PDM-70

DIAGNOSTIC TEST
CZPMAC0

AH-9018C-MC

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IDENTIFICATION

PRODUCT CODE: AC-9017C-MC

PRODUCT NAME: CZPMAC0 PDM70 DIAGNOSTIC TEST

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MAINTAINER: DIAGNOSTIC GROUP

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SEQ 0003

1.0 ABSTRACT

THIS IS A DESCRIPTION ON LOADING, USING AND INTERPRETING THE PDM70 DIAGNOSTIC PROGRAM. THE PROGRAM IS COMPRISED OF TWENTY-THREE KEYBOARD SELECTABLE TESTS WHICH TEST AND AID IN CHECKOUT OF THE PDM70 SYSTEM. THE PROGRAM IS STRUCTURED TO GIVE THE USER THE OPTION OF TESTING ANY OF THE MODULES COMPRISING THE PDM70 ON AN INDIVIDUAL OR SYSTEM TEST BASIS.

THE DIAGNOSTIC PROGRAM RESIDES IN A PDP-11 AND IS INTERFACED VIA A DL11 (ASYNCHRONOUS SERIAL LINE) TO THE PDM70. THE PDP-11 IS USED AS A COMBINATION CONTROL, SOURCE AND DESTINATION MODULE.

EACH MODULE TEST PROGRAM IS INDIVIDUALLY OUTLINED IN THIS WRITE-UP. THE SCOPE LOOPING TECHNIQUE AND MODULE ADDRESSING SCHEME IS IN GENERAL THE SAME FOR ALL MODULES WITH ANY UNIQUE CHARACTERISTICS POINTED OUT IN THE MODULE OUTLINE.

THE CONSOLE TELEPRINTER IS USED TO SELECT THE TEST PROGRAMS AND TO CONTROL THE DIAGNOSTIC. THE DIAGNOSTIC RUNS IN THREE MODES; MONITOR, WAIT AND RUN.

THE 'MONITOR MODE' IS ENTERED WHEN THE PROGRAM IS LOADED OR AT ANY TIME A NEW TEST IS TO BE SELECTED. HERE THE PROGRAM WAITS, DECODES AND THEN EXECUTES THE SELECTED TEST TYPED IN FROM THE KEYBOARD.

WHEN THE 'WAIT MODE' IS ENTERED THE PROGRAM HAS TO WAIT FOR ANY PARAMETERS (SUCH AS A MODULE ADDRESS) TO BE INPUTTED, A SIGNAL TO BE SCOPED OR TO STOP PROGRAM EXECUTION IF AN ERROR IS DETECTED.

THE 'RUN MODE' IS WHEN THE PROGRAM IS ACTUALLY EXECUTING A TEST PROGRAM.

THE TELEPRINTER KEYBOARD IS ALWAYS ACTIVE AND WILL RESPOND TO ANY KEYBOARD INPUT. ALL USERS RESPONSES ENTERED MUST END WITH A 'CR' (CARRIAGE RETURN) AND MAY NOT CONTAIN SPACES OR NULL CHARACTERS. 'RUBOUT' MAY BE USED TO ERASE ANY PREVIOUSLY ENTERED CHARACTERS. IF RUBOUT IS TYPED, THE ERASED CHARACTER WILL BE ECHOED BACK.

2.0 REQUIREMENTS (EQUIPMENT)

1. PDM70 MOTHER BOARD.
2. CLOCK MODULE (M7379-SET TO CORRESPOND TO THE DL11 FREQ.)
3. POWER SUPPLY
4. PDP-11 W/DL11 & 8K OF MEMORY
5. CONSOLE TELEPRINTER
6. PDM70 INTERFACE MODULE

    A. THIS CAN EITHER BE A DF11 OR A SERIAL I/O MODULE (M7385)

SEQ 0004

3.0 LOADING PROCEDURE

1. USE STANDARD PROCEDURE FOR LOADING BINARY TAPES.

4.0 STARTING PROCEDURE

1. THE PROGRAM IS SELF STARTING WITH A RESTART ADDRESS OF "200".

5.0 TELEPRINTER CONTROL SWITCHES

1. RETURN TO MONITOR (^C)*

   TYPING A '^C' AT ANY TIME WILL ENABLE THE PROGRAM TO RETURN TO THE KEYBOARD MONITOR AND WAIT FOR A NEW TEST TO BE ENTERED.

2. CONTINUE (C)

   IF A '^C' HAS BEEN TYPED, RETURNING CONTROL TO THE KEYBOARD MONITOR, AND THE USER WISHES TO RESTART THE LAST TEST HE WAS RUNNING, HE CAN SIMPLY TYPE 'C' CARRIAGE RETURN AND CONTINUE WITHOUT HAVING TO RE-TYPE THE TEST NAME.

3. RESTART (^R)*

   TYPING A '^R' WILL ENABLE THE CURRENT TEST TO BE RESTARTED. IF A '^R' IS TYPED WHILE IN MONITOR MODE, THE ENTIRE TEST PROTOCOL IS RETYPED.

4. MODULE ADDRESS UPDATING (^A)*

   TYPING A '^A' WHILE RUNNING ANY OF THE MODULE PROGRAMS WILL ENABLE A NEW MODULE ADDRESS TO BE ENTERED.

5. EXIT WAIT MODE (CR)

   TYPING 'CR' WILL ENABLE THE PROGRAM TO CONTINUE FROM THE WAIT MODE.

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* ALL CONTROL CHARACTERS ARE OBTAINED BY TYPING THE 'CTRL AND THE CHARACTER DESIGNATED' KEYS SIMULTANEOUSLY.

6. SUPPRESS PRINTING (^O)

TYPING A '^O' TELLS THE COMPUTER TO SUPPRESS THE REST OF THE TELEPRINTER OUTPUT. FOR INSTANCE, IF THE COMPUTER WAS TYPING OUT A MESSAGE AND THE USER KNEW WHAT THE MESSAGE WAS GOING TO BE, HE COULD TYPE A '^O' AND ENABLE THE PROGRAM TO CONTINUE WITHOUT WAITING FOR THE ENTIRE MESSAGE TO BE PRINTED.

6.0 CONSOLE SWITCH SETTINGS

WHEN THE EXERCISER TEST OR A DIAGNOSTIC TEST IS STARTED, THE PROGRAM WILL DETERMINE IF THE PROCESSOR HAS A HARDWARE SWITCH REGISTER (SWR). IF THERE IS NO HARDWARE SWR, THE PROGRAM WILL USE THE SOFTWARE SWR LOCATED AT ADDRESS 176. THE OPERATOR SHOULD SET UP LOC 176 BEFORE STARTING THE PROGRAM WITH THE APPROPRIATE VALUE.

SWITCH	FUNCTION
SW15=0	ENTER THE 'WAIT MODE' AND WAIT FOR 'CR' ON ERROR DETECTION
SW15=1	CONTINUE ON ERROR
SW14=0	CONTINUE ON TO NEXT SUBTEST
SW14=1	LOOP ON CURRENT SUBTEST
SW13=0	ENABLE PRINTOUTS
SW13=1	INHIBIT PRINTOUTS
SW12=0	NORMAL DL11 TRANSMISSION
SW12=1	ENTER THE 'WAIT MODE' AND WAIT FOR A 'CR' TO TRANSMIT EACH CHARACTER. AS EACH CHARACTER IS TRANSMITTED IT IS ALSO PRINTED.
SW11=0	NORMAL DL11 TRANSMISSION
SW11=1	TRANSMIT THE CURRENT CHARACTER UNTIL SW11 IS RESET TO '0'.
SW10=0	RUN THE ENTIRE MODULE TEST PROGRAM
SW10=1	INHIBIT THE MANUAL INTERVENTION TESTS IN THE MODULE TEST PROGRAM
SW09=0	NORMAL DL11 TRANSMISSION
SW09=1	INHIBIT TRANSMITTER DELAY

(SCOPE LOOPING AID)

SEQ 0006

NOTE: THE FUNCTIONS OF THE LOWER BITS (0-8) VARY IN USAGE AND ARE OUTLINED IN THE APPLICABLE TEST DESCRIPTIONS. IN

GENERAL THOUGH, DATA SWITCHES '0-3' ARE USED IN THE EXERCISER TESTS TO ENABLE THE USER TO SELECT ANY PARTICULAR MODULE MODE. IN THESE CASES, THE PROGRAM ADDS A CODE OF '60' TO THE NUMBER READ FROM THE SWITCHES TO REPRESENT AN ASCII NUMBER.

IF THE PROGRAM IS USING THE SOFTWARE SWR, THE OPERATOR MAY CHANGE THE SWITCH SETTINGS FROM THE TTY. AFTER SELECTING A TEST OR TYPING 'C' IN THE MONITOR MODE, THE PROGRAM WILL OUTPUT AT THE TTY THE FOLLOWING MESSAGE

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SWR=XXXXXX

NEW SWR=
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THE OPERATOR MAY THEN ENTER THE NEW VALUE.
CARRIAGE RETURN ENTERS THE UPDATED VALUE.
IF NO VALUE HAS BEEN ENTERED, THE SWITCH REGISTER VALUE REMAINS UNCHANGED.

WHILE SCOPE LOOPING ON SUBTEST, THE OPERATOR MAY INTERRUPT THE TEST TO CHANGE THE SWITCH SETTINGS BY TYPING CONTROL-G AT THE TTY. THE PROGRAM WILL OUTPUT AT THE TTY THE FOLLOWING MESSAGE

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SWR=XXXXXX

NEW SWR=
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THE OPERATOR MAY THEN RESPOND AS DESCRIBED IN THE PRECEDING PARAGRAPH.

7.0 SERIAL I/O INPUT OPTION

AS MENTIONED IN THE ABSTRACT, THE PDM70 MODULES CAN BE TESTED IN TWO MODES; PER MODULE BASES OR SYSTEM TEST. IF THE MODULE IS TESTED INDIVIDUALLY A DF11 IS PLUGGED DIRECTLY INTO THE CONTROL SLOT OF THE PDM70 MOTHER BOARD. THIS ENABLES THE PDP-11 TO ACT AS A COMBINATION CONTROL, SOURCE AND DESTINATION MODULE. IN THIS CASE, THE SYSTEM CLOCK MUST BE SET TO CORRESPOND TO THE CLOCK FREQUENCY OF THE DL11.

WHEN THE MODULE IS TESTED IN A SYSTEM ENVIRONMENT, THE BASIC SYSTEM CONFIGURATION CONSISTS OF A : CONTROL, CLOCK, 'KGM' (KNOWN GOOD SERIAL INPUT/OUTPUT MODULE) AND A 'MUT' (MODULE UNDER TEST). THE 'KGM' SHOULD BE VERIFIED AS SUCH BY TESTING IT WITH THE M7385I TEST (REFER TO SECTION 12.13). THE 'KGM' CAN BE INSERTED IN ANY MODULE SLOT AND THEN CABLED TO THE DL11 OUTPUT OF THE PDP-11. THIS MODULE IS TO BE SET UP WITH THE "D" JUMPER OUT AND THE "L" JUMPER IN SO THAT IT IS INITIALIZED ON POWER UP. THE SYSTEM CLOCK MUST BE SET EITHER EQUAL TO OR GREATER THAN, THE INPUT DEVICES (E.G. DL11) BAUD NOTE. PROGRAMS ARE THEN SENT FROM THE PDP-11 STORED IN THE CONTROL MODULE.

NOT OBVIOUS TO THE USER IS THE EXTRA ADDRESSING WHICH IS 'PADDED'

IN WHEN THE SERIAL I/O MODULE IS USED. THIS PADDING SERVES TWO FUNCTIONS. FIRST, IT FACILITATES LOADING A LEGAL PROGRAM INTO THE CONTROL MODULE 'FIFO' (FIRST-IN, FIRST-OUT BUFFER). THIS MEANS STARTING EACH PROGRAM WITH AN 'STX' AND ENDING IT WITH AN 'ETX'. PADDING ISN'T NECESSARY WHEN THE MODULE IS TESTED ON A MODULE BASIS. ALSO, EXTRA ADDRESSING MUST BE ADDED TO ADDRESS THE 'KGM'. THE PROGRAM HAS TO BE CERTAIN THAT THE 'KGM' NEVER LOSES CONTROL OF A PROGRAM SINCE THIS IS THE ONLY INTERFACE TO THE PDP-11. BY SETTING DATA SWITCH 12, THE USER CAN SINGLE STEP ANY MODULE TEST PROGRAM AND EXAMINE WHAT THIS PADDED PROGRAM LOOKS LIKE.

WHEN THE PROGRAM IS STARTED, IT ASKS IF A SERIAL I/O IS BEING USED. IF IT IS, TYPE 'YES' OR 'Y' CARRIAGE RETURN. IF IT'S NOT, TYPE 'NO', 'N' OR SIMPLY 'CR'. THIS PARAMETER CAN BE CHANGED AT ANY TIME BY TYPING A '^R' WHILE IN THE MONITOR MODE.

IF THE 'KGM' I/O IS BEING USED, THE PROGRAM WILL THEN ASK FOR THE ADDRESS OF THIS MODULE. THIS CAN BE ANY ADDRESS EXCEPT '17' WHICH FIT THE GUIDE LINES DESCRIBED IN SECTION 9.0 (MODULE ADDRESSING).

8.0 DL11 ADDRESS SETUP PROCEDURE

AFTER SETTING UP THE SERIAL I/O OPTION, THE PROGRAM PRINTS 'DL11 ADRS., VEC.?'. THIS ENABLES THE USER TO SELECT HIS OWN DL11 DEVICE AND VECTOR ADDRESSES. BY SIMPLY TYPING 'CR', THE DEFAULT RCSR ADDRESS OF '175610' AND VECTOR ADDRESS OF '300' ARE USED. IF THESE ADDRESSES ARE TO BE MODIFIED, TYPE THE RCSR ADDRESS AND THE VECTOR ADDRESS SEPERATED BY A COMMA.

THE USER SHOULD NOTE THAT BOTH THE DL11 AND THE SERIAL I/O MODULE ARE NORMALLY SETUP FOR 7 BIT EVEN PARITY.

9.0 MODULE ADDRESSING

WHEN A MODULE PROGRAM IS SELECTED, THE PROGRAM REQUESTS THE MODULE ADDRESS BEFORE THE TEST IS RUN. THIS ADDRESS CAN BE ANY NUMBER FROM '0-17'*. THE ONLY RESTRICTION IS THAT IF THE SERIAL INPUT OPTION IS BEING USED, THESE TWO MODULE ADDRESSES MUST NOT CONFLICT. IF THEY DO, A NEW MODULE ADDRESS WILL BE REQUESTED. TYPING A '^A' AT ANY POINT WHILE A MODULE PROGRAM IS RUNNING WILL CAUSE THE PROGRAM TO REQUEST A NEW MODULE ADDRESS.

10.0 MODULE ERRORS

WHEN A MODULE ERROR IS DETECTED, THE FAILING SUBTEST NUMBER, M.A. (MEMORY ADDRESS) WHERE ERROR OCCURRED AND A DESCRIPTIVE MESSAGE OF THE FAILURE ARE TYPED OUT. THE PROGRAM THEN ENTERS THE 'WAIT MODE' UNTIL A 'CR' IS TYPED ENABLING THE PROGRAM TO CONTINUE.

WHEN AN ERROR IS DETECTED, THE 'M.A.' SHOULD BE USED TO LOCATE THE FAILING SUBTEST IN THE LISTING. HERE THE USER WILL FIND A WRITTEN DISCRIPTION OF WHAT THE SUBTEST WAS ATTEMPTING TO DO. THE TEST CAN THEN BE ANALYZED AND THEN LOOPED IF NECESSARY UNTIL THE FAILURE IS FIXED.

WHEN A MODULE IS FAILING THE FIRST SUBTEST, IT IS A GOOD IDEA TO RE-CHECK THE MODULE TO MAKE SURE THAT IT WAS SET UP CORRECTLY WITH THE CORRECT SWITCH & JUMPER SETTINGS. THE IDEAL SITUATION, IF POSSIBLE, WOULD BE TO FIRST TEST A KNOWN GOOD MODULE.

11.0 SCOPE LOOPING

EACH MODULE ADDRESS TEST PROGRAM IS COMPRISED OF ANY NUMBER OF

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* THE MODULE ADDRESS IS INTERPRETTED AS AN OCTAL VALUE.

SEQ 0010

INDIVIDUAL SUBTESTS. WHEN A MODULE PROGRAM IS RUN THESE SUBTESTS ARE RUN AS A WHOLE, OTHERWISE, WHEN ONE SUBTEST FINISHES THE NEXT SUBTEST IS EXECUTED.

THERE ARE TWO WAYS OF RUNNING ANY SELECTED SUUBTEST; THE USER MAY RUN THE 'SUBX' ROUTINE (REFER TO SECTION 13.1) OR RUN THROUGH THE ENTIRE MODULE PROGRAM UNTIL THE SELECTED SUBTEST IS REACHED. IF THE LATTER METHOD IS USED, LOAD THE NUMBER OF THE SUBTEST TO BE LOOPED IN THE CONSOLE SWITCH REGISTER AND START THE MODULE PROGRAM. THE PROGRAM WILL TYPE 'SCOPE BREAK AT XXX' WHEN THE SUBTEST IS REACHED. NOW SET CONSOLE SWITCH '14' TO LOOP ON THE CURRENT SUBTEST AND THEN TYPE 'CR'. THE PROGRAM WILL THEN RUN THE SELECTED SUBTEST UNTIL SWITCH '14' IS RESET TO '0' ENABLING THE PROGRAM TO CONTINUE.

