000012                   MOV     #10.,R4        ;PASS DELAY TIME OF 10 MILLI-SECONDS.
033352  004767  164722                  JSR     PC,DELAY       ;WAIT FOR LNCTR AND LPR REGS TO BE UPDATED.
033356  012705  000377                   MOV     #MAPLNS,R5     ;PASS THE BIT MAP CORRESPONDING TO ALL LINES.
033362  004767  167304                  JSR     PC,TXENBL      ;ENABLE TRANSMITTERS ON ALL LINES.
                                ;+
                                ; Test all active lines individually.
                                ; Disable transmission on each active line.
                                ;-
033366  012703  000001                   MOV     #1,R3          ;SET UP THE LINE BIT MAP FOR CHANNEL 0.
033372  005004                           CLR     R4             ;CLEAR THE LINE NUMBER COUNTER.
033374  012767  004376  150366  2$:      MOV     #2302.,ERRNBR  ;SET THE ERROR NUMBER TO 2302.
033402  030367  146630                   BIT     R3,ACTLNS      ;CHECK IF THE LINE IS ACTIVE.
033406  001447                          BEQ     6$             ;SKIP TESTING THIS LINE IF IT IS INACTIVE.
                                    ;+
                                    ; Clear the TX_ENABLE bit in TBUFFAD2 register.
                                    ; Select the line under test.
                                    ;   Verify it is clear, report error if set.
                                    ;-
033410  010305                           MOV     R3,R5          ;PASS THE BIT MAP OF THE LINE UNDER TEST.
033412  004767  167160                  JSR     PC,TXDSBL      ;DISABLE TRANSMISSION ON THE LINE UNDER TEST.
033416  010477  146622                   MOV     R4,@CSRA       ;SELECT THE LINE CURRENTLY UNDER TEST.
```

HARDWARE TEST - TXENBI-

```
 6580 033422  005777  146632          TST     @TXAD2A         ;VERIFY THE TX_ENABLE BIT IS SET.
 6581 033426  100433                  BMI     4$              ;GO REPORT ERROR IF TX_ENABLE BIT SET.
 6582                                 ;+
 6583                                 ; Write data word (ASCII <LF>) to TXCHR register.
 6584                                 ; Wait for a TX_ACTION to be returned, report error if a TX_ACTION
 6585                                 ; is found before time-out occurs.
 6586                                 ;-
 6587 033430  012767  004377  150332    MOV     #2303.,ERRNBR   ;SET ERROR NUMBER TO 2303.
 6588 033436  012777  100012  146602    MOV     #100012,@TXCHA  ;WRITE THE DATA WORD TO THE DUT'S TXCHAR REG.
 6589 033444  012701  170002            MOV     #170002,R1      ;TEST BIT 15, TIMEOUT OF 2 MILLI SECS.
 6590 033450  016702  146570            MOV     CSRA,R2         ;PASS THE ADDRESS OF THE REGISTER TO TEST.
 6591 033454  004767  167602           JSR     PC,WAIBIS       ;WAIT FOR TX_ACTION TO COME BACK.
 6592 033460  103016                  BCC     4$              ;GO REPORT ERROR IF NO TX-ACTION FOUND.
 6593                                 ;+
 6594                                 ; Wait for the data to appear in the fifo, report error if data found.
 6595                                 ;-
 6596 033462  005267  150302            INC     ERRNBR          ;SET ERROR NUMBER TO 2304.
 6597 033466  012701  070012            MOV     #70012,R1       ;TEST BIT 7, TIMEOUT OF 10 MILLI SECS.
 6598 033472  016702  146546            MOV     CSRA,R2         ;PASS THE ADDRESS OF THE REGISTER TO TEST.
 6599 033476  004767  167560           JSR     PC,WAIBIS       ;WAIT FOR RX_DATA_AVAILABLE TO SET.
 6600 033502  103405                  BCS     4$              ;REPORT ERROR IF DATA RECEIVED IN THE FIFO.
 6601 033504  005267  150260            INC     ERRNBR          ;SET ERROR NUMBER TO 2305.
 6602 033510  017702  146532            MOV     @RBUFA,R2       ;READ THE DATA FROM THE FIFO.
 6603 033514  100004                  BPL     6$              ;SKIP ERROR REPORT IF DATA IS THERE.
 6604
 6605 033516  010401          4$:       MOV     R4,R1           ;PASS THE NUMBER OF CURRENT LINE UNDER TEST.
 6606 033520  012702  013461            MOV     #EM2302,R2      ;PASS THE MESSAGE TO BE REPORTED.
 6607                                                           ;"TX_ENABLE BIT BAD ON LINE: nn".
 6608 033524                          ERROR                   ;                >>>>> ERROR <<<<<.
      033524  104460                                                                TRAP    C$ERROR
 6609                                 ;+
 6610                                 ; Verify all active lines have been tested.
 6611                                 ;-
 6612 033526  000241          6$:       CLC                     ;CLEAR THE CARRY BIT PRIOR TO ROTATION.
 6613 033530  006103                    ROL     R3              ;SHIFT THE BIT MAP FOR THE NEXT LINE.
 6614 033532  005204                    INC     R4              ;INCREMENT THE LINE NUMBER COUNTER.
 6615 033534  020427  000010            CMP     R4,#NUMLNS      ;HAVE ALL THE LINES BEEN TESTED?.
 6616 033540  002715                  BLT     2$              ;NO; BRANCH TO TEST THE NEXT LINE.
 6617
 6618 033542  005067  146604    60$:      CLR     CTRLCF          ;INDICATE THAT WE ARE NOT WITHIN A TEST.
 6619 033546                          ENDTST
      033546                                                                    L10053:
      033546  104401                                                                TRAP    C$ETST
```

```
                                .SBTTL  HARDWARE TEST           - TXENBA-
                                ;++ ******************************************************************************
                                ;*                          - TX_ENABLE (Active) Test -
                                ;*      This test verifies that when the TX_ENABLE bit is set in the approriate
                                ;*      line register, transmission will take place on that line.
                                ;*      This test is performed in internal loopback, and on all active lines.
                                ;*
                                ;-- ******************************************************************************

033550                                  BGNTST
033550                                                                          T23::
        000027                           TNUM == TNUM + 1       ;INCREMENT THE ASSEMBLY TIME TEST COUNTER.
033550  012767  000027  146550           MOV    #TNUM,TSTNUM    ;SET UP THE TEST NUMBER.        (24)
033556  012767  177777  146566           MOV    #-1,CTRLCF      ;INDICATE THAT WE ARE IN A TEST.
033564  012767  000001  150174           MOV    #1,ERRTYP       ;SET ERROR TYPE AS FATAL IN ERROR TABLE.
033572  012767  004541  150170           MOV    #2401.,ERRNBR   ;SET THE FIRST ERROR NUMBER IN ERROR TABLE.
033600  012767  013517  150164           MOV    #EM2401,ERRMSG  ;SET ERROR MESSAGE ADDRESS IN ERRTBL.
033606  012767  017422  150160           MOV    #ER9101,ERRBLK  ;SELECT THE CORRECT ERROR REPORTING ROUTINE.
                                ;+
                                ; Reset the DUT to a known state, remove the status codes from the fifo.
                                ;  Clear TX and RX interrupt enable bits in the CSR.
                                ; This subroutine reports error >>>>> 2401 <<<<<.
                                ;-
033614  004767  164336                   JSR    PC,CLNRST       ;RESET THE DHV11-M, REPORT ANY ERRORS FOUND.
033620  103127                           BCC    60$             ;RESET FAILURE?, ABORT THIS TEST.
                                ;+
                                ; Set internal loopback on all active lines.
                                ; Set LPR on all lines to 38.4k baud, 8 bits per character, odd parity,
                                ; 2 stop bits.
                                ; Disable transmitters on all lines.
                                ;-
033622  016705  146410                    MOV    ACTLNS,R5       ;PASS THE ACTIVE LINE BIT MAP.
033626  012700  000200                    MOV    #200,R0         ;PASS THE LNCTRL CONTENTS.
033632  004767  167674                   JSR    PC,WTWLNC       ;INITIALISE THE LNCTRL REGISTERS.
033636  012700  177670                    MOV    #177670,R0      ;PASS THE LPR CONTENTS.
033642  004767  167740                   JSR    PC,WTWLPR       ;INITIALSE THE LPR REGISTERS ON ALL LINES.
033646  012704  000012                    MOV    #10.,R4         ;PASS DELAY TIME OF 10 MILLI-SECONDS.
033652  004767  164422                   JSR    PC,DELAY        ;WAIT FOR LNCTR AND LPR REGS TO BE UPDATED.
033656  012705  000377                    MOV    #MAPLNS,R5      ;PASS THE BIT MAP CORRESPONDING TO ALL LINES.
033662  004767  166710                   JSR    PC,TXDSBL       ;DISABLE TRANSMITTERS ON ALL LINES.
                                ;+
                                ; Test all active lines individually.
                                ; Enable transmission on each active line.
                                ;-
033666  012703  000001                    MOV    #1,R3           ;SET UP THE LINE BIT MAP FOR CHANNEL 0.
033672  005004                            CLR    R4              ;CLEAR THE LINE NUMBER COUNTER.
033674  012767  004542  150066  2$:       MOV    #2402.,ERRNBR   ;SET THE ERROR NUMBER TO 2402.
033702  030367  146330                    BIT    R3,ACTLNS       ;CHECK IF THE LINE IS ACTIVE.
033706  001463                           BEQ    8$              ;SKIP TESTING THIS LINE IF IT IS INACTIVE.
                                    ;+
                                    ; Select the line under test.
                                    ;  Set the TX_ENABLE bit in TBUFFAD2 register.
                                    ;   Verify it is set, report error if clear.
                                    ;-
033710  010305                            MOV    R3,R5           ;PASS THE BIT MAP OF THE LINE UNDER TEST.
033712  004767  166754                   JSR    PC,TXENBL       ;ENABLE TRANSMISSION ON THE LINE UNDER TEST.
033716  012705  000012                    MOV    #10.,R5         ;SET TXCHAR/LOOP COUNT TO 10.
```