12.0 MODULE TEST PROGRAMS

THE FOLLOWING IS A LIST AND DESCRIPTION OF ALL THE MODULE PROGRAMS. IT SHOULD BE NOTED THAT IN THE PROGRAM TEST PROTOCOL EACH MODULE PROGRAM ENDS WITH A LETTER. THIS LETTER INDICATES THE TYPE OF TEST; A = ADDRESSING, C = CALIBRATION*, E = EXERCISER, G = GAIN*, I = INTERFACE, R = REPEATIBILITY*.

THE MODULE ADDRESS TEST SHOULD BE RUN AND PROVED FULLY OPERATIONAL BEFORE RUNNING ANY OF THE OTHER TESTS. THIS TEST VERIFIES THAT THE MODULE CAN BE ADDRESSED AND THAT IT WORKS 'FUNCTIONALLY' IN ALL ITS INTENDED DATA MODES.

THE USER SHOULD REFER TO THE ENGINEERING SPECIFICATIONS TO VERIFY THAT THE SWITCHES AND JUMPERS ARE SET UP CORRECTLY BEFORE RUNNING ANY TESTS.

NOTE: BEFORE EACH MODULE TEST IT IS A GOOD PRACTICE TO CLEAR OUT THE PDM FIFO BY HITTING THE "RESET" BUTTON ON THE FRONT PANEL.

***ALSO NOTE: IF THE PROGRAM IS USING THE SOFTWARE SWR, REFER TO SECTION 6.0.

12.1. M7380A, CONTROL MODULE TEST

THIS PROGRAM TAKES THE CONTROL MODULE THRU THE INITIALIZATION, ADDRESS AND DATA MODES RESPECTIVELY. INITIALLY, TWO PROGRAMS ARE STORED IN THE CONTROL MODULE 'FIFO'. THE SECOND PROGRAM IS HEADED WITH A 'DC4' SO IT WILL NOT BE RECIRCULATED. WITH THE FIRST PROGRAM IN THE DATA MODE, A '500' WORD RANDOM DATA BUFFER IS CIRCULATED THRU THE CONTROL MODULE. AFTER VERIFYING THE DATA, AN 'EOT' IS ISSUED. THIS ENABLES THE SECOND PROGRAM TO BE CALLED OUT. THE DATA MODE IS AGAIN CHECKED AND ANOTHER 'EOT' IS ISSUED ENABLING THE FIRST PROGRAM IS BE RE-CALLED. ONCE VERIFIED,

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L 1

* APPLY TO THE A/D MODULE ONLY.

SEQ 0011

ANOTHER 'EOT' IS ISSUED. A CHECK IS THEN MADE THAT THE SECOND PROGRAM, HEADED WITH A 'DC4', NO LONGER EXISTS . THE 'FIFO' IS THEN REPROGRAMMED.

THIS PROGRAM CONSISTS OF '64' CHARACTERS ENABLING THE CONTROL 'FIFO' TO BE COMPLETELY FILLED. THE PROGRAM CONSISTS OF ONE SOURCE AND ONE DESTINATION ADDRESS. THE REMAINING 55 LOCATIONS ARE FILLED WITH RANDOM LITERAL CHARACTERS. THE PROGRAM IS THEN CALLED OUT AND VERIFIED.

THE LAST TEST CHECKS THE DELAY TIMES OF THE 'SYN' CHARACTER. THIS TEST REQUIRES A '110 BAUD' CONSOLE DEVICE SUCH AS A 'TTY' IN ORDER TO RUN. THE CRYSTAL CLOCK IN THE TTY IS USED TO TIME THE 'SYN' DELAYS. IF THE CONSOLE DEVICE IS NOT AVAILABLE, THIS TEST WILL NOT PASS. ALL THE DELAYS, 1-9, ARE TESTED IN ORDER. THE TESTS MAKES TWO CHECKS AT EACH DELAY. FIRST, THAT THE DELAY ISN'T TOO SHORT AND SECOND, THAT THE DELAY ISN'T TOO LONG.

THIS COMPLETES THE CONTROL MODULE TESTS. HOWEVER, IF DATA SW10 IS SET THE PROGRAM WILL ALSO TEST THE M7387 HARDWARE READIN MODULE (1). OTHERWISE, THE MESSAGE 'TEST COMPLETE' IS PRINTED AND THE PROGRAM WILL CONTINUE TO CYCLE THRU THE CONTROL TEST UNTIL STOPPED.

1. M7387, HARDWARE READ-IN MODULE

   AS MENTIONED ABOVE, THIS TEST IS RUN IN CONJUNCTION WITH THE M7380A TEST. THE TEST REQUIRES THE USER TO INSERT THE M7387 MODULE WITH A DIAGNOSTIC 'PROM' PROGRAM INTO SLOT 'P5' OF THE MOTHER BOARD.

   AFTER THE MODULE HAS BEEN INSERTED, THE PDM70 SHOULD BE POWERED UP. THIS WILL ENABLE THE PROM PROGRAM TO BE READ OUT, STORED IN THE CONTROL MODULES FIFO, AND THEN EXECUTED.

   THE PROM PROGRAM IS SETUP TO ADDRESS THE SERIAL I/O DESTINATION MODULE AND THEN SEND LITERAL DATA. AFTER VERIFING THE DATA, THE MESSAGE 'PROM OK'' IS TYPED. IF THIS MESSAGE IS NOT TYPED IMMEDIATELY AFTER POWER UP, NO DATA WAS EVER RECEIVED, THUS INDICATING AN ERROR CONDITION.

12.2. M7381A, BCD INPUT MODULE ADDRESS TEST

THIS TEST ADDRESSES THE 'BCD' MODULE IN ALL FOUR(4) DATA MODES VERIFYING INTERNAL AND EXTERNAL DEVICE FLAG OPERATION. IT IS SUGGESTED THAT THE M7381E TEST SHOULD BE RUN IF ANY DATA ERRORS ARE REPORTED. HERE THE USER CAN READILY IDENTIFY THE DATA ERROR BY THE TYPEOUT. THE CUSTOMER SWITCHES (WHICH SELECT HOW MANY DIGITS ARE READ) ARE TESTED BY THE PROGRAM REQUESTING UNIQUE SWITCH SETTINGS. SETTING DATA 'SW10' WILL INHIBIT THE MANUAL INTERVENTION TESTS. THIS MODULE HAS TO BE TESTED WITH THE 'L'

JUMPER OUT.

12.3. M7381E, BCD INPUT MODULE EXERCISER TEST

THIS PROGRAM CONTINUOUSLY LOOPS ADDRESSING THE BCD MODULE AND PRINTING THE RECEIVED DATA. DATA SWITCHES '0 & 1' ARE USED TO SELECT ANY ONE OF THE FOUR (4) 'BCD' DATA MODES. THE SWITCH SETTINGS MAY BE SET AND RESET ANY TIME. DATA SW13 CAN ALSO BE SET TO INHIBIT THE DATA PRINTOUT.

12.4. M7382A, BCD OUTPUT MODULE ADDRESSING TEST

THIS TEST IS COMPRISED OF A SERIES OF SUBTESTS WHICH OUTPUT KNOWN DATA TO THE 'BCD' OUTPUT MODULE. ONCE THE DATA IS TRANSMITTED, THE USER IS NOTIFIED OF THE TRANSMITTED PATTERN. THE PROGRAM THEN ENTERS THE 'WAIT' MODE ENABLING THE USER TO VERIFY THE DATA.

THE LAST SUBTEST REQUESTS FOR THE USER TO SCOPE FOR THE SIGNAL 'OUTPUT DONE H & L'. THE PROGRAM WILL INDEFINITELY HANG IN THIS SUBTEST UNTIL EITHER '^R' IS TYPED TO RESTART THE M7382A TEST OR '^C' IS TYPED TO RETURN TO THE MONITOR.

12.5. BCD I/O TEST

THIS IS AN EXERCISE TEST UTILIZING BOTH THE BCD 'INPUT & OUTPUT' MODULES. AN INCREMENTING BCD COUNT IS SENT TO THE OUTPUT MODULE AND WRAPPED AROUND VIA A SPECIAL CABLE TO THE INPUT MODULE. THE INPUT MODULE IS THEN ADDRESSED, ENABLING THE DATA TO BE READ. THE RECEIVED DATA IS VERIFIED AGAINST THE TRANSMITTED DATA. THIS TEST VERIFIES THAT ALL DATA LINES ARE GOOD AND THAT NO TWO LINES ARE SHORTED TOGETHER.

THE INPUT MODULE CAN BE SET UP TO USE EITHER INTERNAL OR EXTERNAL SYNC. IF EXTERNAL SYNC IS SELECTED, THE SYNC SIGNAL IS SUPPLIED FROM THE BCD OUTPUT MODULE VIA THE CABLE.

12.6. M7383A, A/D MODULE ADDRESS TEST

THIS TEST ADDRESSES THE A/D MODULE AND VERIFIES THE CORRECT DATA FORMAT IS RECEIVED FROM THE MODULE. THE EXTERNAL SYNC FUNCTION IS ALSO TESTED. IT SHOULD BE NOTED THAT THIS TEST MAKES NO ATTEMPT TO VERIFY WHEATHER OR NOT THE A/D IS CONVERTING THE CORRECT VALUES.

12.7. M7383C, A/D CALIBRATION ROUTINE

THIS TEST RUNS IN A CONTINUOUS LOOP ADDRESSING THE A/D MODULE AND PRINTING THE CONVERSION VALUE. AFTER ACCEPTING THE MODULE ADDRESS, THE PROGRAM TYPES 'REMOTE DST.?'. THIS IS AN OPTION WHICH ENABLES THE USER TO SEND THE CONVERSION DATA TO A USER SELECTED DESTINATION, SUCH AS THE DISPLAY. IF THIS OPTION IS DESIRED, TYPE 'YES' OR 'Y' & 'CR'. A REQUEST WILL THEN MADE FOR THE ADDRESS OF THIS DESTINATION. DATA SWITCHES '0-3' ARE USED TO SELECT THE A/D CHANNEL TO BE CONVERTED. SETTING DATA SW13 WILL INHIBIT THE CONVERSION DATA PRINTOUT. ALL DATA SWITCHES MAY BE SET OR RESET AT ANY TIME.

CHANNEL SELECTION IS AS FOLLOWS:

DATA SW'S '0-1' SELECT 'INT. SYNC' ON CH.'S 0,1,2 OR 3
DATA SW'S '2' & '0-1' SELECT 'EXT SYNC' ON CH.'S 0,1,2 OR 3
DATA SW '3' SELECTS 'INT SYNC' CONVERSION ON ALL '4' CH.'S
DATA SW'S '2&3' SELECT 'EXT. SYNC' CONVERSION ON ALL '4' CH.'S

12.8. M7383G, A/D GAIN ACCURACY TEST

THIS TEST IS USED TO TEST THE GAIN ACCURACY OF THE A/D. FIVE SPECIFIC VOLTAGES AT A GAIN OF "1" ARE REQUESTED BY THE PROGRAM. WHEN THE VOLTAGE AND GAIN HAVE BEEN SUPPLIED, TYPE 'CR'. A SERIES OF ONE HUNDRED CONVERSIONS ARE THEN TAKEN AND AVERAGED. THIS AVERAGE IS THEN TESTED TO BE WITHIN '+ OR -' ONE COUNT FROM THE TRUE VOLTAGE VALUE FOR THAT SPECIFIED SETTING. IF IT IS NOT, THE LOW, AVERAGE AND HIGH VALUES OBTAINED ON THAT PARTICULAR GROUP OF CONVERSIONS ARE TYPED OUT. THE PROGRAM WILL THEN TAKE ANOTHER SERIES OF CONVERSIONS AND WILL CONTINUE DOING SO, UNTIL THE CORRECT VALUE IS RECEIVED. AT THAT POINT THE PROGRAM WILL REQUEST A NEW SETTING. DATA SWITCH '13' CAN BE SET TO INHIBIT THE ERROR DATA PRINTOUT.

12.9. M7383R, A/D REPEATIBILITY TEST

THIS TEST TAKES A SERIES OF ONE HUNDRED CONVERSIONS ON A USER SELECTED CHANNEL. THE CONVERSIONS ARE AVERAGED AND THEN DISPLAYED IN A GRAPH FORMAT SHOWING THE REPEATIBILITY CHARACTERISITICS OF THE A/D. AFTER ACCEPTING THE MODULE ADDRESS, THE PROGRAM TYPES 'REMOTE DST.?'. THIS IS A OPTION WHICH ENABLES THE USER TO SEND THE COMPUTED A/D GRAPH TO A USER SELECTED DESTINATION. IF THIS OPTION IS DESIRED, TYPE 'YES' OR 'Y' & 'CR'. A REQUEST WILL THEN BE MADE FOR THE ADDRESS OF THE DESTINATION. WHEN STARTED, THE TEST REQUESTS A CHANNEL AND V.S.F (VERTICAL SCALE FACTOR). THE V.S.F. IS THE NUMBER OF CONVERSIONS, OF THE HUNDRED, TO BE AVERAGED TOGETHER TO REPRESENT ONE POINT ON THE GRAPH. THE V.S.F. CAN BE ANY NUMBER EVENLY DIVIDED INTO ONE HUNDRED. EACH POINT (REPRESENTEND AS AN ASTRICK) IS PLOTTED IN ITS RELATIONSHIP TO THE OVERALL AVERAGE OF THE HUNDRED CONVERSIONS. THE FOLLOWING IS AN EXAMPLE OF WHAT A GRAPH PRINTOUT MIGHT LOOK LIKE USING A V.S.F. OF 10; 10 POINTS,

EACH REPRESENTING THE AVERAGE OF '10' CONVERSIONS.

EXAMPLE:

```
VSF? 10
CH.? 1

-          *
-          *
-          *
-          *
-          *
-          *
-          *
-          *
-          *
-          *

 +++++++++ +++++++++  (SCALE=1MV/DIV)
-141    -150     -159
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THE THREE NUMBERS AT THE BOTTOM OF THE SCALE (RIGHT TO LEFT) REPRESENT; THE LOWEST VALUE, THE OVERALL AVERAGE AND THE HIGHEST VALUE READ OF THE ONE HUNDRED CONVERSIONS. SINCE THE GRAPH ONLY SHOWS COUNTS '+ & -' 9 COUNTS FROM THE AVERAGE, AN OVERRANGE 'HI & LO' PRINTOUT WOULD RESULT IF ANY COUNTS FALL OUT OF THE 9 COUNT RANGE.

12.10. M7384A, D/A ADDRESSING TEST

THIS TEST STARTS BY ADDRESSING THE DIA MODULE USING MODES '8 & 9'. THE USER IS THEN REQUESTED TO SCOPE THE SIGNALS PROG 'L & H'. FIVE SPECIFIC VOLTAGE ARE THEN TRANSMITTED FROM THE D/A ON EACH CHANNEL. AFTER EACH VOLTAGE IS TRANSMITTED, A MESSAGE IS TYPED TELLING THE USER THE VOLTAGE AND CHANNEL. THE LAST SUBTEST CHECKS THE RECOVERY OF THE D/A. THIS IS DONE BY CONTINOUSLY ADDRESSING THE DAC IN MODE 3 (BOTH CHANNELS). THE PROGRAM THEN ALTERNATLY OUTPUTS '0' VOLTS AND '9.5' VOLTS. THIS ENABLES A SQUARE WAVE OUTPUT FROM THE D/A. THE USER IS REQUESTED TO SCOPE BOTH CHANNEL OUTPUTS AND CHECK FOR A 5 U SECOND. RISE TIME.

THE PROGRAM WILL INDEFINITELY HANG IN THIS SUBTEST UNTIL RESTARTED OR EXITED.

12.11. M7384E, D/A EXERCISER TEST

THIS TEST ENABLES ANY USER SELECTED VALUE TO BE TRANSMITTED FROM THE D/A. WHEN SELECTED, THE TEST REQUESTS FOR TWO, THREE DIGIT VALUES (SEPARATED VIA COMMA'S) TO BE TYPED IN. THE FIRST VALUE IS THE ONLY ONE TRANSMITTED WHEN RUNNING ONE CHANNEL. IF BOTH

CHANNELS ARE SELECTED, THE FIRST VALUE WILL BE TRANSMITTED ON CHANNEL '0' (X DAC) AND THE SECOND VALUE WILL BE TRANSMITTED ON CHANNEL '1' (Y DAC). THE CHANNELS ARE SELECTED BY DATA SWITCHES '0 & 1' AND CAN BE SET AND RESET AT ANYTIME. SETTING DATA SWITCH '0' WILL SELECT CHANNEL '0'. SETTING DATA SWITCH '1' WILL SELECT CHANNEL 1 AND SETTING BOTH '0 & 1' WILL SELECT BOTH CHANNELS.

TYPING A '^R' WILL ENABLE FOR A NEW SET OF DAC VALUES TO BE ACCEPTED.

12.12. M7385A, SERIAL I/O ADDRESS TEST

THIS TEST CHECKS BOTH THE SOURCE AND DESTINATION PARTS OF THE SERIAL I/O. BY USING A SPECIAL WRAPPING CABLE, THE DESTINATION OUTPUTS TO THE SOURCE INPUT.

BEFORE TESTING, ALL 'ACTIVE' RECEIVER JUMPERS MUST BE INSERTED AND THE 'D' & 'L' 'MR' JUMPERS MUST BE OUT.

THIS TEST CHECKS ONLY THE 'EIA' OUTPUT OF THE MODULE. REFER TO THE M7385T TEST (12.14) FOR TESTING THE ''TTY'' OUTPUT LOGIC.

IT SHOULD BE NOTED THAT WHEN THIS TEST IS RUN USING THE SERIAL I/O INPUT OPTION, THAT ONLY SUBTESTS ''1,5 & 10'' ARE EXECUTED. THIS MEANS THE TESTING ISN'T TESTED AS IT IS WHEN USING THE DF11 INTERFACE.

IT SHOULD ALSO BE NOTED THAT WHEN THE SERIAL INPUT OPTION IS USED, SUBTEST 5 RETURNS ONE HUNDRED AND TWENTY EIGHT CHARACTERS (128) TO THE DL11 RECEIVER INSTEAD OF ''64''. THE FIRST ''64'' CHARACTERS OF THE BUFFER ARE RETURNED DIRECTLY FROM THE DESTINATION OF THE SERIAL INPUT MODULE. THE SECOND ''64'' CHARACTERS ARE THE CHARACTERS THAT WERE ACTUALLY BUFFERED IN THE ''FIFO'' OF THE MODULE UNDER TEST.

12.13. M7385I, SERIAL I/O INTERFACE MODULE TEST

THIS TEST IS INTENDED TO VERIFY THAT THE SERIAL I/O MODULE USED AS THE PDP-11 INTERFACE IS FUNCTIONING CORRECTLY. THIS IS DONE BY REMOVING THE M7380 CONTROL MODULE (THUS ELIMINATING ONE UNKNOWN) AND JUMPERING THE 'T & R' BUSES (F1D1 TO F1V2) TOGETHER. THE MODULE MUST HAVE THE 'D' JUMPER OUT AND THE 'L' JUMPER IN SO THAT IT IS INITIALIZED ON POWER UP. A PROGRAM IS THEN SENT TO ADDRESS THE DESTINATION PORTION OF THE MODULE. WHEN THIS TEST HAS BEEN RUN SUCESSFULLY, THE CONTROL MODULE CAN BE RE-INSERTED AND VERIFIED BY RUNNING THE M7380A TEST (12.1).D

12.14. M7385T, SERIAL I/O TTL TEST

THIS TEST VERIFIES THAT THE TTL I/O SECTION OF THE SERIAL I/O MODULE IS FUNCTIONING CORRECTLY. IT REQUIRES THAT A TELEPRINTER BE CABLED TO THE MATIN LOCK OF THE SERIAL I/O. THIS COULD BE THE CONSOLE PRINTER ONCE THE TEST IS SELECTED. IF THE CONSOLE PRINTER IS USED, THE PROGRAM SHOULD BE HALTED BEFORE DISCONNECTING THE PRINTER AND THEN RE-STARTED AT THE 'TTLTST'* ADDRESS. ALL CHARACTERS THEN TRANSMITTED WILL BE RECEIVED BY THE SERIAL SOURCE AND WRAPPED AROUND (BY THE CONTROL MODULE OR COMPUTER IF THE DF11 IS USED) TO THE DESTINATION. HERE THE CHARACTER WILL BE TRANSMITTED BACK TO THE TELEPRINTER AND PRINTED. EFFECTIVELY AS FOR AS THE USER IS CONCERNED, THIS TEST ACTS LIKE A KEYBOARD ECHO TEST.

12.15. M7386A, KEYBOARD/DISPLAY MODULE ADDRESS TEST

IN ORDER TO RUN THIS TEST, THE 'W1'' JUMPER MUST BE OUT. THE FIRST SUBTEST ADDRESSES THE KEYBOARD AND CHECKS FOR THE FORCED RETURN OF THE 'EOT''.

THE SECOND SUBTEST RUNS IN A CONTINUOUS LOOP ADDRESSING BOTH THE KEYBOARD & DISPLAY. WHEN THE USER STRIKES 'KEY REQUEST'', THE KEYBOARD BECOMES BUS MASTER. ALL DATA THEN TRANSMITTED FROM THE KEYBOARD IS SENT TO THE DISPLAY (IF AVAILABLE). THIS DATA IS ALSO RECEIVED BY THE PDP-11 AND PRINTED.

IF 'EOT'' IS STRUCK, THE KEYBOARD RELEASES THE BUS AND THE PROGRAM IS AGAIN LOOPED UNTIL THE NEXT 'KEY REQUEST''.

IF 'STX'' IS STRUCK AND THE SERIAL INPUT OPTION IS BEING USED, THE MESSAGE 'RE-INITIALIZE THE PDM70'' IS PRINTED. THE PROGRAM THEN ENTERS THE 'WAIT MODE'' AND UPON RECEIVING A ''CR'', WILL BEGIN RE-CYCLING THE SUBTEST.

IF 'ETX'' IS STRUCK, THIS SUBTEST IS EXITED, AND THE NEXT SUBTEST IS ENTERED. UPON ENTERING THE NEXT SUBTEST, THE MESSAGE 'ENTERING THE DISPLAY TEST, RE-INITIALIZE THE PDM70'' IS PRINTED. THE PROGRAM THEN ENTERS THE 'WAIT MODE'' AND WAITS FOR ''CR''. UPON RECEIPT OF THE ''CR'' THE SUBTEST STARTS DISPLAYING THE ENTIRE CHARACTER SET, ON CHARACTER AT A TIME ACROSS THE ENTIRE SCREEN. AFTER EACH CHARACTER IS DISPLAYED, A SOFTWARE DELAY IS EXECUTED. THIS DELAY ENABLES THE USER TO VIEW THE LINE WBEFORE THE NEXT CHARACTER LINE IS DISPLAYED. AFTER THE ENTIRE CHARACTER SET HAS BEEN DISPLAYED, THE TEST ENTIRE TEST PROGRAM IS RESTARTED.

12.16. M7387A, PROM HARDWARE READ-IN MODULE

THIS PROGRAM MAY BE SELECTED AS A SEPERATE MODULE TEST, ALTHOUGH IT IS RUN AS PART OF THE M7380 CONTROL MODULE TEST. REFER TO

---

* REFERENCE THE LISTING FOR THE ADDRESS OF THIS 'TAG'.

PART 1 OF SECTION 12.1 FOR A COMPLETE TEST DESCRIPTION.

12.17. M7388A, CHARACTER I/O MODULE ADDRESS (IN-HOUSE) TEST

THIS TEST REQUIRES A SPECIAL WRAP-AROUND MODULE (AVAILABLE ONLY IN HOUSE) TO RUN THIS TEST. FOR FIELD TESTING THIS MODULE REFER TO THE M7388F (SECTION 12.18).

THE TEST USES THE SAME TEST PROGRAM AS THE SERIAL I/O MODULE (REFER TO SECTION 12.12). TO RUN THIS TEST, JUMPERS 'SO & SI' MUST BE IN AND THE 'D' & 'L' JUMPERS MUST BE OUT.

12.18 M7388F, CHARACTER I/O MODULE ADDRESS (FIELD) TEST.

THIS PROGRAM IS DESIGNED TO COMMUNICATE WITH THE FIELD SERVICE TESTER. THE FIRST SUBTEST ADDRESS THE MODULE IN MODE '0' AND CHECKS FOR THE FORCED 'EOT'. THE NEXT SUBTEST ADDRESS THE MODULE IN MODE '1' AND CHECKS THAT NO 'EOT' IS RETURNED. A REQUEST IS THEN MADE FOR THE USER TO INPUT DATA (VIA THE TESTER) TO THE MODULE. AS EACH CHARACTER IS RECEIVED, IT IS ECHOED TO PRINTER. THE PROGRAM WILL HANG IN THIS SUBTEST UNTIL 'EOT' IS RECIEVED, ENABLING IT TO ENTER THE NEXT SUBTEST. THE NEXT SUBTEST IS A 'FIFO' STORAGE TEST. IT REQUESTS FOR THE USER TO INPUT DATA (UP TO 63 CHARACTERS) AND AN 'EOT'. AFTER ALL THE DATA HAS BEEN TRANSMITTED, TYPE 'CR'. THE MODULE (SOURCE) IS THEN ADDRESSED IN MODE '0' ENABLING THE 'FIFO' DATA TO BE READ AND PRINTED.

THE NEXT SUBTEST LOADS "16", "4" CHARACTER DATA PATTERNS (A TOTAL OF 64 CHAR.'S) INTO THE DESTINATION 'FIFO'. THE USER IS THEN REQUESTED TO STROKE OUT THESE "64" CHARACTERS AND VERIFY THEM. THE "4" CHARACTERS PATTERN IS: ALL 1'S, ALL0'S, ALTERNATE "1'S & 0'S" AND REVERSED ALTERNATE "1'S & 0'S".

THE LAST SUBTEST ADDRESSES THE MODULE USING ALL THE WRONG MODULE ADDRESSES AND CHECKS THAT THE SOURCE ISN'T ENABLED. THIS SUBTEST IS NOT EXECUTED WHEN USING THE SERIAL INPUT OPTION.

12.19 M7377A, REMOTE SERIAL I/O TEST

THIS PROGRAM TESTS THE M7377 MODULE USING THE PDP-11 VIA THE DL-11 AS THE DESTINATION INPUT AND SOURCE OUTPUT.

THE FIRST SUBTEST ADDRESSES THE SOURCE PORTION OF THE MODULE AND CHECKS FOR FORCED RETURN OF EOT.

THE SECOND SUBTEST TRANSMITS A RANDOM BUFFER AND CHECKS THAT IT IS RETURNED CORRECTLY.

IN THE NEXT SUBTEST A 2ND RANDOM BUFFER IS TRANSMITTED AND THE

VARIABLE TERMINATOR OPTION IS CHECKED.

NEXT, THE SOURCE IS THEN ADDRESSED USING THE WRONG MODULE ADDRESSES AND CHECKED TO MAKE SURE IT DOESN'T BECOME ENABLED.

ETX AND STX ARE THEN USED TO VERIFY THAT ETX WILL CLEAR THE SOURCE AND STX WILL CLEAR THE DESTINATION.

A MANUAL INTERVENTION SUBTEST THEN REQUESTS THAT THE OPERATOR RESET THE MODULE ADDRESS TO '17'. DATA IS TRANSMITTED AND THE RECEIVED DATA IS VERIFIED.

THE LAST SUBTEST CHECKS THE TIMEOUT AND REMOTE TIMEOUT ABILITY OF THE MODULE. A NON-EXISTENT SOURCE IS ADDRESSED AND THE MODULE IS CHECKED TO SEE IF IT WILL TIME-OUT CORRECTLY.

THE TEST FOR THE M7377A MODULE WILL NOT RUN UNLESS THE OUTPUT OF THE M7377A (PDM70-JR) IS JUMPERED BACK TO THE INPUT (PIN 2 TO 3 + PIN 5 TO 7 ON THE MATE'N'LOCK) , AND THE TRANS-MITTER AND RECEIVER CURRENT LOOP INTERFACES ARE SET UP (WITH SWITCHES) TO ONE BEING ACTIVE, AND THE OTHER PASSIVE. ALSO, JUMPER W5 ON THE M7377A HAS TO BE REMOVED, TO ALLOW 'EOT'' TO BE TRANSMITTED TO THE RECEIVER.

12.20 M7378A, FOUNDATION MODULE TEST

THIS TEST SETS THE SERIAL I/O UP AS A SOURCE AND THE FOUNDATION MODULE AS A DESTINATION. A RANDOM BUFFER IS TRANSMITTED TO THE FOUNDATION MODULE VIA THE SERIAL I/O. THEN THE FOUNDATION MODULE IS ADDRESSED AS THE SOURCE AND THE SERIAL I/O IS ADDRESSED AS THE DESTINATION. THE DATA SHOULD BE RETURNED VIA THE ''WRAP-AROUND'' CABLE FROM THE FOUNDATION MODULE TO THE SERIAL I/O.

THE NEXT SUBTESTS VERIFY THAT ADDRESS '17' WILL RETURN DATA CORRECTLY, THAT THE WRONG ADDRESSES WILL NOT RETURN DATA, AND THAT THE CUSTOMER DEFINED MODE FLIP FLOP WORKS CORRECTLY.

13.0 USER AID ROUTINES

13.1. SUBX

THIS ROUTINE ENABLES THE USER TO RUN ANY SELECTED MODULE ADDRESS SUBTEST WITHOUT RUNNING THE ENTIRE PROGRAM. WHEN 'SUBX' IS SELECTED IT ASKS FOR THE 'MEMORY ADDRESS' OF THE SUBTEST TO BE EXECUTED. THIS IS TO BE THE ADDRESS OF THE 'SCOPE' ARGUMENT BEGINNING THAT SUBTEST. IF A 'SUBX' ADDRESS HAD PREVIOUSLY BEEN SET UP, THE USER CAN SIMPLY TYPE 'CR' AND THE PREVIOUSLY SELECTED TEST WILL BE RE-ENTERED.

13.2. RECBUF

SEQ 0020

THIS ROUTINE ENABLES THE USER TO EXAMINE THE CONTENTS OF THE DL11'S RECEIVER BUFFER. WHEN SELECTED, THIS ROUTINE PRINTS THE CONTENTS OF THE BUFFER IN THE ORDER IT WAS RECEIVED. IF THE BUFFER IS EMPTY, A MESSAGE IS TYPED TO THAT EFFECT.

SEQ 0021

IT SHOULD BE NOTED THAT ALL DATA RECEIVED FROM THE PDM70 IS STORED IN THIS BUFFER.

13.3. TRNBUF

THIS ROUTINE ENABLES THE USER TO EXAMINE THE DATA TRANSMITTED VIA THE DL11 TO THE PDM70. THE 'RECBUF' & 'TRNBUF' ROUTINES ARE ESPECIALLY USEFUL IN TRACKING DOWN A DATA FAILURE. BY COMPARING THE TWO BUFFERS, THE USER CAN SEE EXACTLY WHERE THE FAILURE OCCURRED AND PICK OUT ANY DESIRED DATA PATTERNS.

13.4. SEND

THIS ROUTINE ENABLES THE USER TO SEND HIS OWN PROGRAM TO THE PMD70. WHEN 'SEND' IS SELECTED AN ASTERISK IS PRINTED TO INDICATE THAT THE ROUTINE IS READY TO ACCEPT INPUT. AS EACH CHARACTER IS RECEIVED IT IS ECHOED BACK TO THE TELEPRINTER AND TRANSMITTED TO THE PDM70.

THIS ROUTINE IS RUN WITH THE DL11 RECEIVER ENABLED. THIS MEANS THAT THE USER CAN USE THE 'RECBUF' ROUTINE TO EXAMINE FOR ANY DATA RETURNED BY HIS PROGRAM.

13.5. RUN

THIS ROUTINE IS USED IN CONJUNCTION WITH THE SEND ROUTINE. WHEN 'RUN' IS SELECTED, IT WILL RE-TRANSMIT THE USER'S 'SEND' PROGRAM. IF THE SERIAL INPUT OPTION IS BEING USED, THE 'SEND' PROGRAM IS TRANSMITTED AND THEN THE PROGRAM ENTERS THE 'WAIT' MODE. IF THE SERIAL INPUT OPTION IS NOT BEING USED, THE SEND PROGRAM IS CONTINUOUSLY TRANSMITTED. IN THIS CASE, THE CONSOLE SWITCHES CAN BE USED TO INCORPORATE A DELAY TIME BEFORE THE PROGRAM IS RE-TRANSMITTED. NO PROGRAM DELAY IS ISSUED WITH ALL DATA SWITCHES DOWN. ALL DATA SWITCHES UP (EXCEPT 11 & 12)* REPRESENT A MAXIMUM PROGRAM DELAY. THE USERS SEND PROGRAM CAN BE EXAMINED AT ANYTIME BY USING THE 'TRNBUF' ROUTINE.

'CONTROL C' WHICH IS NORMALLY USED TO RETURN TO THE MONITOR IS ECHOED AND TRANSMITTED AS AN 'ETX'. SO IN THE SEND ROUTINE, 'CONTROL E' IS USED TO ESCAPE AND RETURN TO THE MONITOR.

---

* REFER TO CONSOLE SWITCH SETTINGS (SECTION 6.) FOR SPECIFIC SWITCH FUNCTIONS.