```
 6677 033722  010477  146316                    MOV    R4,@CSRA        ;SELECT THE LINE CURRENTLY UNDER TEST.
 6678 033726  005777  146326                    TST    @TXAD2A         ;VERIFY THE TX_ENABLE BIT IS SET.
 6679 033732  100045                           BPL    6$              ;GO REPORT ERROR IF TX_ENABLE BIT CLEAR.
 6680                                          ;+
 6681                                          ; Write data word (ASCII <LF>) to TXCHR register.
 6682                                          ; Wait for a TX_ACTION to be returned, report error if no TX_ACTION
 6683                                          ; found before time-out occurs.
 6684                                          ;-
 6685 033734  012767  004543  150026  4$:      MOV    #2403.,ERRNBR   ;SET ERROR NUMBER TO 2403.
 6686 033742  012777  100012  146276           MOV    #100012,@TXCHA  ;WRITE THE DATA WORD TO THE DUT'S TXCHAR REG.
 6687 033750  012701  170002                    MOV    #170002,R1      ;TEST BIT 15, TIMEOUT OF 2 MILLI SECS.
 6688 033754  016702  146264                    MOV    CSRA,R2         ;PASS THE ADDRESS OF THE REGISTER TO TEST.
 6689 033760  004767  167276                    JSR    PC,WAIBIS       ;WAIT FOR TX_ACTION TO COME BACK.
 6690 033764  103030                           BCC    6$              ;GO REPORT ERROR IF NO TX-ACTION FOUND.
 6691                                          ;+
 6692                                          ; Wait for the data to appear in the fifo, report error if time-out.
 6693                                          ;-
 6694 033766  005267  147776                    INC    ERRNBR          ;SET ERROR NUMBER TO 2404.
 6695 033772  012701  070012                    MOV    #70012,R1       ;TEST BIT 7, TIMEOUT OF 10 MILLI SECS.
 6696 033776  016702  146242                    MOV    CSRA,R2         ;PASS THE ADDRESS OF THE REGISTER TO TEST.
 6697 034002  004767  167254                    JSR    PC,WAIBIS       ;WAIT FOR RX_DATA_AVAILABLE TO SET.
 6698 034006  103017                           BCC    6$              ;REPORT ERROR IF NO DATA RECEIVED IN THE FIFO.
 6699 034010  005267  147754                    INC    ERRNBR          ;SET ERROR NUMBER TO 2405.
 6700 034014  017702  146226                    MOV    @RBUFA,R2       ;READ THE DATA FROM THE FIFO.
 6701 034020  100012                           BPL    6$              ;GO REPORT ERROR IF THER IS'NT ANY DATA THERE.
 6702 034022  005267  147742                    INC    ERRNBR          ;SET ERROR NUMBER TO 2406.
 6703 034026  000302                           SWAB   R2              ;PUT THE LINE NUMBER IN THE LOW BYTE.
 6704 034030  042702  177760                    BIC    #177760,R2      ;CLEAR THE UNWANTED BITS.
 6705 034034  020204                           CMP    R2,R4           ;DID THE DATA COME FROM THE CORRECT LINE?.
 6706 034036  001003                           BNE    6$              ;NO; GO REPORT THE ERROR.
 6707 034040  005305                           DEC    R5              ;DECREMENT THE TXCHAR/LOOP COUNTER.
 6708 034042  001334                           BNE    4$              ;LOOP TO TX THE NEXT CHAR.
 6709 034044  000404                           BR     8$              ;GO TEST THE NEXT LINE.
 6710
 6711 034046  010401                  6$:      MOV    R4,R1           ;PASS THE NUMBER OF CURRENT LINE UNDER TEST.
 6712 034050  012702  013461                    MOV    #EM2302,R2      ;PASS THE MESSAGE TO BE REPORTED.
 6713                                          ;"TX_ENABLE BIT BAD ON LINE: nn".
 6714 034054                                   ERROR                  ;                >>>>> ERROR <<<<<.
      034054  104460                                                                    TRAP    C$ERROR
 6715                                          ;+
 6716                                          ; Verify all active lines have been tested.
 6717                                          ;-
 6718 034056  010305                  8$:      MOV    R3,R5           ;PASS THE BIT MAP OF THE LINE UNDER TEST.
 6719 034060  004767  166512                    JSR    PC,TXDSBL       ;CLEAR THE TX_ENABLE BIT ON THIS LINE.
 6720 034064  000241                           CLC                    ;CLEAR THE CARRY BIT PRIOR TO ROTATION.
 6721 034066  006103                           ROL    R3              ;SHIFT THE BIT MAP FOR THE NEXT LINE.
 6722 034070  005204                           INC    R4              ;INCREMENT THE LINE NUMBER COUNTER.
 6723 034072  020427  000010                    CMP    R4,#NUMLNS      ;HAVE ALL THE LINES BEEN TESTED?.
 6724 034076  002676                           BLT    2$              ;NO; BRANCH TO TEST THE NEXT LINE.
 6725
 6726 034100  005067  146246          60$:     CLR    CTRLCF          ;INDICATE THAT WE ARE NOT WITHIN A TEST.
 6727 034104                                   ENDTST
      034104                                                                    L10054:
      034104  104401                                                                TRAP    C$ETST
```

```
                                .SBTTL  HARDWARE TEST           - INTA -
                                ;++ ******************************************************************************
                                ;*                      - Interrupt Test -
                                ;*      This test verifies that the Device Under Test (DUT) will generate
                                ;*      reception and transmission interrupts correctly.  This test does
                                ;*      not depend on the use of the serial line transmission or reception
                                ;*      capabilities of the DUT.  The lines are put in internal loopback
                                ;*      to minimize any external effects that could be caused on devices
                                ;*      attached to the serial lines.
                                ;*
                                ;-- ******************************************************************************

034106                                  BGNTST
034106                                                                          T24::
                 000030                  TNUM == TNUM + 1       ;INCREMENT THE ASSEMBLY TIME TEST COUNTER.
034106  012767  000030  146212           MOV    #TNUM,TSTNUM    ;SET UP THE TEST NUMBER.        (26)
034114  012767  177777  146230           MOV    #-1,CTRLCF      ;INDICATE THAT WE ARE IN A TEST.
034122  012767  000001  147636           MOV    #1,ERRTYP       ;SET ERROR FATAL ERROR TYPE IN ERROR TABLE.
034130  012767  003101  147632           MOV    #1601.,ERRNBR   ;SET FIRST ERROR REPORT NUMBER IN ERROR TABLE.
034136  012767  013553  147626           MOV    #EM2601.,ERRMSG ;SET TEST ERROR MESSAGE IN ERROR TABLE.
                                ;+
                                ; Reset the DUT to a known state, do not remove the status codes from the fifo.
                                ;  Clear TX and RX interrupt enable bits in the CSR.
                                ; This subroutine reports errors from >>>>> 2601 thru 2602 <<<<<.
                                ;-
034144  004767  165306                   JSR     PC,RESETT       ;RESET THE DHV11-M, REPORT ANY ERRORS FOUND.
034150  103402                           BCS     2$              ;SKIP AROUND ABORTING TEST IF NO ERROR FOUND.
034152  000167  000746                   JMP     60$             ;ABORT TEST IF FATAL ERROR FOUND DURING RESET.
034156  012767  005053  147604  2$:       MOV    #2603.,ERRNBR   ;SET THE ERROR REPORT NUMBER TO 2603.
                                ;+
                                ; Enable transmitters on all lines.
                                ;-
034164  012705  000377          4$:       MOV    #MAPLNS,R5      ;PASS ACTIVE LINE BIT MAP.
034170  004767  166476                   JSR     PC,TXENBL       ;ENABLE TRANSMISSION ON ALL LINES.
                                ;+
                                ; Test reception interrupts.
                                ;    Set up for RX and TX interrupts:
                                ;    RX interrupt service routine inputs a char and counts the interrupt.
                                ;    TX interrupt service routine counts TX interrupts.
                                ;-
034174  005067  146134                    CLR    RXINTC          ;CLEAR THE RX INTERRUPT COUNTER.
034200  005067  146132                    CLR    RXINTF          ;CLEAR THE RX INTERRUPT FLAGS.
034204  005067  146130                    CLR    TXINTC          ;CLEAR THE TX INTERRUPT COUNTER.
034210  012767  002726  146106           MOV    #BUFBAS,BUFPTR  ;LOAD THE BUFFER PTR WITH THE BUFFER BASE ADR.
034216                                   SETPRI  #PRI05          ;DISABLE DEVICE INTERRUPTS.
034216  012700  000240                                                   MOV     #PRI05,R0
034222  104441                                                           TRAP    C$SPRI
034224                                   SETVEC  RXVECA,#RXINPT,#PRI05 ;SET UP INTERRUPT VECTOR TO CATCH RX INT.
034224  012746  000240                                                   MOV     #PRI05,-(SP)
034230  012746  024052                                                   MOV     #RXINPT,-(SP)
034234  016746  145772                                                   MOV     RXVECA,-(SP)
034240  012746  000003                                                   MOV     #3,-(SP)
034244  104437                                                           TRAP    C$SVEC
034246  062706  000010                                                   ADD     #10,SP
034252                                   SETVEC  TXVECA,#CACHTX,#PRI05 ;SET UP INTERRUPT VECTOR TO CATCH TX INT.
034252  012746  000240                                                   MOV     #PRI05,-(SP)
034256  012746  023664                                                   MOV     #CACHTX,-(SP)
```

```
HARDWARE TEST            - INTA -

        034262  016746  145746                                                  MOV     TXVECA,-(SP)
        034266  012746  000003                                                  MOV     #3,-(SP)
        034272  104437                                                          TRAP    C$SVEC
        034274  062706  000010                                                  ADD     #10,SP
   6775 034300                          SETPRI  #PRI00          ;ALLOW INTERRUPTS.
        034300  012700  000000                                                  MOV     #PRI00,R0
        034304  104441                                                          TRAP    C$SPRI
   6776                             ;+
   6777                             ;Enable reception interrupts.
   6778                             ;Delay 4 ms to allow time for the interrupts to take place.
   6779                             ;Disable reception interrupts.
   6780                             ;-
   6781 034306  004767  165732          JSR     PC,RXIE1        ;ENABLE THE RECEPTION INTERRUPTS.
   6782 034312  012704  000004           MOV     #4,R4           ;PASS 4 MS COUNT TO THE DELAY ROUTINE.
   6783 034316  004767  163756          JSR     PC,DELAY        ;DELAY 4 MILLI-SECONDS.
   6784 034322  004767  165656          JSR     PC,RXIE0        ;DISABLE RECEPTION INTERRUPTS.
   6785                             ;+
   6786                             ; Verify that the correct interrupts took place.
   6787                             ;    Test the int counter to verify that interrupts took place.
   6788                             ;-
   6789 034326  005767  146002           TST     RXINTC          ;CHECK THE RX INTERRUPT COUNT.
   6790 034332  001017                  BNE     6$              ;SKIP THE FOLLOWING ERRORS IF COUNT <> 0.
   6791                             ;+
   6792                             ; Determine reason for no RX interrupts and print proper error message.
   6793                             ;-
   6794 034334  012701  013762          MOV     #EM2604,R1      ;SET UP MSG IN CASE "RX.DATA.AVAIL IS CLR".
   6795 034340  032777  000200  145676  BIT     #BIT7,@CSRA     ;TEST THE RX.DATA.AVAIL BIT OF THE CSR.
   6796 034346  001416                  BEQ     8$              ;GO REPORT ERROR IF RX.DATA.AVAIL IS CLR.
   6797 034350  012701  013674          MOV     #EM2603,R1      ;SET UP MSG IN CASE "DATA.VALID IS CLEAR".
   6798 034354  032777  100000  145664  BIT     #BIT15,@RBUFA   ;TEST THE DATA.VALID BIT OF THE FIFO.
   6799 034362  001410                  BEQ     8$              ;GO REPORT ERROR IF DATA.VALID IS CLEAR.
   6800 034364  012701  013603          MOV     #EM2602,R1      ;SET UP MSG,"DATA.VALID IS SET".
   6801 034370  000405                  BR      8$              ;GO REPORT THE ERROR.
   6802                             ;+
   6803                             ; If RX ints occurred with RX.DATA.AVAIL clear, report the error.
   6804                             ;-
   6805 034372  005767  145740  6$:     TST     RXINTF          ;CHECK THE RX INTERRUPT FLAGS.
   6806 034376  100006                  BPL     10$             ;SKIP THE ERROR IF FLAG IS CLEAR.
   6807 034400  012701  014056          MOV     #EM2605,R1      ;SET UP THE PROPER MESSAGE.
   6808                             ;+
   6809                             ; Report the error which has been found.
   6810                             ;-
   6811 034404                  8$:     ERRDF   2603,EM2601,ER0503;             >>>>> ERROR #2603 <<<<<.
        034404  104455                                                          TRAP    C$ERDF
        034406  005053                                                          .WORD   2603
        034410  013553                                                          .WORD   EM2601
        034412  016470                                                          .WORD   ER0503
   6812                             ;+
   6813                             ; Verify that no TX interrupts have been generated so far in this test.
   6814                             ;-
   6815 034414  016702  145720  10$:     MOV     TXINTC,R2       ;LOAD # OF TX INTERRUPTS FOR ER0504 RTN.
   6816 034420  001406                  BEQ     12$             ;SKIP ERROR IF NO TX INTERRUPTS.
   6817                             ;REPORT "TX INTERRUPTS(S) RECEIVED WITH TX INTERRUPTS DISABLED."
   6818 034422  012701  010003          MOV     #EM0526,R1      ;SET UP MESSAGE ADR FOR INDIRECT PRINT.
   6819 034426                          ERRDF   2604,EM2601,ER0504;             >>>>> ERROR #2604 <<<<<.
        034426  104455                                                          TRAP    C$ERDF
        034430  005054                                                          .WORD   2604
```