```
                                .TITLE CZPMACO PDM70 DIAGNOSTIC TEST
                                .ENABLE ABS
                                .ENABLE AMA
                        ;AC-9017C-MC
                        ;COPYRIGHT 1974,1978
                        ;REVISED:          SEPTEMBER 20,1974 ,FEBRUARY 1,1978
                        ;DIGITAL EQUIPMENT CORP. MAYNARD MASS. 01754
                        ;PROGRAMMER: EARL L. BOUSE
                        ;              MIKE MITCHELL
                        ;                BILL SCHLITZKUS

                        ;SWITCH REGISTER DEFINITIONS AND FUNCTIONS:

100000                  SW15=100000                     ;=1, CONTINUE ON ERROR
040000                  SW14=40000                      ;=1, LOOP ON CURRENT TEST
020000                  SW13=20000                      ;=1, SUPPRESS ERROR TYPEOUT
010000                  SW12=10000                      ;=1, SINGLE STEP DL11 OUTPUT DATA.
004000                  SW11=4000                       ;=1, TRANSMIT SAME CHARACTER.
002000                  SW10=2000                       ;=1, INHIBIT MANUAL INTERVENTION
001000                  SW09=1000                       ;=1, INHIBIT TRANSMITTER DELAY
000400                  SW08=400
000200                  SW07=200
000100                  SW06=100
000040                  SW05=40
000020                  SW04=20
000010                  SW03=10
000004                  SW02=4

                        ;REGISTER DEFINITIONS

000000                  R0=%0
000001                  R1=%1
000002                  R2=%2
000003                  R3=%3
000004                  R4=%4
000005                  R5=%5
000006                  SP=%6
000007                  PC=%7

                        ;INSTRUCTIONS DEFINITIONS

005746                  PUSH1SP=5746
005726                  POP1SP=5726
024646                  PUSH2SP=24646
022626                  POP2SP=22626
000240                  NOP=240
000002                  X=2
000002                  Y=2
```

```
                        .SBTTL ******** NOTES *********

                        ;NOTES:
                        ;
                        ;PDM-70 MUST BE CLEARED BEFORE RUNNING ANY TEST.
                        ;
                        ;ON POWERUP, THE FIFO IS GENERALLY CLEARED (UNLESS 'N'' MODULE IS  PRESENT).
                        ;IF, DURING THE COURSE OF RUNNING THIS DIAGNOSTIC, IT BECOMES
                        ;NECCESSARY TO RESTART A SUBTEST (FOR EXAMPLE, AFTER ENCOUNTERING AN ERROR),
                        ;THE PDM70 FIFI SHOULD BE CLEARED OUT TO INSURE THAT GARBAGE WILL
                        ;NOT ACCIDENTLY BE LEFT IN THE FIFO WHICH WOULD SUBSEQUENTLY
                        ;GIVE AN ERRONOUS DATA ERROR.


                        ;MODULE SETUP:
                        ;*********************************************************
                        ; MODULE UNDER TEST  *M7379(CLOCK)  *  M7379 (CLOCK) *
                        ;*********************************************************
                        ;                    *M973 (CABLE)  * M598 (COUPLER) *
                        ;                    ***********************************



                        ;SYSTEM TEST SETUP (USING SERIAL I/O)

                        ;*********************************************************
                        ;MODULE UNDER TEST   * M7379 (CLOCK) * M7379          *
                        ;*********************************************************
                        ;                     *M7380 (CONTROL MODULE)         *
                        ;                     ***********************************


                        ;************************
                        ; SERIAL I/O CABLE     *
                        ;************************


                        ;NOTE: JUMPER 'L'' SHOULD BE IN TO ALLOW POWER UP TO ACCESS THE CONTROL MODULE.
```

```
                                ;LOAD TRAP ADDRESSES '0-1000' WITH THE 'IOT' TRAP
                        000000          .=0
                        000200  .REPT   200
                                        .+2
                                        4
                                .ENDR
                        000020          .=20
000020  020440                          ERTRAP                  ;ERROR TRAP REPORTER ROUTINE.
000022  000340                          340
000024  022722                          PWRFAL                  ;POWER FAIL HANDLER
000026  000340                          340
                        000030          .=30
000030  001200                          EMTSRV                  ;EMT TRAP, EMT DISPATCH SERVICE
000032  000340                          340
                        000060          .=60
000060  014716                          XTTYIN                  ;TELEPRINTER KEYBOARD ROUTINE
000062  000340                          340
                        000176          .=176
000176  000000          SWSWR:  0               ;SOFTWARE SWITCH REGISTER
                        000200          .=200
000200  000137  001376                  JMP     MONITR          ;PROGRAM KEYBOARD MONITOR ROUTINE.

                                .SBTTL EMT TRAP EQUIVALENCE TABLE

                        104000  PRCNTR=EMT                      ;SUBROUTINE TO PRINT CONTROL CHARACTER IN R1
                        104001  SCOPE=EMT+1                     ;LOGIC TEST SCOPE SUBROUTINE
                        104002  SAVREG=EMT+2                    ;SUBROUTINE TO SAVE 'R0-R5' ON STACK
                        104003  GETREG=EMT+3                    ;SUBROUTINE TO GET 'R0-R5' FROM STACK
                        104004  DELAY=EMT+4                     ;SUBROUTINE TO WAIT FOR DL11 RECVR.
                        104005  RECVR0=EMT+5                    ;SUBROUTINE TO SET UP THE DL11 0'S RECEIVER.
                        104006  LDCHR0=EMT+6                    ;SUBROUTINE TO TRANSMIT A SINGLE CHAR. VIA DL '0'
                        104007  LDPGM0=EMT+7                    ;SUBROUTINE TO TRANSMIT THE DATA IN CALL+2 VIA DL '0'
                        104010  TYPEIT=EMT+10                   ;SUBROUTINE TO PRINT CHARACTER IN 'R1'
                        104011  RANDOM=EMT+11                   ;SUBROUTINE TO CREATE A RANDOM DATA BUFFER.
                        104012  PRINT=EMT+12                    ;SUBROUTINE TO PRINT ASCII MESSAGES.
                        104013  TTYIN=EMT+13                    ;SUBROUTINE TO INPUT VIA KEYBOARD
                        104014  PRTOCT=EMT+14                   ;SUBROUTINE TO PRINT A 6 DIGIT OCTAL NO.
                        104015  ASEMBL=EMT+15                   ;SUBROUTINE TO ASSEMLE CHARACTERS INTO OCTAL VALUE
                        104016  SPACE=EMT+16                    ;SUBROUTINE TO PRINT SPACES
                        104017  TSTTKS=EMT+17                   ;SUBROUTINE TO TEST FOR KEYBOARD FLAGS
                        104020  DELAYL=EMT+20                   ;SUBROUTINE TO SETUP A LONG DISPLAY DELAY
                        104021  NULL=EMT+21                     ;SUBROUTINE TO TRANSMIT A NULL PRINTER CHAR.
                        104022  MODERR=EMT+22                   ;SUBROUTINE TO REPORT MODULE ERRORS.
                        104023  NULL1=EMT+23                    ;SUBROUTINE TO TRANSMIT 12 NULL CHAR.'S.
                        104024  DESTIN=EMT+24                   ;SUBROUTINE TO SETUP DESTINATION MODULE.
                        104025  SOURCE=EMT+25                   ;SUBROUTINE TO SETUP A SOURCE MODULE
                        104026  ADDRES=EMT+26                   ;SUBROUTINE TO REQUEST & SAVE MODULE ADDRESS
                        104027  ADCNVT=EMT+27                   ;SUBROUTINE TO TAKE & STORE A/D CONVERSIONS
                        104030  BCDBIN=EMT+30                   ;SUBROUTINE TO CONVERT 'BCD' TO BINARY
                        104031  AVERAG=EMT+31                   ;SUBROUTINE TO AVERAGE 'N' NUMBERS
                        104032  CHANEL=EMT+32                   ;SUBROUTINE TO REQUEST & STORE A/D CHANNEL
                        104033  BINDEC=EMT+33                   ;SUBROUTINE TO CONVERT BINARY TO DEC.
                        104034  WAITGN=EMT+34                   ;SUBROUTINE TO TEST GAIN ACCURACY
                        104035  SETUP=EMT+35                    ;SUBROUTINE TO SETUP THE '^R' RESTART ADDR.
                        104036  NODLAY=EMT+36                   ;SUBROUTINE TO INHIBIT TRANSMITTER DELAY
                        104037  PRTRBF=EMT+37                   ;SUBROUTINE TO PRINT CONTENTS OF RECVR BUFFER
```

```
                        ;*****************************************************************************
                        .SBTTL EMT DISPATCH SERVICE ROUTINE
                        ;ARGUMENT OF EMT IS EXTRACTED AND USED AS OFFSET TO OBTAIN POINTER
                        ;TO THE SELECTED SUBROUTINE.
                        ;*****************************************************************************

001200                          .=1200
001200  011646          EMTSRV: MOV     (SP),-(SP)      ;GET PC FOR TO RETURN
001202  162716  000002          SUB     #2,(SP)         ;PC OF EMT
001206  017616  000000          MOV     @(SP),(SP)      ;GET EMT
001212  005716                  TST     (SP)            ;IS EMT VALID?
001214  001001                  BNE     EMTOK
001216  000000                  HALT                    ;INVALID EMT
001220  006316          EMTOK:  ASL     (SP)            ;MULTIPLY EMT ARG BY '2'
001222  042716  177001          BIC     #177001,(SP)    ;CLEAR UNWANTED BITS
001226  062716  001240          ADD     #EMTTAB,(SP)    ;POINTER TO SUBROUTINE ADDRESS
001232  017616  000000          MOV     @(SP),(SP)      ;SUBROUTINE ADDRESS
001236  000136                  JMP     @(SP)+          ;GO TO SUBROUTINE
                        ;EMT DISPATCH TABLE

001240  021376          EMTTAB: XPRCNT                  ;SUBROUTINE TO PRINT CONTROL CHAR. IN R1.
001242  020636                  XSCOPE                  ;MODULE TEST SCOPE LOOP ROUTINE
001244  023026                  XSAVRG                  ;SUBROUTINE TO SAVE 'R1-R5' ON STACK
001246  023102                  XGETRG                  ;SUBROUTINE TO RETRIEVE 'R1-R5' FROM STACK
001250  022126                  XDLAYL                  ;SUBROUTINE TO WAIT FOR DATA FROM DL11 RECEIVER
001252  016130                  XRECR0                  ;SUBROUTINE TO SET UP DL 0'S RECEIVER.
001254  017302                  XLDCHR                  ;SUBROUTINE TO TRANSMIT A SINGLE CHAR
001256  017320                  XLDADD                  ;SUBROUTINE TO TRANSMIT DATA FROM ADDRESS IN CALL+2.
001260  021340                  XTYPIT                  ;SUBROUTINE TO PRINT CHARACTER IN 'R1'
001262  020776                  XRANGN                  ;SUBROUTINE TO CREATE A RANDOM DATA BUFFER.
001264  021650                  XPRINT                  ;SUBROUTINE TO PRINT ASCII MESSAGES.
001266  014716                  XTTYIN                  ;SUBROUTINE TO INPUT VAI KEYBOARD.
001270  022010                  XOCTPR                  ;SUBROUTINE TO PRINT A '6' DIGIT OCTAL NO.
001272  023156                  XASEMB                  ;SUBROUTINE TO ASSEMBLE A ONE WORD NO.
001274  021234                  XSPACE                  ;SUBROUTINE TO TYPE SPACES
001276  021264                  TKSFLG                  ;SUBROUTINE TO TEST FOR KEYBOARD FLAG.
001300  022126                  XDLAYL                  ;SUBROUTINE TO SET UP A LONG DELAY.
001302  021554                  XNULL                   ;SUBROUTINE TO ISSUE NULL CHARACTERS AFTER RESET''.
001304  020540                  XERMES                  ;SUBROUTINE TO REPORT MODULE ERRORS
001306  021564                  XNULL1                  ;SUBROUTINE TO TRANSPORT '12' NULL CHAR.'S
001310  017164                  XDSTIN                  ;SUBROUTINE TO SET UP A DESTINATION MODULE
001312  017144                  XSOURCE                 ;SUBROUTINE TO SET UP A SOURCE MODULE
001314  020374                  XADRES                  ;SUBROUTINE TO REQUEST & SAVE MODULE ADDRESS
001316  006670                  XADCNT                  ;SUBROUTINE TO TAKE & STORE A/D CONVERSIONS
001320  022430                  XBCDBIN                 ;SUBROUTINE TO CONVERT 'BCD' TO BINARY
001322  015702                  XAVRAGE                 ;SUBROUTINE TO AVERAGE 'N' NUMBERS
001324  020512                  XCHANEL                 ;SUBROUTINE TO REQUEST & STORE A/D CHANNEL.
001326  022574                  XBINDEC                 ;SUBROUTINE TO CONVERT BINARY TO DECIMALS.
001330  006474                  XWATGN                  ;SUBROUTINE TO TEST GAIN ACCURACY.
001332  021276                  XSETUP                  ;SUBROUTINE TO SETUP THE '^R' RESTART ADDR.
001334  021544                  XNODLY                  ;SUBROUTINE TO INHIBIT TRANSMITTED DELAY
001336  022246                  XPRTRB                  ;SUBROUTINE TO PRINT CONTENTS OF RECVR. BUFFER
```

```
                        .SBTTL REGISTER ADDRESSES

001340  177776          PSW:    177776          ;ADDRESS OF PROCESSOR STATUS REG.
001342  177560          TKS:    177560          ;ADDRESS OF KEYBOARD STATUS REG.
001344  177562          TKB:    177562          ;   ''      ''      ''   BUFFER  ''
001346  177564          TPS:    177564          ;   ''      ''  PRINTER STATUS REG.
001350  177566          TPB:    177566          ;   ''      ''  PRINTER BUFFER REG.
001352  177570          SWR:    177570          ;   ''      ''  SWITCH REG.
001354  177571          SWRO:   177571          ;   ''      ''      ''      '' HIGH BYTE

                        ;DL11 REGISTER ADDRESSES

001356  175610          RCSR0:  175610          ;ADDRESS OF UNIT 0'S DL11 REC. CSR
001360  175612          RBUF0:  175612          ;ADDRESS OF UNIT 0'S DL11 REC. BUFFER
001362  175614          XCSR0:  175614          ;ADDRESS OF UNIT 0'S TRANS. CSR
001364  175616          XBUF0:  175616          ;ADDRESS OF UNIT 0'S DL11 TRANS. BUFFER
001366  000300          RINT0:  300             ;ADDRESS OF UNIT 0'S REC. VECTOR
001370  000302          RLVL0:  302

001372  000304          XINT0:  304             ;ADDRESS OF UNIT 0'S DL11 TRANS. VECTOR
001374  000306          XLVL0:  306             ;ADDRESS OF UNIT 1'S DL11 TRANS. VECTOR

                        .SBTTL DEFINITIONS OF THE 'PDM-70' CONTROL CHARACTERS.

        000021          DC1=021                 ;ENABLE SOURCE
        000022          DC2=022                 ;ENABLE DESTINATION
        000023          DC3=023                 ;GO
        000024          DC4=024                 ;DO NOT RECIRCULATE
        000003          ETX=003                 ;END OF TEXT
        000002          STX=002                 ;START OF TEXT
        000026          SYN=026                 ;SYNCHRONIZE (DELAY)
        000001          SOH=001                 ;START OF HEADER
        000017          SI=017                  ;SHIFT IN.
        000004          EOT=004                 ;END OF TRANSMISSION
        000005          ENQ=005                 ;ENQUIRY.

                        ;*****************************************************************************
                        .SBTTL KEYBOARD MONITOR
                        ;*****************************************************************************

001376  012706  001000          MONITR: MOV     #1000,  SP      ;SET UP STACK
001402  012746  000340                  MOV     #340,   -(SP)   ;SET PROC. PRIORITY @7
001406  012746  001414                  MOV     #1$,    -(SP)
001412  000002                          RTI
001414  012737  001430  000004  1$:     MOV     #2$,    4       ;SETUP FOR TIMEOUT
001422  005777  177724                  TST     @SWR            ;HARDWARE SWITCH REGISTER?
001426  000404                          BR      3$              ;YES
001430  012737  000176  001352  2$:     MOV     #SWSWR, SWR     ;NO-USE SOFTWARE SWITCH REG.
001436  022626                          POP2SP                  ;POP THE STACK
001440  012737  000006  000004  3$:     MOV     #6,     4       ;RESTORE TRAP CATCHER
001446  104021                          NULL
001450  000005                          RESET
001452  104021                          NULL
001454  005037  032144                  CLR     DLYSWH          ;CLR SOFTWARE SW.
001460  005037  032122                  CLR     PRTSWH          ;CLR SOFTWARE SW.
001464  005037  032150                  CLR     SENDSW          ;CLR SOFTWARE SW.
```

```
   254  001470  005737  032120                  TST     MTRSWH          ;PROGRAM BEEN INITIALIZED?
   255  001474  001101                          BNE     MONTR5          ;YES
   256  001476  005237  032120                  INC     MTRSWH          ;NO
   257  001502  104012                          PRINT
   258  001504  023353                          TITLE                   ;PRINT PROGRAM HEADER
```

```
                        ;**********.*************************************************************
                        ;MONITOR RESTART ADDRESS STARTS HERE
                        ;**********************************************************************

001506  005037  032132       MONTR1: CLR     SIOSWH
001512  104012                       PRINT
001514  023775                       MES0                    ;TEXT 'IS INPUT VIA SERIAL I/O?
001516  104013                       TTYIN                   ;WAIT FOR INPUT
001520  122737  000131  015330       CMPB    #131,INBUF      ;WAS 'Y' TYPED?
001526  001031                       BNE     MONT1A          ;NO, SETUP DL11 INPUT
001530  104026                       ADDRESS                 ;REQUEST SERIAL I/O ADDRESS
001532  110037  002214               MOVB    R0,IADRS0       ;SET UP ALL ADRESSES WHERE
001536  110037  002220               MOVB    R0,IADRS1       ;SERIAL INTERFACE IS USED.
001542  110037  002224               MOVB    R0,IADRS2
001546  110037  002230               MOVB    R0,IADRS3
001552  110037  003120               MOVB    R0,IADRS4
001556  110037  003124               MOVB    R0,IADRS5
001562  110037  003132               MOVB    R0,IADRS6
001566  110037  017547               MOVB    R0,IADRS7
001572  110037  017643               MOVB    R0,IADRS8
001576  110037  017202               MOVB    R0,IADRS9
001602  110037  011167               MOVB    R0,IADR10
001606  005237  032132               INC     SIOSWH          ;YES, SET SW.
001612  104012          MONT1A: PRINT
001614  027055                       MES63                   ;REQUEST DL11 ADDRESS & VECTOR
001616  104015                       ASEMBL                  ;WAIT AND DECODE
001620  005700                       TST     R0              ;WAS AN ADDRESS ENTERED?
001622  001416                       BEQ     MONTR3          ;NO, USE STANDARD ADDRESS.
001624  012702  001356               MOV     #RCSR0,R2       ;SET UP TO LOAD ADDRESS
001630  012703  000004       MONTR2: MOV     #4,R3
001634  010022                       MOV     R0,(R2)+
001636  062700  000002               ADD     #2,R0           ;ADD '2' TO THE ADDRESS
001642  005303                       DEC     R3
001644  001373                       BNE     .-10
001646  022702  001376               CMP     #XLVL0+2,R2     ;LOADED VECTOR ADDRESSES?
001652  001402                       BEQ     MONTR3          ;YES, EXIT
001654  010400                       MOV     R4,R0
001656  000764                       BR      MONTR2
001660  012777  016740  177500 MONTR3: MOV     #RECVER,@RINT0  ;SET UP RECEIVER SERVICE ADDRESS
                                                             ;RINT0=DL-11 VECTOR (300)
001666  012777  000200  177474       MOV     #200,@RLVL0     ;BR LEVEL '4'
001674  104012          MONTR4: PRINT
001676  023415                       HEADER                  ;PRINT TEST PROTOCOL
001700  012737  001506  032124 MONTR5: MOV     #MONTR1,RVECTR  ;SET UP THE 'RESTART' ADDR, POINTER
001706  104012                       PRINT
001710  031706                       DOT                     ;PRINT DOT TO INDICATE READY
```

```
                                ;*****************************************************************************
                                ;THIS SUBROUTINE DECODES THE USER'S INPUT AND EXECUTES THE SELECTED TEST
                                ;*****************************************************************************

002712  005037  015330        DECODE: CLR     INBUF
002716  104013                        TTYIN                   ;CALL KEYBOARD ROUTINE
002720  022737  000103  015330        CMP     #103,INBUF      ;WAS 'C' TYPED TO CONTINUE LAST TEST?
002726  001007                        BNE     DECOD1          ;NO, DECODE INPUT
002730  005737  032224                TST     RESTRT          ;YES, HAS A RESTART ADDR. BEEN SET UP?
002734  001455                        BEQ     NMATCH          ;NO, ILLEGAL ENTRY.
002736  004737  023304                JSR     PC,     UPDAT1  ;CHECK FOR SOFTWARE SWR
002742  000177  030256                JMP     @RESTRT         ;YES, RESTART LAST TEST
002746  012701  023475        DECOD1: MOV     #TSTLST,R1      ;SET UP MESSAGE ADDR. POINTER
002752  005003                        CLR     R3              ;OFFSET REG.
002754  012702  015330        RECYCL: MOV     #INBUF,R2       ;SET UP TTY BUFFER POINTER
002760  122711  000045                CMPB    #45,(R1)
002764  001403                        BEQ     .+10
002766  122711  000040                CMPB    #40,(R1)        ;CHAR. = TO 'SPACE'
002772  001002                        BNE     .+6             ;NO
002774  105721                        TSTB    (R1)+           ;YES, SKIP CHAR.
002776  000766                        BR      RECYCL
002000  122122        MATCH:  CMPB    (R1)+,(R2)+     ;COMPARE BUFFERS
002002  001022                        BNE     FLUSH           ;NOT EQUAL, SET UP NEXT WORD
002004  122711  000054                CMPB    #54,(R1)
002010  001373                        BNE     MATCH           ;NO, COMPARE NEXT CHAR.
002012  006303                        ASL     R3              ;SET UP OFFSET
002014  005726                        POP1SP
002016  016337  002076  032224        MOV     TSTABL(R3),RESTRT       ;SET UP A RESTART ADDRESS
002024  016337  002076  032126        MOV     TSTABL(R3),AVECTR
002032  062737  000004  032126        ADD     #4,AVECTR       ;SET UP TO RE-ADDRESS MODULE
002040  004737  023304                JSR     PC,     UPDAT1  ;CHECK FOR SOFTWARE SWR
002044  000173  002076                JMP     @TSTABL(R3)     ;EXECUTE SELECTED TEST.
002050  005203        FLUSH:  INC     R3              ;INCREMENT OFFSET CNTR.
002052  122711  000100                CMPB    #100,(R1)       ;TEST FOR '@'
002056  001404                        BEQ     NMATCH          ;YES, END OF MESSAGE.
002060  122721  000054                CMPB    #54,(R1)+       ;CHAR = COMMA?
002064  001733                        BEQ     RECYCLE         ;YES, COMPARE NEXT WORD.
002066  000771                        BR      FLUSH+2         ;NO, KEEP GOING.

002070  104012        NMATCH: PRINT
002072  031702                QMARK                   ;ILLEGAL ENTRY, TYPE '?'
002074  000706                BR      DECODE          ;GET NEW INPUT.
```

```
                        ;*****************************************************************************
                        ;TABLE FOR TESTS SELECTABLE VIA KEYBOARD
                        ;*****************************************************************************
                        

002076  002160  TSTABL: M7380A          ;CONTROL MODULE TEST
002100  003450         M7381A          ;BCD INPUT MODULE ADDRESS TEST
002102  004316         M7381E          ;BCD INPUT MODULE EXERCISER TEST
002104  004412         M7382A          ;BCD OUTPUT MODULE ADDRESSING TEST
002106  004606         BCDIO           ;BCD INPUT/OUTPUT EXERCISER TEST
002110  005014         M7383A          ;A/D MODULE ADDRESS TEST
002112  005416         M7383C          ;A/D MODULE CALIBRATION TEST
002114  005514         M7383R          ;A/D REPEATIBILITY TEST
002116  006356         M7383G          ;A/D GAIN ACCURACY TEST
002120  007072         M7384A          ;D/A MODULE ADDRESS TEST
002122  010006         M7384E          ;D/A OUTPUT MODULE EXERCISER TEST
002124  010126         M7385A          ;SERIAL INPUT/OUTPUT MODULE ADDRESS TEST
002126  011150         M7385I          ;SERIAL I/O INTERFACE TEST
002130  011360         M7385T          ;SERIAL INPUT/OUTPUT TTL TEST
002132  011506         M7386A          ;KEYBOARD/DISPLAY MODULE ADDRESS TEST
002134  003254         M7387A          ;HARDWARE READ-IN MODULE TEST
002136  012050         M7388A          ;CHARACTER I/O (IN-HOUSE) MODULE ADDRESS TEST
002140  012062         M7388F          ;CHARACTER I/O (FIELD) MODULE ADDRESS TEST
002142  012370         M7377A          ;REMOTE SERIAL  MODULE TEST
002144  013664         M7378A          ;FOUNDATION MODULE TEST
002146  021142         SUBX            ;SUBTEST SELECTOR ROUTINE
002150  022224         RECBUF          ;ROUTINE TO PRINT CONTENTS OF DL RECV BUFFER
002152  022232         TRNBUF          ;ROUTINE TO PRINT CONTENTS OF DL TRNS BUFFER
002154  022264         SEND            ;ROUTINE TO TRANSMIT CHAR.'S FROM TTY
002156  022360         RUN             ;ROUTINE TO LOAD & RUN THE SEND PROGRAM
```

```
                                ;*****************************************************************************
                                .SBTTL M7380 CONTROL MODULE TEST.
                                ;THIS TEST COMPLETELY EXERCISES THE PDM-70 'CONTROL MODULE' USING THE
                                ;PDP-11 AS THE MASTER 'SOURCE/DESTINATION' MODULE.  THE TEST TAKES THE
                                ;MODULE THRU THE INITIALIZATION, PROGRAM, ADDRESS AND DATA MODES RESPECTIVELY.
                                ;*****************************************************************************

002160  104012                  M7380A: PRINT
002162  024042                          MES1                    ;TEXT 'CONTROL MODULE TEST'
002164  000240                          NOP
002166  005037  032222                  CLR     LOPSWH
002172  104035                          SETUP                   ;SET UP TEST PARAMETERS.
002174  005037  032144                  CLR     DLYSWH          ;ENABLE TRANSMITTER DELAYS

                                ;*****************************************************************************
                                ;LOAD '2' PROGRAMS INTO THE CONTROLS 'FIFO' AND CHECK THAT
                                ;THE CONTROL MODULE ENTERS THE ADDRESS MODE.
                                ;*****************************************************************************

002200  000240                          NOP
002202  000240                          NOP
002204  104007                          LDPGM0                  ;LOAD THE FOLLOWING PROGRAM.
002206  002212                          PRGM1-1
002210  000412                          BR      TAGB
002212     002                          .BYTE   STX
002213     021                  PRGM1:  .BYTE   DC1
002214     075                  IADRS0: .BYTE   75
002215     001                          .BYTE   SOH
002216     061                          .BYTE   61
002217     022                          .BYTE   DC2             ;ALERT DESTINATION
002220     075                  IADRS1: .BYTE   75
002221     023                          .BYTE   DC3
002222     024                  PRGM2:  .BYTE   DC4             ;START OF 2ND PROGRAM
002223     021                          .BYTE   DC1
002224     075                  IADRS2: .BYTE   75
002225     001                          .BYTE   SOH
002226     061                          .BYTE   61
002227     022                          .BYTE   DC2
002230     075                  IADRS3: .BYTE   75
002231     061                          .BYTE   61
002232     063                          .BYTE   63
002233     023                          .BYTE   DC3
002234     003                  END2:   .BYTE   ETX
002236                                  .EVEN

002236  005737  032132          TAGB:   TST     SIOSWH          ;SERIAL I/O INPUT?
002242  001020                          BNE     TAGOB1          ;YES, JUST LOOK FOR DATA
002244  012701  002213                  MOV     #PRGM1,R1       ;NO, VERIFY 1ST PROGRAM
002250  005737  032222                  TST     LOPSWH          ;LOOPING FROM LAST TEST?
002254  001401                          BEQ     .+4             ;NO, DON'T LOOK FOR 'STX'
002256  005301                          DEC     R1              ;YES, SET UP TO LOOK FOR 'STX'
002260  005237  032222                  INC     LOPSWH
```

```
                                CMP1:   CMPB    (R2)+,(R1)+     ;COMPARE RECV'D/TRANSMITTED DATA
                                        BEQ     .+10
                                        MODERR                  ;RECV'D/TRANS ADDRESS DATA DIFFERENT
                                        ERR2
                                        BR      CT2             ;EXIT ON ERROR.
                                        CMPB    #PRGM2,R1       ;CHK'D ALL DATA?
                                        BNE     CMP1            ;NO

                                ;AT THIS POINT THE MODULE SHOULD BE IN THE 'DATA MODE'
                                ;THIS NEXT SUBTEST SENDS THE CHAR. 'A' AND CHECKS
                                ;THAT IT IS RETURNED AS DATA.

                                TAGOB1: LDCHR0
                                        'A                      ;SEND  CHAR. 'A'
                                        CMPB    #'A,(R2)+       ;WAS 'A' RETURNED?
                                        BEQ     CT2             ;YES
                                        MODERR                  ;MODULE DIDN'T ENTER DATA MODE
                                        ERR19

                                ;************************************************************************
                                ;THE CONTROL MODULE SHOULD NOW BE IN THE 'DATA MODE'.  THE FOLLOWING
                                ;SUBTEST CREATES A RANDOM '500' WORD DATA BUFFER AND TRANSFERS IT TO THE
                                ;CONTROL MODULE.  THIS DATA IS VERIFIED WHEN IT IS RECEIVED BACK FROM THE
                                ;CONTROL MODULE.
                                ;************************************************************************

                                CT2:    SCOPE,2                 ;TEST 2
                                        RANDOM                  ;CREATE A RANDOM DATA BUFFER
                                        LDPGM0                  ;TRANSMIT DATA FROM FOLLOWING ADDRESS.
                                        TRNBF0
                                        MOV     #TRNBF0,R1
                                CMP2:   CMPB    (R2)+,(R1)+     ;REVC'D & TRANS DATA EQUAL?
                                        BEQ     .+10            ;YES
                                        MODERR                  ;RECV'D DATA DOESN'T EQUAL TRANS DATA
                                        ERR3
                                        BR      CT3
                                        TST     PARITY          ;PARITY ERROR FLAG SET?
                                        BEQ     CT3A            ;NO, DATA GOOD
                                        MODERR                  ;YES, PARITY ERROR ON LAST TRANSFER
                                        ERR7
                                        BR      .+10
                                CT3A:   CMP     #TRNEND,R1      ;CHK'D WHOLE BUFFER?
                                                                ;CORRECTED 7/1/74.
                                        BNE     CMP2
```

```
                                ;**********.**********************************************************
                                ;THIS SUBTEST ISSUES AN 'EOT' CHARACTER AND CHECKS THAT THE CONTROL
                                ;MODULE RE-ENTERS THE ADDRESS MODE AND THAT THE SECOND PROGRAM LOADED IN
                                ;THE 1ST SUBTEST GETS READ OUT.
                                ;**************************************************************************

002374  104001  000003    CT3:    SCOPE,3                 ;TEST 3
002400  104006                    LDCHR0
002402  000004                    EOT                     ;TRANSMIT THE 'EOT' CHAR.
002404  012701  002222            MOV     #PRGM2,R1
002410  122722  000004            CMPB    #EOT,(R2)+      ;CHK THAT 'EOT' WAS RETURNED
002414  001403                    BEQ     .+10
002416  104022                    MODERR
002420  030603                    ERR5                    ;EOT CHAR WASN'T RETURNED
002422  000422                    BR      CT4     ;EXIT ON ERROR
002424  005737  032132            TST     SIOSWH          ;SERIAL I/O INPUT?
002430  001010                    BNE     TAG0A           ;YES, JUST VERIFY DATA
002432  122221            CMP3:   CMPB    (R2)+,(R1)+     ;COMPARE DATA OF THE SECOND PROGRAM
002434  001403                    BEQ     .+10
002436  104022                    MODERR                  ;ADDRESS ERROR IN 2ND PROGRAM
002440  030544                    ERR4
002442  000412                    BR      CT4
002444  122701  002234            CMPB    #END2,R1        ;DONE
002450  001370                    BNE     CMP3            ;NO

                                ;SEND A CHAR. TO VERIFY THE 2ND PROGRAM IS
                                ;IN THE DATA MODE

002452  104006            TAG0A:  LDCHR0
002454  000101                    'A
002456  122722  000101            CMPB    #'A,(R2)+       ;WAS THE 'A' RECV'D?
002462  001402                    BEQ     CT4             ;YES
002464  104022                    MODERR                  ;2ND PROGRAM DIDN'T ENTER DATA MODE
002466  031321                    ERR18
```

```
                        ;**********************************************************************
                        ;ISSUE ANOTHER 'EOT' TO TEST THAT THE ADDRESS MODE OF THE 1ST PROGRAM IS
                        ;RECIRCULATED BACK OUT OF THE 'FIFO'.
                        ;**********************************************************************

002470  104001  000004  CT4:    SCOPE,4                 ;TEST 4
002474  104006          LDCHR0
002476  000004                  EOT                     ;'EOT' SHOULD RE-ADDRESS 1ST PROGRAM
002500  105722          TSTB    (R2)+                   ;ADD '1' TO BUFFER POINTER
002502  005737  032132  TST     SIOSWH                  ;SERIAL I/O INPUT?
002506  001012          BNE     TAGOC                   ;YES, JUST CHECK DATA
002510  012701  002213  MOV     #PRGM1,R1
002514  122122  CMP4:   CMPB    (R1)+,(R2)+
002516  001403          BEQ     .+10
002520  104022          MODERR                          ;1ST PROGRAM DIDN'T RECIRCULATE
002522  030634          ERR6
002524  001012          BNE     CT5
002526  022701  002222  CMP     #PRGM2,R1
002532  001370          BNE     CMP4

                        ;SEND A CHAR. TO VERIFY THAT THE 1ST PROGRAM ENTERED THE DATA MODE

002534  104006  TAGOC:  LDCHR0
002536  000101          'A
002540  122722  000101  CMPB    #'A,(R2)+               ;WAS CHAR RETURNED?
002544  001402          BEQ     CT5                     ;YES
002546  104022          MODERR                          ;1ST PROGRAM DIDN'T RE-ENTER DATA MODE
002550  030634          ERR6
```