```
        034432  013553                                                          .WORD   EM2601
        034434  016514                                                          .WORD   ER0504
  6820                          ;+
  6821                          ; Clean out the interrupt vectors used in this test.
  6822                          ;-
  6823 034436                   12$:    SETPRI  #PRI05          ;DISABLE DEVICE INTERRUPTS.
        034436  012700  000240                                                  MOV     #PRI05,R0
        034442  104441                                                         TRAP    C$SPRI
  6824 034444           CLRVEC  RXVECA          ;RETURN RX INT VECTOR TO UNUSED POOL.
        034444  016700  145562                                                  MOV     RXVECA,R0
        034450  104436                                                         TRAP    C$CVEC
  6825 034452           CLRVEC  TXVECA          ;RETURN TX INT VECTOR TO UNUSED POOL.
        034452  016700  145556                                                  MOV     TXVECA,R0
        034456  104436                                                         TRAP    C$CVEC
  6826                          ;+
  6827                          ; Test transmission interrupts.
  6828                          ;    Set up for RX and TX interrupts:
  6829                          ;    RX interrupt service routine counts RX interrupts.
  6830                          ;    TX interrupt service routine counts the interrupt and sets flags.
  6831                          ;-
  6832 034460  005067  145650           CLR     RXINTC          ;CLEAR THE RX INTERRUPT COUNTER.
  6833 034464  005067  145650           CLR     TXINTC          ;CLEAR THE TX INTERRUPT COUNTER.
  6834 034470  005067  145646           CLR     TXINTF          ;CLEAR THE RX INTERRUPT FLAGS.
  6835 034474          SETVEC  RXVECA,#CACHRX,#PRI05 ;SET UP INTERRUPT VECTOR TO CATCH RX INT.
        034474  012746  000240                                                  MOV     #PRI05,-(SP)
        034500  012746  023636                                                  MOV     #CACHRX,-(SP)
        034504  016746  145522                                                  MOV     RXVECA,-(SP)
        034510  012746  000003                                                  MOV     #3,-(SP)
        034514  104437                                                          TRAP    C$SVEC
        034516  062706  000010                                                  ADD     #10,SP
  6836 034522          SETVEC  TXVECA,#TXINTR,#PRI05 ;SET UP INT VECTOR TO TX INT ROUTINE.
        034522  012746  000240                                                  MOV     #PRI05,-(SP)
        034526  012746  024160                                                  MOV     #TXINTR,-(SP)
        034532  016746  145476                                                  MOV     TXVECA,-(SP)
        034536  012746  000003                                                  MOV     #3,-(SP)
        034542  104437                                                          TRAP    C$SVEC
        034544  062706  000010                                                  ADD     #10,SP
  6837 034550           SETPRI  #PRI00          ;ALLOW INTERRUPTS.
        034550  012700  000000                                                  MOV     #PRI00,R0
        034554  104441                                                         TRAP    C$SPRI
  6838                          ;+
  6839                          ; Verify that the TX_ACTION bit is clear.
  6840                          ;-
  6841 034556  012705  000022           MOV     #18.,R5         ;INITIALIZE THE LOOP COUNTER.
  6842 034562  012701  000144           MOV     #100.,R1        ;SET 100 MS TIME-OUT.
  6843 034566  012702  100000           MOV     #BIT15,R2       ;SELECT TX_ACTION BIT TO TEST.
  6844 034572  016704  145446           MOV     CSRA,R4         ;PASS DUT CSR AS THE WORD TO TEST.
  6845 034576  012703  100000   14$:    MOV     #BIT15,R3       ;WAIT FOR TX_ACTION TO BE SET.
  6846 034602  004767  163646           JSR     PC,MSLOOP       ;WAIT UP TO 100 MS FOR TX_ACTION SET.
  6847 034606  103020                   BCC     20$             ;IF TIME-OUT, CONSIDER TX_ACTION CLEAR.
  6848 034610  005003                   CLR     R3              ;NOW, WAIT FOR TX_ACTION CLEAR.
  6849 034612  004767  163636           JSR     PC,MSLOOP       ;WAIT UP TO 100 MS FOR TX_ACTION CLEAR.
  6850 034616  103005                   BCC     16$             ;IF TIME-OUT, REPORT TX_ACTION WON'T CLEAR.
  6851 034620  005305                   DEC     R5              ;DECREMENT THE TX_ACTION SET COUNTER.
  6852 034622  001365                   BNE     14$             ;LOOP IF NOT TOO MANY TX_ACTIONS FOUND.
  6853                          ;REPORT "TX_ACTION SET REPEATEDLY AFTER RESET, NO DATA SENT."
  6854 034624  012701  014200           MOV     #EM2607,R1      ;SELECT ERROR MESSAGE.
```

```
HARDWARE TEST            - INTA -

 6855 034630  000402                        BR      18$             ;GO TO REPORT THE ERROR.
 6856 034632  012701  014274          16$:   MOV     #EM2608,R1      ;SELECT TX_ACTION STUCK SET MSG.
 6857 034636                          18$:   ERRDF   2605,EM2606,ER0503;              >>>>> ERROR #2605 <<<<<
      034636  104455                                                                  TRAP    C$ERDF
      034640  005055                                                                  .WORD   2605
      034642  014141                                                                  .WORD   EM2606
      034644  016470                                                                  .WORD   ER0503
 6858 034646  000424                        BR      24$             ;GO TO TEST WITH TX_ACTION SET.
 6859                                    ;+
 6860                                    ; Verify that no interrupts occur with TX_ACTION clear.
 6861                                    ;-
 6862 034650  004767  166152          20$:   JSR     PC,TXIE1        ;ENABLE TX_INTERRUPTS.
 6863 034654  012704  000062                 MOV     #50.,R4         ;PASS 50 MS TIME TO THE DELAY ROUTINE.
 6864 034660  004767  163414                 JSR     PC,DELAY        ;DELAY 50 MILLI-SECONDS TO ALLOW INTS TO OCCUR.
 6865 034664  005767  145450                 TST     TXINTC          ;TEST THE TX INTERRUPT COUNT.
 6866 034670  001413                        BEQ     24$             ;SKIP THE ERROR IF NO TX INTERRUPTS.
 6867 034672  012701  014200                 MOV     #EM2607,R1      ;SELECT MESSAGE IN CASE TX INT FLAG CLEAR.
 6868 034676  005767  145440                 TST     TXINTF          ;TEST THE TX INTERRUPT FLAGS.
 6869 034702  100002                        BPL     22$             ;GO REPORT ERROR IF TX FLAG IS CLEAR.
 6870 034704  012701  014345                 MOV     #EM2609,R1      ;TX FLAG IS SET, SELECT PROPER ERROR MESSAGE.
 6871                                    ;REPORT "TRANSMIT INTERRUPT TEST ERROR:..."
 6872 034710                          22$:   ERRDF   2606,EM2606,ER0503;              >>>>> ERROR #2606 <<<<<
      034710  104455                                                                  TRAP    C$ERDF
      034712  005056                                                                  .WORD   2606
      034714  014141                                                                  .WORD   EM2606
      034716  016470                                                                  .WORD   ER0503
 6873                                    ;+
 6874                                    ; Prepare TX interrupt counter and flags.
 6875                                    ;-
 6876 034720  005067  145414          24$:   CLR     TXINTC          ;CLEAR THE TX INTERRUPT COUNT.
 6877 034724  005067  145412                 CLR     TXINTF          ;CLEAR THE TX INTERRUPT FLAGS.
 6878                                    ;+
 6879                                    ; Set up line parameters for transmission.
 6880                                    ;-
 6881 034730  012705  000377                 MOV     #MAPLNS,R5      ;PASS ACTIVE LINES BIT MAP.
 6882 034734  012700  000200                 MOV     #200,R0         ;PASS INERT STATE, INTERNAL LOOPBACK.
 6883 034740  004767  166566                 JSR     PC,WTWLNC       ;DISABLE RECPTION AND DMA, ETC. ON DUT.
 6884 034744  012700  156430                 MOV     #156430,R0      ;SPECIFY 9600BPS,1STOP,NO PARITY,8BITS/CHAR.
 6885 034750  004767  166632                 JSR     PC,WTWLPR       ;WRITE TO ALL LPR REGISTERS.
 6886                                    ;+
 6887                                    ; Send a null char to each line.
 6888                                    ;-
 6889 034754  016701  145266                 MOV     TXCHA,R1        ;SET UP TXCHAR REGISTER ADDRESS.
 6890 034760  012702  100000                 MOV     #100000,R2      ;SET CHARACTER TO BE TRANSMITTED = NULL.
 6891 034764  004767  166572                 JSR     PC,WTWLNS       ;SEND NULL CHAR TO EACH LINE.
 6892                                    ;+
 6893                                    ; Delay 250 milli-seconds to allow interrupts to occur.
 6894                                    ;-
 6895 034770  012704  000372                 MOV     #250.,R4        ;SET UP FOR 250 MS DELAY.
 6896 034774  004767  163300                 JSR     PC,DELAY        ;WAIT 250 MS.
 6897                                    ;+
 6898                                    ; Verify that TX interrupts occurred.
 6899                                    ;-
 6900 035000  005767  145334                 TST     TXINTC          ;CHECK THE TX INTERRUPT COUNTER.
 6901 035004  001007                        BNE     26$             ;SKIP THE FOLLOWING ERROR IF WE GOT TX INTS.
 6902                                    ;+
 6903                                    ; Determine the reason that we received no interrupts.
```

HARDWARE TEST - INTA -

```
6904
6905 035006  012701  014424          ;-
                                        MOV     #EM2610,R1      ;SET UP MSG IN CASE "TX_ACTION IS SET".
6906 035012  005777  145226             TST     @CSRA           ;CHECK THE DUT CSR.
6907 035016  100407                    BMI     28$             ;GO TO REPORT ERROR IF TX_ACTION IS SET.
6908 035020  012701  014516             MOV     #EM2611,R1      ;SET UP "TX_ACTION NOT SET" MESSAGE.
6909                                    ;+
6910                                    ; Check to verify that TX_ACTION was set for each interrupt.
6911                                    ;-
6912 035024  005767  145312     26$:    TST     TXINTF          ;CHECK THE TX INTERRUPT FLAGS.
6913 035030  100006                    BPL     30$             ;SKIP ERROR IF TX_ACTION CLR FLAG IS CLEAR.
6914 035032  012701  014345             MOV     #EM2609,R1      ;SET UP TX INT WITH "TX_ACTION CLR" MSG.
6915                                    ;+
6916                                    ; Report "TRANSMIT INTERRUPT TEST ERROR:...."
6917                                    ;-
6918 035036                     28$:    ERRDF   2607,EM2606,ER0503;             >>>>> ERROR #2607 <<<<<.
     035036  104455                                                                   TRAP    C$ERDF
     035040  005057                                                                   .WORD   2607
     035042  014141                                                                   .WORD   EM2606
     035044  016470                                                                   .WORD   ER0503
6919                                    ;+
6920                                    ; Verify that no TX interrupts have been generated so far in this test.
6921                                    ;-
6922 035046  016702  145262     30$:    MOV     RXINTC,R2       ;LOAD # OF RX INTERRUPTS FOR ER0504 RTN.
6923 035052  001406                    BEQ     32$             ;SKIP ERROR IF NO RX INTERRUPTS.
6924 035054  012701  007713             MOV     #EM0525,R1      ;SET UP MESSAGE ADR FOR INDIRECT PRINT.
6925                                ;REPORT "RX INTERRUPTS(S) RECEIVED WITH RX INTERRUPTS DISABLED."
6926 035060                             ERRDF   2608,EM2606,ER0504;             >>>>> ERROR #2608 <<<<<.
     035060  104455                                                                   TRAP    C$ERDF
     035062  005060                                                                   .WORD   2608
     035064  014141                                                                   .WORD   EM2606
     035066  016514                                                                   .WORD   ER0504
6927                                    ;+
6928                                    ; Disable interrupts and clean out the interrupt vectors used in this test.
6929                                    ;-
6930 035070  005001     32$:    CLR     R1              ;CLEAR BOTH TRANSMITTER
6931 035072  004767  165670             JSR     PC,TXIE0        ; INTERRUPT ENABLE AND RECEIVER
6932 035076  004767  165102             JSR     PC,RXIE0        ; INTERRUPT ENABLE BITS IN THE DUT CSR.
6933 035102                             SETPRI  #PRI05          ;DISABLE DEVICE INTERRUPTS.
     035102  012700  000240                                                         MOV     #PRI05,R0
     035106  104441                                                                 TRAP    C$SPRI
6934 035110                             CLRVEC  RXVECA          ;RETURN RX INT VECTOR TO UNUSED POOL.
     035110  016700  145116                                                         MOV     RXVECA,R0
     035114  104436                                                                 TRAP    C$CVEC
6935 035116                             CLRVEC  TXVECA          ;RETURN TX INT VECTOR TO UNUSED POOL.
     035116  016700  145112                                                         MOV     TXVECA,R0
     035122  104436                                                                 TRAP    C$CVEC
6936
6937 035124  005067  145222     60$:    CLR     CTRLCF          ;INDICATE THAT WE ARE NOT WITHIN A TEST.
6938
6939 035130                             ENDTST
     035130                                                                 L10055:
     035130  104401                                                                 TRAP    C$ETST
6940
```

```
                                .SBTTL  HARDWARE TEST           - BRLEVA -
                                ;** ************************************************************************
                                ;*                      - BR Level Test B -
                                ;*      This test verifies that the Device Under Test (DUT) will generate
                                ;*      reception and transmission interrupts at the correct BR level.
                                ;*      This test does not depend on the use of the serial line transmission
                                ;*      or reception capabilities of the DUT.  The lines are put in internal
                                ;*      loopback to minimize any external effects that could be caused on
                                ;*      devices attached to the serial lines.
                                ;*
                                ;-- ************************************************************************

035132                                  BGNTST
035132                                                                          T25::
                 000031                  TNUM == TNUM + 1       ;INCREMENT THE ASSEMBLY TIME TEST COUNTER.
035132  012767  000031  145166           MOV     #TNUM,TSTNUM   ;SET UP THE TEST NUMBER.        (30)
035140  012767  177777  145204           MOV     #-1,CTRLCF     ;INDICATE THAT WE ARE IN A TEST.
035146  012767  000001  146612           MOV     #1,ERRTYP      ;SET ERROR TYPE AS FATAL IN ERROR TABLE.
035154  012767  005671  146606           MOV     #3001.,ERRNBR  ;SET THE FIRST ERROR NUMBER IN ERROR TABLE.
035162  012767  014601  146602           MOV     #EM3001,ERRMSG ;SET ERROR MESSAGE ADDRESS IN ERRTBL.
035170  005067  145266                   CLR     ERSMRF         ;INITIALIZE THE "REPORT ERROR SUMMARY" FLAGS.
                                ;+
                                ; Reset the DUT to a known state, do not remove the status codes from the fifo.
                                ;  Clear TX and RX interrupt enable bits in the CSR.
                                ; This subroutine reports errors from >>>>> 3001 thru 3002 <<<<<.
                                ;-
035174  004767  164256                  JSR     PC,RESETT      ;RESET THE DHV11-M, REPORT ANY ERRORS FOUND.
035200  103402                          BCS     2$             ;SKIP AROUND ABORTING TEST IF NO ERROR FOUND.
035202  000167  000572                  JMP     60$            ;ABORT TEST IF FATAL ERROR FOUND DURING RESET.
035206  012767  005673  146554  2$:      MOV     #3003.,ERRNBR  ;SET THE ERROR REPORT NUMBER TO 3003.
                                ;+
                                ; Enable transmitters on all lines.
                                ;-
035214  012705  000377          4$:      MOV     #MAPLNS,R5     ;PASS ACTIVE LINE BIT MAP.
035220  004767  165446                  JSR     PC,TXENBL      ;ENABLE TRANSMISSION ON ALL LINES.
                                ;+
                                ; Generate a transmission interrupt request.
                                ; Processor priority should be at 7 disabling ints.
                                ;-
035224                                  SETPRI  #PRI07         ;DISABLE ALL INTERRUPTS.
035224  012700  000340                                                          MOV     #PRI07,R0
035230  104441                                                                  TRAP    C$SPRI
035232                                  SETVEC  TXVECA,#TXINTR,#PRI07 ;SET UP INTERRUPT VECTOR TO CATCH TX INT.
035232  012746  000340                                                          MOV     #PRI07,-(SP)
035236  012746  024160                                                          MOV     #TXINTR,-(SP)
035242  016746  144766                                                          MOV     TXVECA,-(SP)
035246  012746  000003                                                          MOV     #3,-(SP)
035252  104437                                                                  TRAP    C$SVEC
035254  062706  000010                                                          ADD     #10,SP
                                    ;+
                                    ; Set up DUT for transmission interrupts:
                                    ;  Set up internal loopback.
                                    ;  Set up line parameters for transmission.
                                    ;-
035260  012705  000377                   MOV     #MAPLNS,R5     ;PASS ACTIVE LINES BIT MASK.
035264  012700  000200                   MOV     #200,R0        ;PASS INERT STATE, INTERNAL LOOPBACK.
035270  004767  166236                  JSR     PC,WTWLNC      ;DISABLE RECPTION AND DMA, ETC. ON DUT.
```

```
 6990 035274  012700  156430                MOV     #156430,R0      ;SPECIFY 9600BPS,1STOP,NO PARITY,8BITS/CHAR.
 6991 035300  004767  166302                JSR     PC,WTWLPR       ;WRITE INTO ALL LPR REGISTERS.
 6992                                    ;+
 6993                                    ; Send a null char to each line.
 6994                                    ;-
 6995 035304  016701  144736                MOV     TXCHA,R1        ;SET UP TXCHAR REGISTER ADDRESS.
 6996 035310  012702  100000                MOV     #100000,R2      ;SET CHARACTER TO BE TRANSMITTED = NULL.
 6997 035314  004767  166242                JSR     PC,WTWLNS       ;SEND NULL CHAR TO EACH LINE.
 6998                                    ;+
 6999                                    ; Delay 50 ms to allow time for the interrupt to be generated.
 7000                                    ;-
 7001 035320  012704  000062                MOV     #50.,R4         ;PASS 50 MS TIME TO THE DELAY ROUTINE.
 7002 035324  004767  162750                JSR     PC,DELAY        ;DELAY 50 MILLI-SECONDS.
 7003                                ;+
 7004                                ; Generate a reception interrupt request.
 7005                                ;-
 7006 035330                                SETVEC  RXVECA,#RXBRRT,#PRI07 ;SET UP INTERRUPT VECTOR TO CATCH RX INT.
      035330  012746  000340                                                MOV     #PRI07,-(SP)
      035334  012746  023762                                                MOV     #RXBRRT,-(SP)
      035340  016746  144666                                                MOV     RXVECA,-(SP)
      035344  012746  000003                                                MOV     #3,-(SP)
      035350  104437                                                        TRAP    C$SVEC
      035352  062706  000010                                                ADD     #10,SP
 7007                                ;+
 7008                                ; Set up for the loop which tests the interrupt BR levels.
 7009                                ;-
 7010 035356  012705  000340                MOV     #340,R5         ;SET UP THE PRIORITY LEVEL TO 7.
 7011 035362  005003                        CLR     R3              ;CLEAR THE RX PRIORITY STORE AND FLAGS.
 7012 035364  005002                        CLR     R2              ;CLEAR THE TX PRIORITY STORE AND FLAGS.
 7013                                    ;+
 7014                                    ; Enable TX and RX interrupts.
 7015                                    ; Processor priority should be at 7 disabling the interrupts.
 7016                                    ;-
 7017 035366  004767  164652                JSR     PC,RXIE1        ;ENABLE RECEIVER INTERRUPTS.
 7018 035372  004767  165430                JSR     PC,TXIE1        ;ENABLE TRANSMITTER INTERRUPTS.
 7019                                ;+
 7020                                ; Loop, lowering the processor priority until the DUT interrupts on RX and TX.
 7021                                ;-
 7022 035376  005067  144736        6$:     CLR     TXINTC          ;CLEAR THE TX INTERRUPT COUNTER.
 7023 035402  005067  144734                CLR     TXINTF          ;CLEAR THE TX INTERRUPT FLAGS.
 7024 035406  005067  144722                CLR     RXINTC          ;CLEAR THE RX INTERRUPT COUNTER.
 7025 035412  005067  144720                CLR     RXINTF          ;CLEAR THE RX INTERRUPT FLAGS.
 7026 035416                                SETPRI  R5              ;SET PROCESSOR PRIORITY TO THE SELECTED VALUE.
      035416  010500                                                MOV     R5,R0
      035420  104441                                                TRAP    C$SPRI
 7027 035422  012704  000001                MOV     #1,R4           ;PASS 1 MS COUNT TO THE DELAY ROUTINE.
 7028 035426  004767  162646                JSR     PC,DELAY        ;DELAY 1 MS TO ALLOW INTERRUPTS TO OCCUR.
 7029                                    ;+
 7030                                    ; Determine if any RX DUT interrupts occurred.
 7031                                    ; Log the processor priority for the RX interrupt if first RX int.
 7032                                    ;-
 7033 035432  005767  144676                TST     RXINTC          ;CHECK THE RECEIVE INTERRUPT COUNTER.
 7034 035436  001412                        BEQ     8$              ;SKIP THE PRIORITY LOG IF NO RX INT OCCURRED.
 7035                                    ;+
 7036                                    ; If this is the first RX interrupt, log the priority.
 7037                                    ;-
 7038 035440  005703                        TST     R3              ;CHECK THE RX PRIORITY STORE AND FLAGS.
```