```
                                ;**********************************************************************
                                ;THIS SUBTEST ISSUES ANOTHER 'EOT' CHARACTER.  THIS SHOULD ENABLE THE
                                ;ADDRESS OF THE 1ST PROGRAM TO BE OUTPUT SINCE THE SECOND PROGRAM
                                ;CONTAINED A 'DC4' AND SHOULD HAVE BEEN FLUSHED.
                                ;**********************************************************************
002552  104001  000005        CT5:    SCOPE,5                 ;TEST 5
002556  104006                        LDCHR0
002560  000004                        EOT                     ;'EOT' SHOULD ENABLE ADDRESS MODE
002562  122722  000004                CMPB    #EOT,(R2)+      ;CHECK THAT 'EOT' WAS RETURNED
002566  001403                        BEQ     .+10
002570  104022                        MODERR                  ;'EOT' CHAR. WASN'T RETURNED
002572  030603                        ERR5
002574  000424                        BR      CT6             ;EXIT ON ERROR
002576  005737  032132                TST     SIOSWH          ;SERIAL I/O INPUT?
002602  001012                        BNE     TAGOD           ;YES.
002604  012701  002213                MOV     #PRGM1,R1
002610  122122                CMP5:   CMPB    (R1)+,(R2)+     ;CHECK RECV'D ADDR. AGAINST PROGRAM 1.
002612  001403                        BEQ     .+10
002614  104022                        MODERR                  ;PROGRAM DIDN'T RECIRCULATE PROPERLY
002616  030634                        ERR6
002620  000412                        BR      CT6
002622  122701  002222                CMPB    #PRGM2,R1
002626  001370                        BNE     CMP5
002630  104006                TAGOD:  LDCHR0
002632  000101                        'A
002634  122722  000101                CMPB    #'A,(R2)+
002640  001402                        BEQ     .+6
002642  104022                        MODERR
002644  030634                        ERR6
```

```
                        ;*************************************************************************
                        ;THIS TEST CHECKS THAT ALL '64' LOCATIONS OF THE CONTROLS 'FIFO' CAN
                        ;BE ACCESSED.  THIS IS DONE BY LOADING ONE '64' CHARACTER PROGRAM IN
                        ;THE 'FIFO'.  IN THIS PROGRAM, '56' CHARACTERS ARE RANDOM LITERAL
                        ;CHARACTERS ENTERED UNDER AN 'SI' COMMAND.
                        ;*************************************************************************

002646  104001  000006  CT6:    SCOPE,6                     ;TEST 6
002652  104011                  RANDOM                      ;CREATE A RANDOM DATA BUFFER
002654  012700  017670          MOV     #TRNBF0,R0          ;SET UP TO LOAD AN ADDRESS ON THE DATA
002660  112720  000002          MOVB    #STX,(R0)+          ;ENTER ADDRESS MODE
002664  112720  000021          MOVB    #DC1,(R0)+          ;ALERT SOURCE IF SERIAL I/O IS OUT THERE.
002670  113720  002214          MOVB    IADRS0,(R0)+        ;ADDRESS INPUTTED VIA USER
002674  112720  000001          MOVB    #SOH,(R0)+          ;MODE '1'; WAIT FOR DATA
002700  112720  000061          MOVB    #61,(R0)+
002704  112720  000022          MOVB    #DC2,(R0)+          ;ALERT DESTINATION FOR SERIAL I/O
002710  113720  002214          MOVB    IADRS0,(R0)+        ;ADDRESS INPUTTED VIA USER
002714  112720  000017          MOVB    #SI,(R0)+           ;SEND '55' LITERAL CHARACTERS
002720  112737  000023  017767  MOVB    #DC3,TRNBF0+77      ;LOAD THE '64' CHAR.
002726  112737  000003  017770  MOVB    #ETX,TRNBF0+100     ;TERMINATE THE PROGRAM

002734  104007                  LDPGM0                      ;SEND THE PROGRAM
002736  017670                  TRNBF0
002740  104004                  DELAY                       ;WAIT FOR DATA TO RETURN
002742  105722                  TSTB    (R2)+               ;WAS ANY DATA RETURNED?
002744  001003                  BNE     .+10                ;YES
002746  104022                  MODERR                      ;CONTROL MODULE DIDN'T RETURN ANY DATA
002750  030471                  ERR2
002752  000417                  BR      CT7                 ;EXIT ON ERROR
002754  012701  017670          MOV     #TRNBF0,R1          ;SET UP TO VERIFY DATA
002760  005737  032132          TST     SIOSWH              ;USING SERIAL I/O?
002764  001402                  BEQ     .+6                 ;NO. VERIFY ADDRESS AS WELL AS DATA
002766  062701  000010          ADD     #10,R1              ;YES, MOVE POINTER TO VERIFY DATA ONLY
002772  122122          CMP6:   CMPB    (R1)+,(R2)+
002774  001403                  BEQ     .+10
002776  104022                  MODERR                      ;DATA ERROR
003000  030526                  ERR3
003002  000403                  BR      CT7                 ;EXIT ON ERROR
003004  022701  017767          CMP     #TRNBF0+77,R1       ;DONE?
003010  001370                  BNE     CMP6                ;NO
```

```
                        ;*************************************************************************
                        ;AT THIS POINT THE PROGRAM, ADDRESS AND DATA MODES HAVE BEEN TESTED.
                        ;THIS SUBTEST ISSUES ANOTHER 'STX' CHARACTER TO GET THE CONTROL MODULE
                        ;BACK INTO THE PROGRAM MODE.
                        ;*************************************************************************

003012  104001  000007  CT7:    SCOPE,7                 ;TEST 7
003016  104006          LDCHR0
003020  000002          STX                             ;ISSUE 'STX' TO RE-ENTER PROGRAM MODE
003022  122722  000002  CMPB    #STX,(R2)+
003026  001402          BEQ     .+6
003030  104022          MODERR                          ;THE 'STX' CHARACTER WASN'T RETURNED
003032  030440          ERR1

                        ;*************************************************************************
                        ;THIS SUBTESTS TESTS THE DELAY TIMES OF THE 'SYN' CHARACTER. ALL THE
                        ;DELAY TIMES OF '1-9' ARE TESTED IN ORDER. THE TEST MAKES '2' CHECKS
                        ;ON EACH TIME. FIRST IS THAT THE DELAY ISN'T TOO SHORT AND SECOND THAT
                        ;THE DELAY ISN'T TOO LONG. THIS TEST IS PREFORMED BY LOADING
                        ;'9' SEPARATE PROGRAMS AND STORING THEM IN THE CONTROL FIFO.
                        ;*************************************************************************

003034  104001  000010  CT10:   SCOPE,10                  ;TEST 10
003040  104036          NODLAY                          ;INHIBIT TRANSMITTER DELAY
003042  012701  000001  MOV     #1,R1                   ;SET UP DELAY TIMES (1-9).
003046  012702  000002  MOV     #2,R2                   ;SHORT TIME DELAY COUNT.
003052  012703  000061  MOV     #61,R3                  ;START DELAY WITH '1'.

003056  104005          TAGD:   RECVR0                  ;ENABLE THE DL11 RECVR
003060  012746  000000  MOV     #0,     -(SP)           ;ENABLE INTERRUPTS
003064  012746  003072  MOV     #1$,    -(SP)
003070  000002          RTI
003072  005004          1$:     CLR     R4              ;CONTAINS THE ACTUAL DELAYS COUNTED
003074  110337  003127  MOVB    R3,SYNTIM               ;SET UP DELAY TIME FOR THIS LOOP
003100  110337  030766  MOVB    R3,ERR9+16              ;PRINT DELAY TIME ON ERROR
003104  110337  031023  MOVB    R3,ERR10+16
003110  104007          LDPGM0                          ;LOAD THE FOLLOWING PROGRAM
003112  003116          .+4
003114  000411          BR      TAGF                    ;GO HERE WHEN LOADED
003116      002         .BYTE   STX
003117      021         .BYTE   DC1
003120      075         IADRS4: .BYTE   75              ;MODIFIED BY USER
003121      001         .BYTE   SOH                     ;MODE '0' AUTO 'EOT'
003122      060         .BYTE   60
003123      022         .BYTE   DC2
003124      075         IADRS5: .BYTE   75              ;MODIFIED BY USER
003125      017         .BYTE   SI                      ;ENABLE DESTINATION
003126      026         .BYTE   SYN
003127      061         SYNTIM: .BYTE   61              ;LOCATION MODIFIED ON EACH PASS.
003130      023         .BYTE   DC3
003131      021         .BYTE   DC1
003132      075         IADRS6: .BYTE   75              ;MODIFIED BY USER
003133      001         .BYTE   SOH
003134      061         .BYTE   61
003135      023         .BYTE   DC3
```

```
  665  003136  003                          .BYTE   ETX
  666          003140                       .EVEN
  667
  668  003140  104023              TAGF:   NULL1                   ;1 SEC. TTY DELAY.
  669  003142  005204                      INC     R4              ;INCREMENT DELAY COUNTER
  670  003144  020401                      CMP     R4,R1           ;WAITED LONG ENOUGH?
  671  003146  001410                      BEQ     TAGG            ;YES, 'EOT' SHOULD BE BACK.
  672  003150  020402                      CMP     R4,R2           ;CHECK FOR FAST RETURN?
  673  003152  002372                      BGE     TAGF            ;NO, EXECUTE NEXT DELAY
  674  003154  005737  016224             TST     RECEOT          ;BACK?
  675  003160  001767                      BEQ     TAGF            ;NO, STILL OK
  676  003162  104022                      MODERR                  ;'SYN' DELAY TOO SHORT
  677  003164  030750                      ERR9                    ;** CHECK 'W2' JUMPER IN?
  678  003166  000416                      BR      TAGI+2          ;EXIT ON ERROR
  679
  680  003170  104023              TAGG:   NULL1                   ;GIVE IT AN EXTRA SEC.
  681  003172  005737  016224             TST     RECEOT          ;SHOULD BE BACK HERE.
  682  003176  001003                      BNE     TAGH            ;HOORAY IT IS.
  683  003200  104022                      MODERR                  ;'SYN' DELAY TOO LONG
  684  003202  031005                      ERR10                   ;** CHECK 'W2' JUMPER IN?
  685  003204  000407                      BR      TAGI+2
  686
  687  003206  005201              TAGH:   INC     R1
  688  003210  022701  000012             CMP     #12,R1          ;TEST ALL TIMES?
  689  003214  001403                      BEQ     TAGI+2          ;YES, EXIT
  690  003216  005202                      INC     R2              ;NO, SET UP TO TEST NEXT TIME
  691  003220  005203                      INC     R3              ;SET UP NEW 'SYN' COUNT
  692                                                              ;ENABLE NEXT PROGRAM
  693  003222  000715              TAGI:   BR      TAGD            ;LOAD THE NEW TIME DELAY PROGRAM
  694  003224  012746  000340             MOV     #340,   -(SP)
  695  003230  012746  003236             MOV     #1$,    -(SP)
  696  003234  000002                      RTI
  697  003236  032777  002000  176106 1$: BIT     #SW10,@SWR      ;IS 'SW10' SET
  698  003244  001471                      BEQ     CT12            ;NO, INHIBIT TESTING M7387
```

```
                        ;**********.*************************************************************
                        .SBTTL M7387 READ-IN MODULE TEST
                        ;THIS TEST IS RUN IN CONJUNCTION WITH THE M7380 CONTROL TEST. IT
                        ;REQUESTS THE USER TO INSET THE M7387 READER MODULE AND THEN
                        ;HIT THE RESET BUTTON. THIS WILL ENABLE THE PROM DIAGNOSTIC PROGRAM TO
                        ;BE CALLED OUT. THIS PROGRAM IS THEN VERIFIED AND THE MESSAGE 'PROM OK'
                        ;IS TYPED.
                        ;*************************************************************************

003246  104001  000011  CT11:   SCOPE,11                    ;TEST 11
003252  000401                  BR      .+4
003254  104035          M7387A: SETUP                       ;ENTERED HERE IS M7387A IS TYPED
003256  104012                  PRINT
003260  027100                  MES64                       ;TEXT 'INSERT M7387 MODULE''.
003262  104005                  RECVR0                      ;ENABLE DL11
003264  012746  000000          MOV     #0,     -(SP)       ;ENABLE INTERRUPTS
003270  012746  003276          MOV     #1$,    -(SP)
003274  000002                  RTI
003276  005712          1$:     TST     (R2)
003300  001776                  BEQ     .-2                 ;NO, WAIT
003302  104004                  DELAY                       ;WAIT FOR DATA
003304  012746  000340          MOV     #340,   -(SP)       ;INHIBIT INTERRUPTS
003310  012746  003316          MOV     #2$,    -(SP)
003314  000002                  RTI
003316  012701  003360          2$:     MOV     #PROMS,R1
003322  122122          CMP11:  CMPB    (R1)+,(R2)+         ;DATA OK?
003324  001403                  BEQ     .+10                ;YES
003326  104022                  MODERR                      ;PROM DATA ERROR
003330  030526                  ERR3
003332  000436                  BR      CT12                ;EXIT ON ERROR

003334  022701  003427          CMP     #PROMD,R1           ;CHECKED ALL DATA?
003340  001370                  BNE     CMP11               ;NO
003342  104012                  PRINT                       ;YES
003344  027166                  MES65                       ;TEXT 'PROM OK'
003346  104013                  TTYIN                       ;WAIT FOR 'CR' TO CONTINUE.
003350  012737  000001  032222  MOV     #1,LOPSWH
003356  000424                  BR      CT12

                        ;FOLLOWING IS THE DATA WHICH SHOULD BE READ FROM PROM

003360      015         PROMS:  .BYTE   15
003361      012                 .BYTE   12
003362      115                 .BYTE   'M
003363      067                 .BYTE   67
003364      063                 .BYTE   63
003365      070                 .BYTE   70
003366      067                 .BYTE   67
003367      040                 .BYTE   40
003370      120                 .BYTE   'P
003371      122                 .BYTE   'R
003372      117                 .BYTE   'O
003373      115                 .BYTE   'M
003374      040                 .BYTE   40
003375      122                 .BYTE   'R
```

```
                                                .BYTE   'E
                                                .BYTE   'A
                                                .BYTE   'D
                                                .BYTE   55
                                                .BYTE   'I
                                                .BYTE   'N
                                                .BYTE   40
                                                .BYTE   'T
                                                .BYTE   'E
                                                .BYTE   'S
                                                .BYTE   'T
                                                .BYTE   15
                                                .BYTE   12
                                                .BYTE   60
                                                .BYTE   61
                                                .BYTE   62
                                                .BYTE   63
                                                .BYTE   64
                                                .BYTE   65
                                                .BYTE   66
                                                .BYTE   67
                                                .BYTE   70
                                                .BYTE   71
                                                .BYTE   15
                                                .BYTE   12
                                        PROMD:  .BYTE   0

                                                .EVEN


                                        ;*******************************************************************************
                                        ;TEST COMPLETE
                                        ;*******************************************************************************

003430  104001  000012                  CT12:   SCOPE,12                        ;TEST 12
003434  104012                                  PRINT
003436  024236                                  MES7                    ;TEXT 'TEST COMPLETE'
003440  005237  032222                          INC     LOPSWH          ;SET SW. TO LOOP PROGRAM
003444  000137  002172                          JMP     M7380A+12       ;RESTART PROGRAM
```

```
                                ;*****************************************************************************
                                .SBTTL M7381 BCD INPUT MODULE ADDRESS TEST
                                ;*****************************************************************************

003450  104012          M7381A: PRINT
003452  025233                  MES29
003454  104026                  ADDRESS                 ;GET MODULE ADDRESS
003456  104012          BCDT0:  PRINT                   ;TEST 'SET SW'S ALL ON
003460  025303                  MES31
003462  025324                  MES31A
003464  004737  023274          JSR     PC,     UPDATE  ;CHECK FOR SOFTWARE SWR
003470  104035                  SETUP                   ;SETUP TEST PARAMETERS

                                ;*****************************************************************************
                                ;THIS SUBTEST ADDRESSES THE MODULE IN MODE '0' AND CHECKS THAT THE
                                ;MODULE ADDRESS, MODE AND CORRECT NUMBER OF DIGITS ARE RETURNED.
                                ;*****************************************************************************

003472  000240          BCDT1:  NOP
003474  000240                  NOP
003476  112737  000060  017231  MOVB    #60,SOH1        ;SET UP MODE '0'
003504  004737  017220          JSR     PC,@#ADRSRC     ;ADDRESS THE MODULE
003510  005737  016224          TST     RECEOT          ;WAS 'EOT' RETURNED?
003514  001003                  BNE     .+10            ;YES, VERIFY DATA
003516  104022                  MODERR                  ;NO, MODULE DIDN'T ENTER DATA MODE.
003520  031041                  ERR11
003522  000432                  BR      BCDT2
003524  123722  032134          CMPB    MODADR,(R2)+    ;RECEIVE CORRECT ADDRESS?
003530  001403                  BEQ     .+10            ;YES
003532  104022                  MODERR                  ;RECEIVED WRONG MODULE ADDRESS
003534  030526                  ERR3
003536  000424                  BR      BCDT2
003540  122722  000060          CMPB    #60,(R2)+       ;RECEIVE CORRECT MODE?
003544  001403                  BEQ     .+10            ;YES
003546  104022                  MODERR                  ;MODULE WAS ADDRESSED IN MODE '0'
003550  030526                  ERR3
003552  000416                  BR      BCDT2
003554  122722  000077  CMP2A:  CMPB    #77,(R2)+       ;SHOULD READ ALL 1'S WITH INPUTS OPEN
003560  001403                  BEQ     .+10
003562  104022                  MODERR                  ;DATA ERROR, SHOULD READ ALL 1'S
003564  030526                  ERR3                    ;WITH THE INPUTS OPEN.
003566  000410                  BR      BCDT2
003570  022702  016246          CMP     #RECBF0+12,R2   ;DONE?
003574  001367                  BNE     CMP2A           ;NO
003576  122722  000004          CMPB    #EOT,(R2)+      ;WERE CORRECT NUMBER OF CHAR.'S RECEIVED?
003602  001402                  BEQ     .+6             ;YES
003604  104022                  MODERR                  ;DIDN'T RECEIVE ALL DATA CHAR.'S
003606  030526                  ERR3
```