```
 7039 035442  001010                        BNE     8$              ;GOTO TEST FOR TX INTS IF NOT THE FIRST RX INT.
 7040 035444  010503                         MOV     R5,R3           ;LOG THE PRESENT PRIORITY IN THE RX PRIO STORE.
 7041 035446  052703  100000                 BIS     #BIT15,R3       ;SET THE RX INT HAS OCCURRED FLAG.
 7042 035452  016700  144660                 MOV     RXINTF,R0       ;GET THE RX INTERRUPT ROUTINE FLAGS.
 7043 035456  042700  137777                 BIC     #137777,R0      ;CLEAR ALL BUT THE TX INT ERROR FLAG.
 7044 035462  050003                         BIS     R0,R3           ;IF TX INT ERROR, SET BIT 14 OF THE PRIO FLAGS.
 7045                                    ;+
 7046                                    ; Determine if any TX DUT interrupts have occurred.
 7047                                    ; Log the present processor priority if this is the first TX interrupt.
 7048                                    ;-
 7049 035464  005767  144650        8$:      TST     TXINTC          ;CHECK THE TRANSMIT INTERRUPT COUNTER.
 7050 035470  001405                        BEQ     10$             ;SKIP THE PRIORITY LOG IF NO TX INT OCCURRED.
 7051                                       ;+
 7052                                       ; If this is the first TX interrupt, log the priority.
 7053                                       ;-
 7054 035472  005702                         TST     R2              ;CHECK THE TX PRIORITY STORE AND FLAGS.
 7055 035474  100403                        BMI     10$             ;SKIP THE LOGGING IF NOT FIRST TX INTERRUPT.
 7056 035476  010502                         MOV     R5,R2           ;LOG THE PRESENT PRIORITY IN THE TX PRIO STORE.
 7057 035500  052702  100000                 BIS     #BIT15,R2       ;SET THE TX INT HAS OCCURRED FLAG.
 7058                                    ;+
 7059                                    ; Select next processor priority.
 7060                                    ; Test for both RX and TX interrupts having occurred, loop if not.
 7061                                    ;-
 7062 035504  162705  000040        10$:     SUB     #40,R5          ;DECREMENT PRIORITY LEVEL BY ONE.
 7063 035510  002402                        BLT     12$             ;GOTO CHECK FOR ERRORS IF BELOW PRIORITY ZERO.
 7064 035512  030203                         BIT     R2,R3           ;AND PRIO FLAGS TOGETHER, ALTER NONE OF THEM.
 7065 035514  100330                        BPL     6$              ;LOOP IF RX AND TX INTS HAVEN'T BOTH OCCURRED.
 7066                                    ;+
 7067                                    ; Disable interrupts and clear interrupt vectors.
 7068                                    ;-
 7069 035516                        12$:     SETPRI  #PRI07          ;DISABLE ALL INTERRUPTS.
      035516  012700  000340                                                             MOV     #PRI07,R0
      035522  104441                                                                    TRAP    C$SPRI
 7070 035524                                CLRVEC  RXVECA          ;RETURN RX INT VECTOR TO UNUSED POOL.
      035524  016700  144502                                                             MOV     RXVECA,R0
      035530  104436                                                                    TRAP    C$CVEC
 7071 035532                                CLRVEC  TXVECA          ;RETURN TX INT VECTOR TO UNUSED POOL.
      035532  016700  144476                                                             MOV     TXVECA,R0
      035536  104436                                                                    TRAP    C$CVEC
 7072                                    ;+
 7073                                    ; Verify that RX and TX interrupts occurred,
 7074                                    ; at the proper BR level, and
 7075                                    ; in the proper order.
 7076                                    ;    Determine if TX interrupt occurred.
 7077                                    ;-
 7078 035540  005702                         TST     R2              ;DETERMINE WHETHER TX INT OCCURRED OR NOT.
 7079 035542  100414                        BMI     16$             ;SKIP THESE ERRORS IF TX INT OCCURRED.
 7080                                    ;+
 7081                                    ; Determine reason that no TX int occurred.
 7082                                    ;-
 7083 035544  012701  014424                 MOV     #EM2610,R1      ;SELECT "NO TX INT FROM TX.ACTION" MESSAGE.
 7084 035550  005777  144470                 TST     @CSRA           ;CHECK THE TX.ACTION BIT OF THE DUT CSR.
 7085 035554  100402                        BMI     14$             ;SKIP TX.ACTION CLR MSG SELECTION IF IT IS SET.
 7086 035556  012701  014516                 MOV     #EM2611,R1      ;SELECT "TX.ACTION CLEAR AFTER CHARS SENT" MSG.
 7087                                    ;REPORT "INTERRUPT BR LEVEL TEST ERROR:"
 7088 035562                        14$:     ERRDF   3003,EM3001,ER0503;             >>>>> ERROR #3003 <<<<<.
      035562  104455                                                                    TRAP    C$ERDF
```

```
                035564  005673                                                                  .WORD   3003
                035566  014601                                                                  .WORD   EM3001
                035570  016470                                                                  .WORD   ER0503
  7089          035572  000423                  BR      18$             ;SKIP THE BR LEVEL CHECK, NO TX INT OCCURRED.
  7090                                          ;+
  7091                                          ; Verify that the TX interrupt was at the proper BR level.
  7092                                          ;-
  7093          035574  010204          16$:    MOV     R2,R4           ;CALCULATE THE BR LEVEL
  7094          035576  042704  177400          BIC     #177400,R4      ; THAT THE TRANMSIT
  7095          035602  006204                  ASR     R4              ; INTERRUPT WAS
  7096          035604  006204                  ASR     R4              ; REQUESTED AT, WHICH
  7097          035606  006204                  ASR     R4              ; IS ONE GREATER THAN
  7098          035610  006204                  ASR     R4              ; THE PROCESSOR PRIORITY
  7099          035612  006204                  ASR     R4              ; LEVEL AT WHICH THE
  7100          035614  005204                  INC     R4              ; TRANSMIT INTERRUPT OCCURRED.
  7101          035616  116705  144420          MOVB    BRLEVL,R5       ;GET THE EXPECTED INTERRUPT BR LEVEL.
  7102          035622  120405                  CMPB    R4,R5           ;COMARE THE INTERRUPT BR LEVEL WITH EXPECTED.
  7103          035624  001406                  BEQ     18$             ;SKIP THE ERROR IF BR LEVEL IS CORRECT.
  7104                                          ;REPORT "TX INTERRUPT GENERATED AT WRONG BR LEVEL: ..."
  7105          035626  012701  014726          MOV     #EM3003,R1      ;SELECT THE ERROR MESSAGE FOR THE ERROR CALL.
  7106          035632                          ERRDF   3004,EM3001,ER3001;             >>>>> ERROR #3004 <<<<<.
                035632  104455                                                                  TRAP    C$ERDF
                035634  005674                                                                  .WORD   3004
                035636  014601                                                                  .WORD   EM3001
                035640  017070                                                                  .WORD   ER3001
  7107                                          ;+
  7108                                          ; Determine if RX interrupt occurred.
  7109                                          ;-
  7110          035642  005703          18$:    TST     R3              ;CHECK THE RX INT OCCURRED FLAG.
  7111          035644  100415                  BMI     22$             ;SKIP THESE ERRORS IF RX INT OCCURRED.
  7112                                          ;+
  7113                                          ; Determine reason that no RX int occurred.
  7114                                          ;-
  7115          035646  012701  013603          MOV     #EM2602,R1      ;SELECT "NO RX INT FROM TX.ACTION" MSG.
  7116          035652  032777  000200  144364  BIT     #BIT7,@CSRA     ;CHECK THE RX.DATA.AVAIL BIT OF THE DUT CSR.
  7117          035660  001002                  BNE     20$             ;SKIP RX.DATA.AVAIL CLR MSG IF BIT IS SET.
  7118          035662  012701  014632          MOV     #EM3002,R1      ;SELECT "NO RX.DATA.AVAIL AFTER RESET" MSG.
  7119                                          ;REPORT "INTERRUPT BR LEVEL TEST ERROR:"
  7120          035666                  20$:    ERRDF   3005,EM3001,ER0503;             >>>>> ERROR #3005 <<<<<.
                035666  104455                                                                  TRAP    C$ERDF
                035670  005675                                                                  .WORD   3005
                035672  014601                                                                  .WORD   EM3001
                035674  016470                                                                  .WORD   ER0503
  7121          035676  000423                  BR      24$             ;SKIP THE BR CHECK IF NO RX INT OCCURRED.
  7122                                          ;+
  7123                                          ; Verify that the RX interrupt was at the proper BR level.
  7124                                          ;-
  7125          035700  010304          22$:    MOV     R3,R4           ;CALCULATE THE BR LEVEL
  7126          035702  042704  177400          BIC     #177400,R4      ; THAT THE RECEIVE
  7127          035706  006204                  ASR     R4              ; INTERRUPT WAS
  7128          035710  006204                  ASR     R4              ; REQUESTED AT, WHICH
  7129          035712  006204                  ASR     R4              ; IS ONE GREATER THAN
  7130          035714  006204                  ASR     R4              ; THE PROCESSOR PRIORITY
  7131          035716  006204                  ASR     R4              ; LEVEL AT WHICH THE
  7132          035720  005204                  INC     R4              ; RECEIVE INTERRUPT OCCURRED.
  7133          035722  116705  144314          MOVB    BRLEVL,R5       ;GET THE EXPECTED INTERRUPT BR LEVEL.
  7134          035726  120405                  CMPB    R4,R5           ;COMARE THE INTERRUPT BR LEVEL WITH EXPECTED.
```

```
                        BEQ     24$             ;SKIP THE ERROR IF BR LEVEL IS CORRECT.
                    ;REPORT "RX INTERRUPT GENERATED AT WRONG BR LEVEL: ..."
                        MOV     #EM3004,R1      ;SELECT ERROR MESSAGE FOR THE ERROR CALL.
                        ERRDF   3006,EM3001,ER3001;             >>>>> ERROR #3006 <<<<<.
                                                                        TRAP    C$ERDF
                                                                        .WORD   3006
                                                                        .WORD   EM3001
                                                                        .WORD   ER3001

                    ;+
                    ; Test for interrupts occuring in the proper order.
                    ;-
24$:                    BIT     #BIT14,R3       ;CHECK THE IMPROPER INT ORDER ERROR FLAG.
                        BEQ     26$             ;SKIP ERROR REPORT IF ERROR DID NOT OCCUR.
                    ;REPORT "TX INTERRUPT GIVEN PRECEDENCE OVER SIMULTANEOUS RX INT."
                        MOV     #EM3005,R1      ;SELECT THE ERROR MESSAGE FOR INDIRECT PRINT.
                        ERRDF   3007,EM3001,ER0503;             >>>>> ERROR #3007 <<<<<.
                                                                        TRAP    C$ERDF
                                                                        .WORD   3007
                                                                        .WORD   EM3001
                                                                        .WORD   ER0503

                    ;+
                    ; Clean up, exit the test.
                    ;-
26$:    004767  164772  JSR     PC,TXIE0        ;CLEAR TRANSMITTER INTERRUPTS.
        004767  164204  JSR     PC,RXIE0        ;CLEAR RECEIVER INTERRUPTS.
60$:    005067  144346   CLR    CTRLCF          ;INDICATE THAT WE ARE NOT WITHIN A TEST.
                        SETPRI  #PRI05          ;DISABLE ALL BUT LTC INTERRUPTS.
        012700  000240                                                  MOV     #PRI05,R0
        104441                                                          TRAP    C$SPRI
                        ENDTST
                                                                L10056:
                                                                        TRAP    C$ETST
```

```
                                .SBTTL  HARDWARE TEST           - DIABMP -
                                ;** ****************************************************************************
                                ;*                          - Diagnostic field (BMP) Test -
                                ;*      This test verifies that a request to the DUT to report BMP status
                                ;*      codes is complied with, within the specified time.
                                ;*      All active lines are tested.
                                ;-- ****************************************************************************

036014                                  BGNTST
036014                                                                          T26::
            000032                       TNUM == TNUM + 1           ;INCREMENT THE ASSEMBLY TIME TEST COUNTER.
036014  012767  000032  144304           MOV    #TNUM,TSTNUM        ;SET UP THE TEST NUMBER.        (31)
036022  012767  177777  144322           MOV    #-1,CTRLCF          ;INDICATE THAT WE ARE IN A TEST.
036030  012767  000001  145730           MOV    #1,ERRTYP           ;SET ERROR TYPE AS FATAL IN ERROR TABLE.
036036  012767  006035  145724           MOV    #3101.,ERRNBR       ;SET THE FIRST ERROR NUMBER IN ERROR TABLE.
036044  012767  015150  145720           MOV    #EM3101,ERRMSG      ;SET ERROR MESSAGE ADDRESS IN ERRTBL.
036052  012767  017422  145714           MOV    #ER9101,ERRBLK      ;SELECT THE CORRECT ERROR REPORTING ROUTINE.
                                ;+
                                ; Reset the DUT to a known state, remove the status codes from the fifo.
                                ;  Clear TX and RX interrupt enable bits in the CSR.
                                ; This subroutine reports error >>>>> 3101 <<<<<.
                                ;-
036060  004767  162072                   JSR    PC,CLNRST           ;RESET THE DHV11-M, REPORT ANY ERRORS FOUND.
036064  103077                           BCC    60$                 ;RESET FAILURE?, ABORT THIS TEST.
                                ;+
                                ; Test all active lines individually.
                                ; Write the request code to the diagnostic field in the LPR register.
                                ; Verify that a BMP code is returned within the correct time.
                                ;-
036066  016705  144144                   MOV    ACTLNS,R5           ;GET THE ACTIVE LINE BIT MAP.
036072  005004                           CLR    R4                  ;CLEAR THE LINE NUMBER COUNTER.
036074  016703  144144                   MOV    CSRA,R3             ;GET THE ADDRESS OF THE DUT'S CSR.
036100  000241                  2$:      CLC                        ;CLEAR THE CARRY BIT PRIOR TO SHIFTING BIT MAP.
036102  006005                           ROR    R5                  ;SHIFT THE BIT MAP INTO THE CARRY BIT.
036104  103064                          BCC     8$                  ;DO NOT TEST THE LINE IF IT IS INACTIVE.
                                    ;+
                                    ; Select the line under test.
                                    ;  Write the BMP request code to the DIAG field in the LPR register.
                                    ;-
036106  012767  006036  145654           MOV    #3102.,ERRNBR       ;SET THE ERROR NUMBER TO 3102.
036114  010413                           MOV    R4,(R3)             ;SELECT THE LINE CURRENTLY UNDER TEST.
036116  052777  000002  144124           BIS    #2,@LPRA            ;WRITE THE BMP REQUEST CODE TO THE LPR.
                                  ;+
                                  ; Wait for BMP request code to be cleared, report error if time-out
                                  ; occurs.
                                  ;-
036124  012701  010764                    MOV    #10764,R1           ;TEST BIT 1, TIMEOUT OF 500 MILLI SECS.
036130  016702  144114                    MOV    LPRA,R2             ;PASS THE ADDRESS OF THE REGISTER TO TEST.
036134  004767  165046                   JSR     PC,WAIBIC           ;WAIT FOR REQUEST CODE TO CLEAR.
036140  103042                           BCC     6$                  ;GO REPORT ERROR IF CODE DID NOT CLEAR IN TIME.
                                  ;+
                                  ; Wait for BMP code to appear in the fifo, report error if time-out
                                  ; occurs.
                                  ;-
036142  005267  145622                    INC    ERRNBR              ;SET ERROR NUMBER TO 3103.
036146  012701  070012                    MOV    #70012,R1           ;TEST BIT 7, TIMEOUT OF 10 MILLI SECS.
036152  016702  144066                    MOV    CSRA,R2             ;PASS THE ADDRESS OF THE REGISTER TO TEST.
```

```
 7214 036156  004767  165100                    JSR     PC,WAIBIS       ;WAIT FOR RX_DATA_AVAILABLE TO SET.
 7215 036162  103031                            BCC     6$              ;GO REPORT ERROR IF CODE DID NOT CLEAR IN TIME.
 7216                                          ;+
 7217                                          ; Read the BMP code (if it is there) from the RBUF register.
 7218                                          ; Determine if it is a valid BMP code,
 7219                                          ; Verify the BMP code was received from the correct channel.
 7220                                          ; If the BMP code does not indicate DUT running ok, then save it on
 7221                                          ; the queue to be reported in a later test.
 7222                                          ;-
 7223 036164  005267  145600                    INC     ERRNBR          ;SET ERROR NUMBER TO 3104.
 7224 036170  017702  144052                    MOV     @RBUFA,R2       ;GET THE BMP CODE FROM THE FIFO.
 7225 036174  100024                           BPL     6$              ;GO REPORT ERROR IF NO BMP CODE FOUND.
 7226 036176  005267  145566                    INC     ERRNBR          ;SET ERROR NUMBER TO 3105.
 7227 036202  012700  170301                    MOV     #170301,R0      ;SET-UP A BMP CODE MASK.
 7228 036206  040200                            BIC     R2,R0           ;TRY TO CLEAR THE BMP MASK.
 7229 036210  001016                           BNE     6$              ;GO REPORT ERROR IF IT IS NOT A VALID BMP CODE.
 7230 036212  005267  145552                    INC     ERRNBR          ;SET THE ERROR NUMBER TO 3106.
 7231 036216  010200                            MOV     R2,R0           ;COPY THE BMP CODE.
 7232 036220  000300                            SWAB    R0              ;PUT THE LINE NUMBER IN THE LOW BYTE.
 7233 036222  042700  177760                    BIC     #177760,R0      ;CLEAR THE UNWANTED BITS.
 7234 036226  120400                            CMPB    R4,R0           ;DID THE BMP CODE COME FROM THE CORRECT LINE?.
 7235 036230  001006                           BNE     6$              ;NO; GO REPORT ERROR.
 7236 036232  120227  000305                    CMPB    R2,#305         ;IS THE BMP CODE A "GOOD ONE"?.
 7237 036236  001407                           BEQ     8$              ;YES; SKIP SAVING THE BMP CODE ON THE QUEUE.
 7238 036240  004767  164024                    JSR     PC,SAVBMP       ;SAVE THE BMP CODE ON THE QUEUE.
 7239 036244  000404                           BR      8$              ;GO SEE IF THERE ARE ANY MORE LINE TO TEST.
 7240
 7241 036246  010401                  6$:       MOV     R4,R1           ;PASS THE LINE NUMBER TO BE REPORTED.
 7242 036250  012702  015204                    MOV     #EM3102,R2      ;PASS THE ERROR MESSAGE TO BE REPORTED.
 7243                                          ;"BMP REQUEST BIT BAD ON LINE:"
 7244 036254                                   ERROR                   ;               >>>>> ERROR <<<<<.
      036254  104460                                                                     TRAP    C$ERROR
 7245                                          ;+
 7246                                          ; Verify all active lines have been tested.
 7247                                          ;-
 7248 036256  005204                  8$:       INC     R4              ;INCREMENT THE LINE NUMBER COUNTER.
 7249 036260  005705                            TST     R5              ;ARE THERE ANY MORE ACTIVE LINES TO TEST?.
 7250 036262  001306                           BNE     2$              ;YES; BRANCH TO TEST THE NEXT LINE.
 7251 036264  005067  144062          60$:      CLR     CTRLCF          ;INDICATE THAT WE ARE NOT WITHIN A TEST.
 7252 036270                                   ENDTST
      036270                                                                  L10057:
      036270  104401                                                                 TRAP    C$ETST
```

```
                                        .SBTTL  HARDWARE TEST           - REPBMP -
                                        ;++ ******************************************************************************
                                        ;*                      - Report any BMP codes in the queue -
                                        ;*      This is a pseudo-test used to report any BMP codes that were found
                                        ;*      in the DUT's FIFO during previous test, and logged in the BMP code
                                        ;*      queue.
                                        ;*      It is unlikely that running this pseudo-test alone will produce any
                                        ;*      error reports.
                                        ;*
                                        ;-- ******************************************************************************
036272                                          BGNTST
036272                                                                                  T27::
          000033                                 TNUM == TNUM + 1        ;INCREMENT THE ASSEMBLY TIME TEST COUNTER.
036272    012767  000033  144026                 MOV     #TNUM,TSTNUM    ;SET UP THE TEST NUMBER.        (93)
036300    012767  177777  144044                 MOV     #-1,CTRLCF      ;INDICATE THAT WE ARE IN A TEST.
036306    016702  144212                         MOV     BMPCQP,R2       ;GET THE CONTENTS OF THE POINTER.
036312    012703  002526                         MOV     #BMPCQB,R3      ;GET THE START ADDRESS OF THE QUEUE.
036316    020203                                 CMP     R2,R3           ;SEE IF THE POINTER HAS MOVED FROM THE BASE.
036320    001411                                BEQ     60$             ;EXIT NO CODES IN THE QUEUE.
                                        ;+
                                        ; There is at least one BMP code in the queue. Report the error.
                                        ;-
                                                ;Report error BMP CODE FOUND IN TEST nn, BMP CODE:nnnnnn"

036322    012701  016013                        MOV     #EM9304,R1      ;PASS THE FIRST MESSAGE TO BE REORTED.
036326                                          ERRDF   9301,EM9301,ER9301 ;            >>>>> ERROR #9301 <<<<<.
036326    104455                                                                                TRAP    C$ERDF
036330    022125                                                                                .WORD   9301
036332    015676                                                                                .WORD   EM9301
036334    017450                                                                                .WORD   ER9301

036336    012767  002526  144160                 MOV     #BMPCQB,BMPCQP  ;SET POINTER BACK TO THE BEGINING OF THE QUE.

036344    005067  144002          60$:           CLR     CTRLCF          ;INDICATE THAT WE ARE NOT WITHIN A TEST.
036350                                          ENDTST
036350                                                                                  L10060:
036350    104401                                                                                TRAP    C$ETST
```

```
                        ;*****************************************************************************************************
                        ;
                        ;               VDHA.HWQ
                        ;
                        ;*****************************************************************************************************


                        .SBTTL  HARDWARE PARAMETER CODING SECTION



                        ;++
                        ; THE HARDWARE PARAMETER CODING SECTION CONTAINS MACROS
                        ; THAT ARE USED BY THE SUPERVISOR TO BUILD P-TABLES.  THE
                        ; MACROS ARE NOT EXECUTED AS MACHINE INSTRUCTIONS BUT ARE
                        ; INTERPRETED BY THE SUPERVISOR AS DATA STRUCTURES.  THE
                        ; MACROS ALLOW THE SUPERVISOR TO ESTABLISH COMMUNICATIONS
                        ; WITH THE OPERATOR.
                        ;--

036352                          BGNHRD
036352  000022                                                  .WORD L10061-L$HARD/2
036354                                                  L$HARD::

                        ;DEVICE CSR ADDRESS QUESTION:
036354                          GPRMA   HWPTQ1,0,0,160000,177776,YES
036354  000031                                                  .WORD   T$CODE
036356  036420                                                  .WORD   HWPTQ1
036360  160000                                                  .WORD   T$LOLIM
036362  177776                                                  .WORD   T$HILIM
                        ;DEVICE INTERRUPT VECTOR QUESTION:
036364                          GPRMA   HWPTQ2,2,0,40,776,YES
036364  001031                                                  .WORD   T$CODE
036366  036436                                                  .WORD   HWPTQ2
036370  000040                                                  .WORD   T$LOLIM
036372  000776                                                  .WORD   T$HILIM
                        ;ACTIVE LINES BIT MAP QUESTION:
036374                          GPRMD   HWPTQ3,4,0,MAPLNS,0,177777,YES
036374  002032                                                  .WORD   T$CODE
036376  036471                                                  .WORD   HWPTQ3
036400  000377                                                  .WORD   MAPLNS
036402  000000                                                  .WORD   T$LOLIM
036404  177777                                                  .WORD   T$HILIM
                        ;INTERRUPT BR LEVEL QUESTION:
036406                          GPRMD   HWPTQ5,6,0,377,0,6,YES
036406  003032                                                  .WORD   T$CODE
036410  036517                                                  .WORD   HWPTQ5
036412  000377                                                  .WORD   377
036414  000000                                                  .WORD   T$LOLIM
036416  000006                                                  .WORD   T$HILIM