```
                        ;*************************************************************************
                        ;THIS SUBTEST ADDRESSES THE MODULE FOR MODE '1' (EXT. SYNC) AND CHECKS
                        ;THAT ONLY AN 'EOT' AND ONLY AN 'EOT' IS RECEIVED BACK.
                        ;*************************************************************************

003610  104001          BCDT2:  SCOPE
003612  000002                  2
003614  112737  000061  017231        MOVB    #61,SOH1        ;SET UP MODE '1' 'EXT SYNC'
003622  004737  017220              JSR     PC,@#ADRSRC     ;ADDRESS THE MODULE
003626  122722  000004              CMPB    #EOT,(R2)+      ;WAS 'EOT' RETURNED?
003632  001402                      BEQ     .+6             ;YES
003634  104022                      MODERR                  ;'EXT SYNC' DIDN'T RETURN AN 'EOT'
003636  030603                      ERR5

                        ;*************************************************************************
                        ;THIS SUBTEST ADDRESSES THE MODULE IN MODE '2' AND CHECKS THAT ONLY
                        ;DATA IS RECIEVED FROM THE MODULE.
                        ;*************************************************************************

003640  104001          BCDT3:  SCOPE
003642  000003                  3
003644  112737  000062  017231        MOVB    #62,SOH1        ;SET UP MODE '2'
003652  004737  017220              JSR     PC,@#ADRSRC     ;ADDRESS THE MODULE
003656  122737  000004  016244        CMPB    #EOT,RECBF0+10  ;IS 'EOT' IN CORRECT PLACE
003664  001402                      BEQ     .+6             ;YES
003666  104022                      MODERR                  ;ONLY DATA SHOULD BE TRANSMITTED IN MODE '2'
003670  030526                      ERR3

                        ;*************************************************************************
                        ;THIS SUBTEST ADDRESSES THE MODULE FOR MODE '3' (EXT. SYNC) AND CHECKS
                        ;THAT ONLY AN 'EOT' AND ONLY 'EOT' IS RECEIVED BACK.
                        ;*************************************************************************

003672  104001          BCDT4:  SCOPE
003674  000004                  4
003676  112737  000063  017231        MOVB    #63,SOH1        ;SET UP MODE '3'
003704  004737  017220              JSR     PC,ADRSRC       ;ADDRESS MODULE
003710  122722  000004              CMPB    #EOT,(R2)+      ;WAS 'EOT' RETURNED?
003714  001402                      BEQ     .+6             ;YES
003716  104022                      MODERR                  ;EXTERNAL &SYNC' DIDN'T RETURN AN 'EOT'
003720  030526                      ERR3
```

```
                        ;*************************************************************************
                        ;THIS SUBTEST ADDRESSES THE MODULE USING ALL THE WRONG
                        ;MODULE ADDRESSES AND TESTS THAT THE MODULE ISN'T ENABLED.
                        ;*************************************************************************

003722  104001          BCDT5:  SCOPE
003724  000005                  5
003726  004737  005154          JSR     PC,@#ADRSIT     ;SUBROUTINE TO ADDRESS MODULE

                        ;*************************************************************************
                        ;THIS SUBTEST REQUESTS THAT THE CUSTOMER SWITCHES BE RE-SET TO ALL ON
                        ;AND THE INPUTS GROUNDED.  THE PROGRAM THEN CHECKS THAT ALL 0'S
                        ;ARE READ FROM THE MODULE.
                        ;NOTE: IF DATA SW10 IS NOT SET, THE FOLOWING SUBTESTS ARE SKIPPED.
                        ;*************************************************************************

003732  104001          BCDT6:  SCOPE
003734  000006                  6
003736  032777  002000  175406          BIT     #SW10,@SWR      ;SW SET?
003744  001520                  BEQ     BCDT11          ;NO, SKIP MANUAL TESTS.
003746  104012                  PRINT
003750  025303                  MES31
003752  025434                  MES31D
003754  004737  023274          JSR     PC,     UPDATE  ;CHECK FOR SOFTWARE SWR
003760  012737  003760  020774  MOV     #.,RETURN       ;RE-SET SCOPE LOOP POINTER
003766  104005                  RECVR0
003770  112737  000062  017231  MOVB    #62,SOH1        ;SET UP MODE '2'
003776  004737  017220          JSR     PC,@#ADRSRC     ;ADDRESS THE MODULE
004002  122722  000060  CMP2B:  CMPB    #60,(R2)+
004006  001403                  BEQ     .+10
004010  104022                  MODERR                  ;DATA SHOULD TO ALL 0'S WITH
004012  030526                  ERR3                    ;THE INPUTS GROUNDED
004014  000403                  BR      BCDT7           ;EXIT ON ERROR
004016  022702  016244          CMP     #RECBF0+10,R2   ;DONE?
004022  001367                  BNE     CMP2B           ;NO

                        ;*************************************************************************
                        ;THIS SUBTEST REQUESTS THAT THE CUSTOMER SWITCHES BE SET TO ALL OFF AND
                        ;CHECKS THAT ONLY THE ADDRESS, MODE AND 'EOT' ARE RETURNED.
                        ;NOTE: IF DATA SW10 IS SET THE FOLLOWING TESTS ARE SKIPPED.
                        ;*************************************************************************

004024  104001          BCDT7:  SCOPE
004026  000007                  7
004030  104012                  PRINT
004032  024316                  MES10                   ;TEXT 'RESET MODULE TO ADDR. '17'.
004034  104012                  PRINT
004036  025303                  MES31                   ;SET CUST. SW.'S TO '0'
004040  025463                  MES31E
004042  004737  023274          JSR     PC,     UPDATE  ;CHECK FOR SOFTWARE SWR
004046  112737  000077  032134  MOVB    #77,MODADR      ;SET UP NEW MODULE ADDRESS.
004054  112737  000077  017227  MOVB    #77,SRCADR
004062  012737  004062  020774  MOV     #.,RETURN       ;RE-SET SCOPE LOOP POINTER
```

```
                                        RECVR0                  ;ENABLE THE DL11 RECVR.
004072  112737  000060  017231          MOVB    #60,SOH1        ;SET UP MODE '0'
004100  004737  017220                  JSR     PC,@#ADRSRC     ;ADDRESS THE MODULE
004104  005712                          TST     (R2)            ;WAS ANY DATA RETURNED?
004106  001003                          BNE     .+10            ;YES
004110  104022                          MODERR                  ;DIDN'T ENTER DATA MODE
004112  031041                          ERR11
004114  000406                          BR      BCDT10          ;EXIT ON ERROR
004116  122737  000004  016236          CMPB    #EOT,RECBF0+2   ;EOT SHOULD BE 3RD CHAR. BACK
004124  001402                          BEQ     .+6             ;OK, IT IS
004126  104022                          MODERR                  ;DATA WASN'T INHIBITED
004130  030526                          ERR3

                                ;*************************************************************************
                                ;THIS SUBTEST REQUESTS THAT THE CUSTOMER SWITCHES BE SET TO ALTERNATE
                                ;ON & OFF AND CHECKS THAT ONE '4' CHARACTERS ARE RETURNED.
                                ;*************************************************************************

004132  104001                  BCDT10: SCOPE
004134  000010                          10
004136  104012                          PRINT
004140  025303                          MES31
004142  025403                          MES31C
004144  004737  023274                  JSR     PC,     UPDATE  ;CHECK FOR SOFTWARE SWR
004150  012737  004150  020774          MOV     #.,RETURN       ;RE-SET THE SCOPE LOOP POINTER
004156  104005                          RECVR0
004160  112737  000062  017231          MOVB    #62,SOH1        ;SET UP MODE '2'
004166  004737  017220                  JSR     PC,@#ADRSRC     ;ADDRESS THE MODULE
004172  022737  000004  016240          CMP     #EOT,RECBF0+4   ;WHERE ONLY '4' CHAR.'S RETURNED
004200  001402                          BEQ     .+6             ;YES
004202  104022                          MODERR                  ;ONLY '4' CHAR.'S SHOULD BE RETURNED
004204  030526                          ERR3
```

```
                        ;*****************************************************************************
                        ;THIS SUBTEST TESTS THE DEVICE FLAG IN MODE '1'.  A REQUEST IS MADE
                        ;FOR AN EXTERNAL SIGNAL TO BE SUPPLIED.  THE 'BCD' INPUT MODULE
                        ;IS THEN ADDRESSED AND CHECKS THAT DATA WAS RETURNED.
                        ;*****************************************************************************

004206  104001          BCDT11: SCOPE
004210  000011                  11
004212  104012                  PRINT
004214  026654                  MES60                   ;TEXT 'SUPPLY AN EXTERNAL SYNC.
004216  104013                  TTYIN                   ;WAIT FOR 'CR'
004220  112737  000061  017231  MOVB    #61,SOH1        ;SELECT MODE '1' ;WAIT FOR DEVICE FLAG.
004226  004737  017220          JSR     PC,@#ADRSRC     ;ADDRESS THE MODULE
004232  105737  016235          TSTB    RECBF0+1        ;WAS ANY DATA RETURNED?
004236  001002                  BNE     BCDT12          ;YES, CHECK FORMAT
004240  104022                  MODERR                  ;NO DATA RETURNED WITH EXT. SYNC.
004242  031433                  ERR20


                        ;*****************************************************************************
                        ;THIS SUBTEST TEST THE DEVICE FLAG IN MODE '3'.  A REQUEST IS MADE
                        ;FOR AN EXTERNAL SIGNAL TO BE SUPPLIED.  THE 'BCD' INPUT MODULE IS
                        ;THEN ADDRESSED AND CHECKED THAT DATA WAS RETURNED.
                        ;*****************************************************************************

004244  104001          BCDT12: SCOPE
004246  000012                  12
004250  104012                  PRINT
004252  026654                  MES60                   ;TEXT 'SUPPLY AN EXTERNAL SYNC.'
004254  104013                  TTYIN                   ;WAIT FOR 'CR'
004256  112737  000063  017231  MOVB    #63,SOH1        ;SELECT MODE 3 WAIT FOR DEVICE FLAG
004264  004737  017220          JSR     PC,ADRSRC       ;ADDRESS THE MODULE
004270  105737  016235          TSTB    RECBF0+1        ;WAS ANY DATA RETURNED?
004274  001002                  BNE     BCDT13          ;YES, VERIFY FORMAT
004276  104022                  MODERR                  ;NO DATA RETURNED WITH EXT. SYNC.
004300  031433                  ERR20
```

```
                        ;*****************************************************************************
                        ;TEST COMPLETE
                        ;*****************************************************************************

004302  104001          BCDT13: SCOPE
004304  000013                  13
004306  104012                  PRINT
004310  024236                  MES7                    ;TEST COMPLETE
004312  000137  003456          JMP     BCDT0

                        ;*****************************************************************************
                        .SBTTL M7381 BCD INPUT EXERCISER TEST
                        ;THIS TEST REQUESTS THE MODULE ADDRESS AND THEN CONTINUOUSLY
                        ;ADDRESSES THE MODULE USING DATA SWITCHES '0 & 1' TO SELECT THE MODE.
                        ;THE RECEIVED DATA IS THEN PRINTED ON THE TELETYPE.
                        ;*****************************************************************************

004316  104012          M7381E: PRINT
004320  025474                  MES32
004322  104026                  ADDRESS                 ;GET MODULE ADDRESS
004324  104035                  SETUP                   ;SETUP THE '^R' ADDRESS
004326  004737  021626          JSR     PC,TTYENB       ;ENABLE INTERRUPTS

004332  104012          M381E1: PRINT
004334  032032                  CRLF
004336  104017          M381E2: TSTTKS                  ;CHECK FOR KEYBOARD FLAG
004340  117700  175006          MOVB    @SWR,R0         ;GET MODE FROM SW.'S
004344  142700  000374          BICB    #374,R0         ;CLR UN-WANTED BITS
004350  110037  017231          MOVB    R0,SOH1         ;SET UP THE MODE
004354  152737  000060  017231  BISB    #60,SOH1
004362  104005                  RECVR0                  ;ENABLE THE DL11 RECVR.
004364  004737  017220          JSR     PC,@#ADRSRC     ;ADDRESS THE MODULE
004370  105737  016224          TSTB    RECEOT          ;HAS 'EOT' RETURNED?
004374  001775                  BEQ     .-4             ;NO, WAIT IT OUT
004376  032777  020000  174746  BIT     #SW13,@SWR      ;INHIBIT PRINTOUT?
004404  001354                  BNE     M381E2          ;YES,
004406  104037                  PRTRBF                  ;PRINT RECVR. DATA
004410  000752                  BR      M381E2
```

```
                        ;*****************************************************************************
                        .SBTTL M7382 BCD OUTPUT MODULE ADDRESS TEST
                        ;*****************************************************************************

004412  104012          M7382A: PRINT
004414  025526                  MES33
004416  104026                  ADDRESS                 ;GET THE MODULE ADDRESS
004420  104035                  SETUP                   ;SET UP TEST PARAMETERS

                        ;*****************************************************************************
                        ;THIS TEST ADDRESSED THE BCD OUTPUT MODULE AND TRANSMITS '8' DIGITS
                        ;OF DATA AS '77'.  THIS SHOULD CAUSE ALL THE OUTPUT LINES TO BE HIGH
                        ;*****************************************************************************

004422  000240          OBCDT1: NOP
004424  000240                  NOP
004426  004737  017234          JSR     PC,@#ADRDST     ;ADDRESS DESTINATION

004432  104007                  LDPGM0                  ;TRANSMIT THE FOLLOWING DATA
004434  004440                  .+4
004436  000405                  BR      TAG3A
004440     077                  .BYTE   77              ;1ST DIGIT
004441     077                  .BYTE   77
004442     077                  .BYTE   77
004443     077                  .BYTE   77
004444     077                  .BYTE   77
004445     077                  .BYTE   77
004446     077                  .BYTE   77
004447     077                  .BYTE   77              ;LAST DIGIT
004450     004                  .BYTE   EOT
        004452                  .EVEN

004452  104012          TAG3A:  PRINT                   ;TEXT 'EXAMINE OUTPUT
004454  025557                  MES34
004456  025612                  MES35                   ;CHECK FOR ALL LOGIC 1'S
004460  104013                  TTYIN                   ;WAIT FOR CHECK
```

```
                                ;**********  ********************************************************
                                ;THIS SUBTEST SHOULD CAUSE ALTERNATE 'HI & LO 'S' TO BE SEEN ON THE OUTPUT
                                ;*************************************************************************

004462  104001          OBCDT2: SCOPE
004464  000002                  2
004466  004737  017234          JSR     PC,@#ADRDST     ;ADDRESS DESTINATION
004472  104007                  LDPGM0                  ;TRANSMIT THE FOLLOWING DATA
004474  004500                  .+4
004476  000405                  BR      TAG3B
004500     065                  .BYTE   65              ;1ST DIGIT
004501     065                  .BYTE   65
004502     065                  .BYTE   65
004503     065                  .BYTE   65
004504     065                  .BYTE   65
004505     065                  .BYTE   65
004506     065                  .BYTE   65
004507     065                  .BYTE   65              ;LAST DIGIT
004510     004                  .BYTE   EOT
        004512                  .EVEN

004512  104012          TAG3B:  PRINT
004514  025557                  MES34
004516  026064                  MES40B
004520  104013                  TTYIN                   ;WAIT FOR CHECK
                                ;*************************************************************************
                                ;THIS SUBTEST SHOULD CAUSE ALTERNATE 'HI & LO'S' TO BE SEEN ON THE OUTPUT
                                ;IN REVERSE OF THOSE IN THE PREVIOUS SUBTEST.
                                ;*************************************************************************

004522  104001          OBCDT3: SCOPE
004524  000003                  3
004526  004737  017234          JSR     PC,@#ADRDST     ;ADDRESS DESTINATION

004532  104007                  LDPGM0                  ;TRANSMIT THE FOLLOWING DATA
004534  004540                  .+4
004536  000405                  BR      TAG3C
004540     072                  .BYTE   72
004541     072                  .BYTE   72
004542     072                  .BYTE   72
004543     072                  .BYTE   72
004544     072                  .BYTE   72
004545     072                  .BYTE   72
004546     072                  .BYTE   72
004547     072                  .BYTE   72
004550     004                  .BYTE   EOT
        004552                  .EVEN
004552  104012          TAG3C:  PRINT
004554  025557                  MES34
004556  025631                  MES37
004560  026064                  MES40B
004562  104013                  TTYIN                   ;WAIT FOR CHECK
```

```
                        ;*************************************************************************
                        ;THIS SUBTEST CONTINUOUSLY ADDRESSES THE MODULE ENABLING THE USER TO SCOPE
                        ;FOR THE SIGNAL 'OUTPUT DONE 'H & L'.
                        ;*************************************************************************

004564  104001          OBCDT4: SCOPE
004566  000004                  4
004570  104012                  PRINT
004572  025643                  MES38                   ;TEXT SCOPE FOR OUTPUT DONE
004574  004737  017234  TAG3D:  JSR     PC,@#ADRDST     ;ADDRESS DESTINATION

004600  104006                  LDCHR0
004602  000004                  EOT
004604  000773                  BR      TAG3D           ;CYCLE UNTIL RESTARTED