036420                          ENDHRD
                                                                .EVEN
036420                                                  L10061:
```

```
 7338 036420    103    123    122         HWPTQ1: .ASCIZ  /CSR ADDRESS: /
      036423    040    101    104
      036426    104    122    105
      036431    123    123    072
      036434    040    000
 7339 036436    111    116    124         HWPTQ2: .ASCIZ  /INTERRUPT VECTOR ADDRESS: /
      036441    105    122    122
      036444    125    120    124
      036447    040    126    105
      036452    103    124    117
      036455    122    040    101
      036460    104    104    122
      036463    105    123    123
      036466    072    040    000
 7340 036471    101    103    124         HWPTQ3: .ASCIZ  /ACTIVE LINE BIT MAP: /
      036474    111    126    105
      036477    040    114    111
      036502    116    105    040
      036505    102    111    124
      036510    040    115    101
      036513    120    072    040
      036516    000
 7341 036517    111    116    124         HWPTQ5: .ASCIZ  /INTERRUPT BR LEVEL: /
      036522    105    122    122
      036525    125    120    124
      036530    040    102    122
      036533    040    114    105
      036536    126    105    114
      036541    072    040    000
 7342
 7343                                     .EVEN
```

```
 7346                                            ;***************************************************************************
*
 7347                                            ;
 7348                                            ;                VDHA.SWQ
 7349                                            ;
 7350                                            ;***************************************************************************
*
 7352
 7353
 7354                                            .SBTTL  SOFTWARE PARAMETER CODING SECTION
 7355
 7356                                            ;++
 7357                                            ; THE SOFTWARE PARAMETER CODING SECTION CONTAINS MACROS
 7358                                            ; THAT ARE USED BY THE SUPERVISOR TO BUILD P-TABLES.  THE
 7359                                            ; MACROS ARE NOT EXECUTED AS MACHINE INSTRUCTIONS BUT ARE
 7360                                            ; INTERPRETED BY THE SUPERVISOR AS DATA STRUCTURES.  THE
 7361                                            ; MACROS ALLOW THE SUPERVISOR TO ESTABLISH COMMUNICATIONS
 7362                                            ; WITH THE OPERATOR.
 7363                                            ;--
 7364
 7365 036544                                            BGNSFT
      036544  000013                                                                            .WORD L10062-L$SOFT/2
      036546                                                                            L$SOFT::
 7366
 7375                                            ;UNIT NUMBER PRINTOUT QUESTION:
 7376 036546                                            GPRML   SWPTQ1,0,20,YES
      036546  000130                                                                            .WORD   T$CODE
      036550  036574                                                                            .WORD   SWPTQ1
      036552  000020                                                                            .WORD   20
 7377                                            ;NUMBER OF INDIVIDUAL DATA ERRORS TO REPORT ON A LINE QUESTION:
 7378 036554                                            GPRMD   SWPTQ2,2,D,177777,0,177777,YES
      036554  001052                                                                            .WORD   T$CODE
      036556  036650                                                                            .WORD   SWPTQ2
      036560  177777                                                                            .WORD   177777
      036562  000000                                                                            .WORD   T$LOLIM
      036564  177777                                                                            .WORD   T$HILIM
 7379                                            ;ROM VERSION PRINTOUT ON FIRST PASS QUESTION:
 7380 036566                                            GPRML   SWPTQ3,0,1,YES
      036566  000130                                                                            .WORD   T$CODE
      036570  036737                                                                            .WORD   SWPTQ3
      036572  000001                                                                            .WORD   1
 7381
 7382                                            .EVEN
 7383
 7384 036574                                            ENDSFT
                                                                                            .EVEN
      036574                                                                            L10062:
 7385
 7386
 7393 036574     122     105     120        SWPTQ1: .ASCIZ  /REPORT UNIT NUMBER AS EACH UNIT IS TESTED: /
      036577     117     122     124
      036602     040     125     116
      036605     111     124     040
      036610     116     125     115
      036613     102     105     122
      036616     040     101     123
      036621     040     105     101
      036624     103     110     040
      036627     125     116     111
```

```
        036632  124  040  111
        036635  123  040  124
        036640  105  123  124
        036643  105  104  072
        036646  040  000
 7394   036650  116  125  115        SWPTQ2: .ASCIZ  /NUMBER OF INDIVIDUAL DATA ERRORS TO REPORT ON A LINE: /
        036653  102  105  122
        036656  040  117  106
        036661  040  111  116
        036664  104  111  126
        036667  111  104  125
        036672  101  114  040
        036675  104  101  124
        036700  101  040  105
        036703  122  122  117
        036706  122  123  040
        036711  124  117  040
        036714  122  105  120
        036717  117  122  124
        036722  040  117  116
        036725  040  101  040
        036730  114  111  116
        036733  105  072  040
        036736  000
 7395   036737  122  117  115        SWPTQ3: .ASCIZ  /ROM VERSION PRINTOUT ON THE FIRST PASS: /
        036742  040  126  105
        036745  122  123  111
        036750  117  116  040
        036753  120  122  111
        036756  116  124  117
        036761  125  124  040
        036764  117  116  040
        036767  124  110  105
        036772  040  106  111
        036775  122  123  124
        037000  040  120  101
        037003  123  123  072
        037006  040  000
 7396                            .EVEN
```

```
                        ;++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
                        ;
                        ;               FVTSKL6.P11
                        ;
                        ;++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++


                        $PATCH::
037010                          .BLKW   24


                                LASTAD
                                                                        .EVEN
037060  000000                                                         .WORD   0
037062  000000                                                         .WORD   0
037064                  L$LAST::
037064                          ENDMOD


                        .
                        .
                        .
000001                  .END
```

Symbol table

```
ACTLNS  002236 G        CTRLCF  002352 G        C$RPT = 000025          EM0401  007252 G        EM2608  014274 G
ADR   = 000020 G        C$AU  = 000052          C$SEFG= 000046          EM0402  007321 G        EM2609  014345 G
ADRPTR  020140 G        C$AUTO= 000061          C$SPRI= 000041          EM0501  007471 G        EM2610  014424 G
ALTFLD  017630 G        C$BRK = 000022          C$SVEC= 000037          EM0502  007537 G        EM2611  014516 G
ASSEMB= 000010          C$BSEG= 000004          C$TOME= 000076          EM0525  007713 G        EM3001  014601 G
BCOUNT  002372 G        C$BSUB= 000002          DELAY   020300 G        EM0526  010003 G        EM3002  014632 G
BITTBL  002410 G        C$CLCK= 000062          DFPTBL  002214 G        EM0601  010073 G        EM3003  014726 G
BIT0  = 000001 G        C$CLEA= 000012          DIAGMC= 000000          EM0602  010127 G        EM3004  015002 G
BIT00 = 000001 G        C$CLOS= 000035          DRADRT  002244 G        EM0603  010307 G        EM3005  015056 G
BIT01 = 000002 G        C$CLP1= 000006          DROP    025202          EM0701  010472 G        EM3101  015150 G
BIT02 = 000004 G        C$CPBF= 000074          DR00MG  006004 G        EM0702  010527 G        EM3102  015204 G
BIT03 = 000010 G        C$CPME= 000075          DR02MG  006010 G        EM0703  010707 G        EM9009  015245 G
BIT04 = 000020 G        C$CVEC= 000036          DR04MG  006015 G        EM0801  011072 G        EM9010  015271 G
BIT05 = 000040 G        C$DCLN= 000044          DR06MG  006021 G        EM0802  011132 G        EM9014  015315 G
BIT06 = 000100 G        C$DODU= 000051          DR10MG  006026 G        EM0901  011205 G        EM9017  015411 G
BIT07 = 000200 G        C$DRPT= 000024          DR12MG  006035 G        EM0902  011236 G        EM9018  015522 G
BIT08 = 000400 G        C$DU  = 000053          DR14MG  006046 G        EM1001  011272 G        EM9019  015532 G
BIT09 = 001000 G        C$EDIT= 000000          DR16MG  006057 G        EM1002  011336 G        EM9020  015547 G
BIT1  = 000002 G        C$ERDF= 000055          EDROP   025260          EM1003  011423 G        EM9022  015573 G
BIT10 = 002000 G        C$ERHR= 000056          EF.CON= 000036 G        EM1101  011501 G        EM9023  015612 G
BIT11 = 004000 G        C$ERRO= 000060          EF.NEW= 000035 G        EM1201  011525 G        EM9024  015634 G
BIT12 = 010000 G        C$ERSF= 000054          EF.PWR= 000034 G        EM1202  011544 G        EM9026  015652 G
BIT13 = 020000 G        C$ERSO= 000057          EF.RES= 000037 G        EM1203  011630 G        EM9301  015676 G
BIT14 = 040000 G        C$ESCA= 000010          EF.STA= 000040 G        EM1204  011706 G        EM9302  015716 G
BIT15 = 100000 G        C$ESEG= 000005          EF0503  004134 G        EM1205  011742 G        EM9303  015746 G
BIT2  = 000004 G        C$ESUB= 000003          EF0505  004141 G        EM1301  011766 G        EM9304  016013 G
BIT3  = 000010 G        C$ETST= 000001          EF1401  004214 G        EM1302  012012 G        ENDETB  003726 G
BIT4  = 000020 G        C$EXIT= 000032          EF1402  004316 G        EM1401  012051 G        ENDIT   025066
BIT5  = 000040 G        C$FREQ= 000101          EF1601  004353 G        EM1402  012101 G        ERCNTB  002464 G
BIT6  = 000100 G        C$FRME= 000100          EF1602  004377 G        EM1403  012167 G        ERLTBL  002726 G
BIT7  = 000200 G        C$GETB= 000026          EF1603  004441 G        EM1404  012242 G        ERRBLK  003774 G
BIT8  = 000400 G        C$GETW= 000027          EF1604  004503 G        EM1405  012314 G        ERRMSG  003772 G
BIT9  = 001000 G        C$GMAN= 000043          EF3001  004600 G        EM1406  012327 G        ERRNBR  003770 G
BMPCQB  002526 G        C$GPHR= 000042          EF3002  004647 G        EM1407  012342 G        ERRTYP  003766 G
BMPCQE  002726 G        C$GPRI= 000040          EF9001  004716 G        EM1408  012354 G        ERSMRF  002462 G
BMPCQP  002524 G        C$INIT= 000011          EF9002  005000 G        EM1601  012362 G        ER0101  016070 G
BOE   = 000400 G        C$INLP= 000020          EF9003  005057 G        EM1604  012445 G        ER0201  016406 G
BRLEVL  002242 G        C$MANI= 000050          EF9004  005113 G        EM1701  012513 G        ER0503  016470 G
BUFBAS  002726 G        C$MAP = 000102          EF9005  005150 G        EM1801  012570 G        ER0504  016514 G
BUFEND  003726 G        C$MEM = 000031          EF9006  005201 G        EM1901  012636 G        ER1401  016562 G
BUFMID  003326 G        C$MMU = 000103          EF9010  005225 G        EM2001  012713 G        ER1601  016712 G
BUFPTR  002324 G        C$MSG = 000023          EF9016  005324 G        EM2002  012755 G        ER1603  017010 G
BUF3QT  003526 G        C$OPNR= 000034          EF9017  005421 G        EM2101  013030 G        ER3001  017070 G
CACHRX  023636 G        C$OPNW= 000104          EF9018  005475 G        EM2102  013073 G        ER9004  017160 G
CACHTX  023664 G        C$PNTB= 000014          EF9019  005602 G        EM2201  013167 G        ER9007  017262 G
CALMSL  017702 G        C$PNTF= 000017          EF9301  005626 G        EM2202  013224 G        ER9008  017340 G
CKTRAP  020126 G        C$PNTS= 000016          EF9302  005704 G        EM2203  013316 G        ER9101  017422 G
CLKBRL  002356 G        C$PNTX= 000015          EM0101  020534 G        EM2301  013423 G        ER9301  017450 G
CLKCSR  002354 G        C$PUTB= 000072          EM0102  020620 G        EM2302  013461 G        EVL   = 000004 G
CLKHRZ  002362 G        C$PUTW= 000073          EM0103  006067 G        EM2401  013517 G        E$END = 002100
CLKINT  023712 G        C$QIO = 000377          EM0201  006125 G        EM2601  013553 G        E$LOAD= 000035
CLKVEC  002360 G        C$RDBU= 000007          EM0202  006173 G        EM2602  013603 G        F$AU  = 000015
CLNRST  020156 G        C$REFG= 000047          EM0203  006346 G        EM2603  013674 G        F$AUTO= 000020
CLR16W  020200 G        C$REL = 000077          EM0204  006511 G        EM2604  013762 G        F$BGN = 000040
CNTERR  020222 G        C$RESE= 000033          EM0301  006670 G        EM2605  014056 G        F$CLEA= 000007
CSRA    002244 G        C$REVI= 000004          EM0302  006733 G        EM2606  014141 G        F$DU  = 000016
CSR0  = 000000 G        C$RFLA= 000021          EM0303  007073 G        EM2607  014200 G        F$END = 000041
```

Symbol table

```
F$HARD= 000004          I$PTAB= 000041          L$PROT  024242 G        L10054  034104          RMATBB  002304 G
F$HW  = 000013          I$PWR = 000041          L$PRT   002112 G        L10055  035130          ROLDAP  021570 G
F$INIT= 000006          I$RPT = 000041          L$REPP  002062 G        L10056  036012          RSTRPT  021622 G
F$JMP = 000050          I$SEG = 000041          L$REV   002010 G        L10057  036270          RXBDTX= 000030 G
F$MOD = 000000          I$SETU= 000041          L$RPT   024234 G        L10060  036350          RXBETX= 000020 G
F$MSG = 000011          I$SFT = 000041          L$SOFT  036546 G        L10061  036420          RXBFUL= 000100 G
F$PROT= 000021          I$SRV = 000041          L$SPC   002056 G        L10062  036574          RXBRRT  023762 G
F$PWR = 000017          I$SUB = 000041          L$SPCP  002020 G        MAPLNS= 000377 G        RXIE0   022204 G
F$RPT = 000012          I$TST = 000041          L$SPTP  002024 G        MFUNIT  004076 G        RXIE1   022244 G
F$SEG = 000003          J$JMP = 000167          L$STA   002030 G        MMENAB  002404 G        RXINPT  024052 G
F$SOFT= 000005          LNCTRA  002254 G        L$SW    002226 G        MMPRES  002402 G        RXINTC  002334 G
F$SRV = 000010          LNCTRO= 000010 G        L$TEST  002114 G        MMSR0   002400 G        RXINTF  002336 G
F$SUB = 000002          LOE   = 040000 G        L$TIML  002014 G        MSG1    016174 G        RXVECA  002232 G
F$SW  = 000014          LOT   = 000010 G        L$UNIT  002012 G        MSG2    016252 G        R0SLOT= 000002 G
F$TEST= 000001          LPCSLT= 000036 G        L10000  002224          MSG3    016331 G        R1SLOT= 000004 G
GETPRM  024652          LPRA    002250 G        L10001  002232          MSLCNT  002376 G        R2SLOT= 000006 G
GPRSOB  002450 G        LPRO  = 000004 G        L10002  016172          MSLGET  020340 G        R3SLOT= 000010 G
G$CNTO= 000200          L$ACP   002110 G        L10003  016466          MSLOOP  020454 G        R4SLOT= 000012 G
G$DELM= 000372          L$APT   002036 G        L10004  016512          MSTICK  002374 G        R5SLOT= 000014 G
G$DISP= 000003          L$AU    025266 G        L10005  016560          NDERPT  002230 G        SAVBMP  022270 G
G$EXCP= 000400          L$AUT   002070 G        L10006  016710          NEWPAS  024632          SFPTBL  002226 G
G$HILI= 000002          L$AUTO  025116 G        L10007  017006          NEWRES  024624          SKPSTS  022336 G
G$LOLI= 000001          L$CCP   002106 G        L10010  017066          NEWSTA  024314          STATA   002252 G
G$NO  = 000000          L$CLEA  025120 G        L10011  017156          NUMLNS= 000010 G        STATO = 000006 G
G$OFFS= 000400          L$CO    002032 G        L10012  017260          OOPS    020470 G        SVCGBL= 000000
G$OFSI= 000376          L$DEPO  002011 G        L10013  017336          OPTION  002226 G        SVCINS= 000001
G$PRMA= 000001          L$DESC  004046 G        L10014  017420          O$APTS= 000000          SVCSUB= 000001
G$PRMD= 000002          L$DESP  002076 G        L10015  017446          O$AU  = 000000          SVCTAG= 000001
G$PRML= 000000          L$DEVP  002060 G        L10016  017626          O$BGNR= 000001          SVCTST= 000001
G$RADA= 000140          L$DISP  002124 G        L10017  024240          O$BGNS= 000001          SWAPO   022414 G
G$RADB= 000000          L$DLY   002116 G        L10021  025114          O$DU  = 000001          SWPTQ1  036574
G$RADD= 000040          L$DTP   002040 G        L10022  025116          O$ERRT= 000001          SWPTQ2  036650
G$RADL= 000120          L$DTYP  002034 G        L10023  025154          O$GNSW= 000001          SWPTQ3  036737
G$RADO= 000020          L$DU    025156 G        L10024  025264          O$POIN= 000001          S$LSYM= 010000
G$XFER= 000004          L$DUT   002072 G        L10025  025272          O$SETU= 000000          TIMER1  002364 G
G$YES = 000010          L$DVTY  004036 G        L10026  025562          PAR0A   002406 G        TIMER2  002366 G
HELP  = 000000          L$EF    002052 G        L10027  025776          PASCNT  002332 G        TIMER3  002370 G
HOE   = 100000 G        L$ENVI  002044 G        L10030  026226          PCSLOT= 000016 G        TNUM  = 000033 G
HWPTQ1  036420          L$ERRT  003766 G        L10031  026410          PNT   = 001000 G        TP4FLG  002346 G
HWPTQ2  036436          L$ETP   002102 G        L10032  026566          PREGRT  004020 G        TP4RTN  024136 G
HWPTQ3  036471          L$EXP1  002046 G        L10033  026770          PREG05  003776          TP4VEC  002344 G
HWPTQ5  036517          L$EXP4  002064 G        L10034  027162          PRI   = 002000 G        TSABRT  022464 G
IBE   = 010000 G        L$EXP5  002066 G        L10035  027354          PRI00 = 000000 G        TSTNUM  002326 G
IDU   = 000040 G        L$HARD  036354 G        L10036  027526          PRI01 = 000040 G        TXAD1A  002256 G
IER   = 020000 G        L$HIME  002120 G        L10037  027726          PRI02 = 000100 G        TXAD10= 000012 G
IESTAT  002330 G        L$HPCP  002016 G        L10040  030140          PRI03 = 000140 G        TXAD2A  002260 G
ISR   = 000100 G        L$HPTP  002022 G        L10041  030406          PRI04 = 000200 G        TXAD20= 000014 G
IXE   = 004000 G        L$HW    002214 G        L10042  030750          PRI05 = 000240 G        TXBFCA  002262 G
I$AU  = 000041          L$ICP   002104 G        L10043  031334          PRI06 = 000300 G        TXBFC0= 000016 G
I$AUTO= 000041          L$INIT  024250 G        L10044  031544          PRI07 = 000340 G        TXCHA   002246 G
I$CLN = 000041          L$LADP  002026 G        L10045  031760          PUFIFO  020716 G        TXCHR0= 000002 G
I$DU  = 000041          L$LAST  037064 G        L10046  032224          RBUFA   002246 G        TXDSBL  022576 G
I$HRD = 000041          L$LOAD  002100 G        L10047  032474          RBUF0 = 000002 G        TXENBL  022672 G
I$INIT= 000041          L$LUN   002074 G        L10050  032602          RDPDR   021000 G        TXIE0   022766 G
I$MOD = 000041          L$MREV  002050 G        L10051  033012          REGTST  021220 G        TXIE1   023026 G
I$MSG = 000041          L$NAME  002000 G        L10052  033246          REPSMR  021430 G        TXINTC  002340 G
I$PROT= 000040          L$PRIO  002042 G        L10053  033546          RESETT  021456 G        TXINTF  002342 G
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Symbol table

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TXINTR  024160 G        T$SAVL= 177777          T$$PRO= 010020          T2      025564 G        UAM   = 000200 G
TXVECA  002234 G        T$SEGL= 177777          T$$RPT= 010017          T20     032604 G        UNBTTB  002264 G
T$ARGC= 000003          T$SUBN= 000000          T$$SOF= 010062          T21     033014 G        UNITN   002240 G
T$CODE= 000130          T$TAGL= 177777          T$$SW = 010001          T22     033250 G        UNSDIV  023052 G
T$ERRN= 022125          T$TAGN= 010063          T$$TES= 010060          T23     033550 G        WAIBIC  023206 G
T$EXCP= 000000          T$TEMP= 000000          T1      025274 G        T24     034106 G        WAIBIS  023262 G
T$FLAG= 000050          T$TEST= 000033          T10     027530 G        T25     035132 G        WDPDR   023336 G
T$GMAN= 000000          T$TSTM= 177777          T11     027730 G        T       036014 G        WORD1   002350 G
T$HILI= 177777          T$TSTS= 000001          T12     030142 G        T       036272 G        WTWLNC  023532 G
T$LAST= 000001          T$$AU = 010025          T13     030410 G        T       026000 G        WTWLNS  023562 G
T$LOLI= 000000          T$$AUT= 010022          T14     030752 G        T4      026230 G        WTWLPR  023606 G
T$LSYM= 010000          T$$CLE= 010023          T15     031336 G        T5      026412 G        X$ALWA= 000000
T$LTNO= 000033          T$$DU = 010024          T16     031546 G        T6      026570 G        X$FALS= 000040
T$NEST= 177777          T$$HAR= 010061          T17     031762 G        T7      026772 G        X$OFFS= 000400
T$NS0 = 000000          T$$HW = 010000          T18     032226 G        T8      027164 G        X$TRUE= 000020
T$NS1 = 000005          T$$INI= 010021          T19     032476 G        T9      027356 G        $PATCH  037010 G
T$PTNU= 000000          T$$MSG= 010016

. ABS.  037064    000   (RW,I,GBL,ABS,OVR)
        000000    001   (RW,I,LCL,REL,CON)
Errors detected:  0

*** Assembler statistics


Work  file  reads: 275
Work  file writes: 284
Size of work file: 35712 Words  ( 140 Pages)
Size of core pool: 19714 Words  ( 75 Pages)
Operating  system: RSX-11M/PLUS (Under VAX/VMS)

Elapsed time: 00:06:07.92
CVDHAC.BIN,CVDHAC.LST/-SP=SVC40/ML,CVDHAC.P11
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