                        .SBTTL BCD I/O TEST
                        ;*************************************************************************
                        ;BCD INPUT/OUTPUT EXERCISER TEST
                        ;THIS TEST USES BOTH THE BCD 'INPUT&OUTPUT' MODULES.  AN INCREMENTING
                        ;'BCD' COUNT IS SENT TO THE OUTPUT MODULE AND WRAPPED AROUND VIA A
                        ;SPECIAL CABLE TO THE INPUT MODULE.  THE DATA RECEIVED FROM THE INPUT MODULE
                        ;IS THEN VERIFIED AGAINST THE TRANSMITTED DATA.  THE INPUT MODULE CAN
                        ;BE SETUP TO USE EITHER INTERNAL OR EXTERNAL SYNC.  IF EXTERNAL SYNC IS
                        ;SELECTED, THIS SIGNAL IS SUPPLIED FROM THE SIGNAL ON THE BCD OUTPUT
                        ;MODULE KNOWN AS OUTPUT DATA H.
                        ;*************************************************************************

004606  104012          BCDIO:  PRINT
004610  026143                  MES43                   ;TEXT 'BCD I/O TEST'
004612  104026                  ADDRESS                 ;GET THE MODULE ADDRESS
004614  104012                  PRINT
004616  026116                  MES42                   ;TEXT 'INT OR EXT SYNC.?'
004620  104013                  TTYIN                   ;WAIT FOR INPUT
004622  122737  000111  015330  CMPB    #111,INBUF      ;'I' FOR INTERNAL?
004630  001404                  BEQ     .+12            ;YES, SET UP FOR INT. SYNC.
004632  112737  000061  017231  MOVB    #61,SOH1        ;NO, SET UP FOR ENT. SYNC.
004640  000403                  BR      .+10
004642  112737  000060  017231  MOVB    #60,SOH1
004650  104035                  SETUP                   ;SET UP TEST PARAMETERS
```

```
                        ;*************************************************************************
                        ;THIS SUBTEST OUTPUTS A DATA PATTERN OF '60-77' TO EACH 'BCD' OUTPUT,
                        ;ONE AT A TIME.  THIS PATTERN IS THEN READ BACK BY THE BCD INPUT
                        ;MODULE AND COMPARED AGAINST THE OUTPUTTED DATA.  THIS TEST WILL VERIFY
                        ;THAT EACH OUTPUT LINE CAN BE ADDRESSED AND THAT NO TWO OUTPUTS ARE
                        ;SHORTED TOGETHER.
                        ;*************************************************************************

004652  000240        BCDIO1: NOP
004654  000240                NOP
004656  012700  004712        MOV     #DATA1,R0       ;SET UP DATA TABLE TO TRANSMIT ALL O'S.
004662  112720  000060        MOVB    #60,(R0)+
004666  022700  004722        CMP     #DATA2,R0       ;DONE?
004672  001373                BNE     .-10            ;NO
004674  012701  004712        MOV     #DATA1,R1       ;SET UP DATA POINTER

004700  004737  017234  TAG4A: JSR     PC,@#ADRDST     ;ADDRESS DESTINATION
004704  104007                LDPGM0                  ;TRANSMIT DATA
004706  004712                .+4
004710  000405                BR      TAG4B           ;GO HERE WHEN DONE
004712     060        DATA1:  .BYTE   60
004713     060                .BYTE   60
004714     060                .BYTE   60
004715     060                .BYTE   60
004716     060                .BYTE   60
004717     060                .BYTE   60
004720     060                .BYTE   60
004721     060                .BYTE   60
004722     004        DATA2:  .BYTE   EOT
        004724                .EVEN

004724  104005  TAG4B:  RECVR0                  ;ENABLE THE DL11 RECVR.
004726  004737  017220        JSR     PC,@#ADRSRC     ;ADDRESS BCD INPUT
004732  104004                DELAY                   ;GIVE 'EM TIME TO READ THE DATA.
004734  012702  004712        MOV     #DATA1,R2       ;SET UP TO VERIFY DATA
004740  012703  016236        MOV     #RECBF0+2,R3
004744  122223  TAG4C:  CMPB    (R2)+,(R3)+     ;DATA EQUAL?
004746  001403                BEQ     .+10            ;YES
004750  104022                MODERR                  ;INPUT DATA DOESN'T EQUAL DATA OUTPUT
004752  030526                ERR3
004754  000414                BR      TAG4E+2         ;EXIT ON ERROR
004756  022702  004722        CMP     #DATA2,R2       ;DONE?
004762  001370                BNE     TAG4C           ;NO, COMPARE NEXT BYTE

004764  105211  TAG4D:  INCB    (R1)            ;UPDATE DATA PATTERN
004766  122711  000100        CMPB    #100,(R1)       ;DONE ALL CODES FOR THIS OUTPUT?
004772  001342                BNE     TAG4A           ;NO, TRANSMIT NEXT PATTERN
004774  112721  000060        MOVB    #60,(R1)+       ;YES, RESET IT TO '60'.
005000  022701  004722        CMP     #DATA2,R1       ;DONE WITH TEST?
005004  001367  TAG4E:  BNE     TAG4D           ;NO, START NEXT OUTPUT TEST
005006  104012                PRINT
005010  024236                MES7                    ;TEST COMPLETE
005012  000717                BR      BCDIO1          ;RESTART TEST
```

```
                                ;*****************************************************************
                                .SBTTL M7383 A/D INPUT MODULE ADDRESS TEST
                                ;THIS TEST IS USED TO VERIFY THAT THE A/D MODULE CAN BE ADDRESS
                                ;AND THAT IT WILL RETURN DATA ON COMPLETION OF A CONVERSION.
                                ;*****************************************************************

005014  104012                  M7383A: PRINT
005016  024364                          MES11                   ;TEXT 'A/D ADDRESSING TEST.'
005020  104026                          ADDRESS                 ;GET MODULE ADDRESS
005022  104035                  ADT0:   SETUP                   ;SET UP TEST PARAMETERS

                                ;*****************************************************************
                                ;THE FOLLOWING SUBTEST ADDRESSES THE A/D MODULE AND VERIFIES THAT
                                ;DATA AND 'EOT' ARE RETURNED BY THE MODULE
                                ;*****************************************************************

005024  000240                  ADT1:   NOP
005026  000240                          NOP
005030  112737  000063  017231          MOVB    #63,SOH1        ;PROGRAM CH.'3'
005036  004737  017220                  JSR     PC,@#ADRSRC     ;ADDRESS MODULE

005042  000240                  TAG2A:  NOP
005044  105737  016235                  TSTB    RECBF0+1        ;DATA RETURNED?
005050  001003                          BNE     .+10            ;YES
005052  104022                          MODERR                  ;MODULE DIDN'T ENTER DATA MODE
005054  031041                          ERR11
005056  000414                          BR      ADT2            ;EXIT ON ERROR
005060  005737  016224                  TST     RECEOT          ;WAS 'EOT' RETURNED?
005064  001003                          BNE     .+10            ;YES
005066  104022                          MODERR                  ;MODULE DIDN'T RETURN 'EOT'
005070  030603                          ERR5
005072  000406                          BR      ADT2            ;EXIT ON ERROR
005074  122737  000004  016244          CMPB    #EOT,RECBF0+10  ;CORRECT NO. OF CHAR.'S RETURNED?
005102  001402                          BEQ     .+6             ;YES
005104  104022                          MODERR                  ;DIDN'T RECV. CORRECT NO. OF CHAR.'S.
005106  030526                          ERR3

                                ;*****************************************************************
                                ;THIS SUBTEST ADDRESSES THE A/D MODULE USING MODE '8' AND TESTS
                                ;THAT THE CORRECT NUMBER OF CHARACTER ARE RECEIVED BACK.
                                ;*****************************************************************

005110  104001                  ADT2:   SCOPE
005112  000002                          2
005114  112737  000070  017231          MOVB    #70,SOH1        ;PROGRAM MODE '8'
005122  004737  017220                  JSR     PC,@#ADRSRC     ;ADDRESS MODULE

005126  122737  000004  016274  TAG2B:  CMPB    #EOT,RECBF0+40  ;'EOT' SHOULD BE RETURNED HERE
005134  001402                          BEQ     .+6             ;OK
005136  104022                          MODERR                  ;MODULE DIDN'T RETURN '4' CH.'S OF DATA
005140  030526                          ERR3
```

```
1280
1281                            ;*********************************************************************
1282                            ;THIS SUBTEST ADDRESSES THE 'A/D' USING THE WRONG MODULE ADDRESSES
1283                            ;AND TESTS THAT THE MODULE ISN'T ENABLED.
1284                            ;*********************************************************************
1285
1286  005142  104001           ADT3:   SCOPE
1287  005144  000003                   3
1288  005146  004737  005154          JSR     PC,@#ADRSIT
1289  005152  000437                   BR      ADT4
1290
1291  005154  005737  032132   ADRSIT: TST     SIOSWH          ;USING THE SERIAL INPUT?
1292  005160  001033                   BNE     TAG2H           ;YES, INHIBIT RUNNING THIS TEST.
1293  005162  112737  000060  005211   MOVB    #60,ADCHX1      ;SET UP 1ST ADDRESS TO BE TESTED
1294  005170  123737  032134  005211   TAG2C:  CMPB    MODADR,ADCHX1   ;EQUAL TO SELECTED ADDR.?
1295  005176  001416                   BEQ     TAG2F           ;YES, SELECT NEXT. ADDR.
1296  005200  104005                   RECVR0
1297  005202  104025                   SOURCE
1298  005204  005210                   .+4
1299  005206  000403                   BR      TAG2G
1300
1301  005210     021                   .BYTE   DC1             ;ALERT MODULE
1302  005211     060   ADCHX1: .BYTE   60              ;ADDRESS MODIFIED FROM '60-77'
1303  005212     001                   .BYTE   SOH
1304  005213     060                   .BYTE   60
1305  005214     023                   .BYTE   DC3             ;ENABLE MODULE
1306  005215     000                   .BYTE   0
1307
1308  005216  005712   TAG2G:  TST     (R2)            ;WAS ANY DATA RETURNED
1309  005220  001405                   BEQ     TAG2F           ;NO
1310  005222  113737  005211  031166   MOVB    ADCHX1,ERR13A
1311  005230  104022                   MODERR                  ;MODULE WAS ENABLE WITH ILLEGAL ADDR.
1312  005232  031124                   ERR13
1313
1314  005234  105237  005211   TAG2F:  INCB    ADCHX1          ;UPDATE MODULE ADDRESS
1315  005240  122737  000100  005211   CMPB    #100,ADCHX1     ;DONE?
1316  005246  001350                   BNE     TAG2C           ;NO
1317  005250  000207   TAG2H:  RTS     PC
```

```
                                ;*****************************************************************************
                                ;THIS SUBTEST CHECKS THAT THE A/D MODULE WILL WORK UNDER EXTERNAL SYNC.
                                ;THE MODULE IS ADDRESSED AND THEN A REQUEST IS MADE FOR AN EXTERNAL
                                ;SYNC SIGNAL TO BE SUPPLIED.
                                ;*****************************************************************************

005252  104001          ADT4:   SCOPE
005254  000004                  4
005256  032777  002000  174066          BIT     #SW10,@SWR      ;SW. '10' SET?
005264  001450                  BEQ     ADT5+4          ;NO, INHIBIT THIS TEST
005266  104012                  PRINT
005270  024316                  MES10                   ;TEXT 'RESET MODULE ADDR.
005272  104013                  TTYIN                   ;WAIT FOR SETUP
005274  012737  005274  020774          MOV     #.,RETURN       ;RESET SCOPE LOOP POINTER
005302  112737  000077  017227          MOVB    #77,SRCADR      ;SET UP ADDRESS '17'
005310  104005                  RECVR0                  ;ENABLE THE DL11 RECEIVER
005312  112737  000064  017231          MOVB    #64,SOH1        ;EXT SYNC; CHANNEL '0'
005320  004737  017220          JSR     PC,@#ADRSRC     ;ADDRESS MODULE
005324  005712                  TST     (R2)            ;MAKE SURE NO DATA WAS RETURNED
005326  001403                  BEQ     .+10
005330  104022                  MODERR                  ;EXT SYNC CONVERSION TOOK PLACE
005332  031475                  ERR21                   ;WITH NO EXT. SYNC SUPPLIED.
005334  000422                  BR      ADT5            ;EXIT ON ERROR
005336  104012                  PRINT
005340  026654                  MES60                   ;TEXT 'SUPPLY EXT. SYNC SIGNAL'.
005342  012746  000000                  MOV     #0,     -(SP)   ;ENABLE INTERRUPTS
005346  012746  005354                  MOV     #1$,    -(SP)
005352  000002                  RTI
005354  000001          1$:     WAIT
005356  012746  000340                  MOV     #340,   -(SP)   ;INHIBIT INTERRUPTS
005362  012746  005370                  MOV     #2$,    -(SP)
005366  000002                  RTI
005370  104004          2$:     DELAY                   ;WAIT FOR DATA
005372  005712                  TST     (R2)            ;WAS A DATA RETURNED
005374  001002                  BNE     .+6             ;YES
005376  104022                  MODERR                  ;NO DATA WAS RETURNED WITH
005400  031433                  ERR20                   ;EXTERNAL SYNC.

                                ;*****************************************************************************
                                ;TEST COMPLETE
                                ;*****************************************************************************

005402  104001          ADT5:   SCOPE
005404  000005                  5
005406  104012                  PRINT
005410  024236                  MES7                    ;TEXT 'TEST COMPLETE'
005412  000137  005022          JMP     ADT0            ;RE-START TEST.
```

```
                                ;*******************************************************************************
                                .SBTTL M7383 A/D CALIBRATION ROUTINE
                                ;THIS ROUTINE TAKES CONTINUOUS CONVERSION USING DATA SW'S '0-4'IN OCTAL
                                ;WEIGHT TO SELECT THE CHANNEL TO BE CONVERTED AND THEN PRINTS THE CONVERTED VALUE
                                ;
                                ;CHANNEL SELECTION IS AS FOLLOWS:
                                ;
                                ;DATA SW'S '0-1' SELECT 'INT. SYNC' ON CH.'S 0,1,2 OR 3
                                ;DATA SW' '2' & '0-1' SELECT 'EXT SYNC' ON CH.'S 0,1,2 OR 3
                                ;DATA SW '3' ONLY SELECTS 'INT SYNC' CONVERSION ON ALL '4' CH.'S
                                ;DATA SW'S '2&3' SELECT 'EXT. SYNC' CONVERSION ON ALL '4' CH.'S
                                ;*******************************************************************************

005416  104012                  M7383C: PRINT
005420  024411                          MES12                   ;TEXT 'A/D CALIBRATION ROUTINE'
005422  104026                          ADDRESS                 ;GET MODULE ADDRESS
005424  004737  021442                  JSR     PC,REMOTE       ;CHECK FOR REMOTE DESTINATION
005430  104035                          SETUP                   ;SET UP THE '^R' RESTART ADDRESS
005432  012701  000001                  MOV     #1,R1           ;SET UP FOR '1' CONVERSION
005436  104036                          NODLAY                  ;SET TRANS. DELAY INHIBIT SW.
005440  104012                  CALBT1: PRINT
005442  032032                          CRLF
005444  104017                  CALBT2: TSTTKS                  ;CHECK FOR KEYBOARD FLAG
005446  117703  173700                  MOVB    @SWR,R3         ;GET CHANNEL
005452  142703  000300                  BICB    #300,R3         ;CLR UN-WANTED BITS
005456  152703  000060                  BISB    #60,R3          ;CONVERT TO ASCII
005462  110337  017231                  MOVB    R3,SOH1         ;SET UP TO CONVERT CH.
005466  104027                          ADCNVT                  ;CONVERT
005470  032777  020000  173654          BIT     #SW13,@SWR      ;INHIBIT TYPEOUT?
005476  001362                          BNE     CALBT2          ;YES, TAKE NEXT CONVERSION
005500  004737  021502                  JSR     PC,SETRMT       ;CHK FOR AND SET UP REMOTE DST.

005504  104037                  PRTRBF                          ;PRINT RECV'D DATA
005506  004737  021524                  JSR     PC,CLRMOTE      ;CLEAR REMOTE DESTINATION
005512  000754                          BR      CALBT2
```

```
                                ;*****************************************************************
                                .SBTTL M7383 A/D REPEATIBILITY TEST
                                ;THIS TEST REQUESTS FOR A CHANNEL AND A V.S.F (VERTICAL SCALE FACTOR) TO
                                ;BE INPUTTED FROM THE TELETYPE.  A SERIES OF '100' CONVERSIONS A THEN TAKEN,
                                ;AVERAGED AND THEN THE RESULT IS DISPLAYED IN A HISTOGRAM FORMAT ON
                                ;THE TELETYPE.
                                ;*****************************************************************

005514  104012                  M7383R: PRINT
005516  024574                          MES15                   ;TEXT 'A/D REPEATIBILITY TEST'.
005520  104026                          ADDRESS                 ;GET THE MODULE ADDRESS
005522  004737  021442                  JSR     PC,REMOTE       ;CHECK FOR REMOTE DESTINATION
005526  104035                          SETUP                   ;SET UP RESTART ADDR. POINTER
005530  104036                          NODLAY                  ;SET TRANS. DELAY INHIBIT SW.
005532  104012                  REPT0A: PRINT
005534  024624                          MES16                   ;REQUEST 'VSF'
005536  104013                          TTYIN
005540  104030                          BCDBIN                  ;CONVERT INPUT TO BINARY
005542  005737  022564                  TST     BCDTAB          ;VSF=07
005546  001771                          BEQ     REPT0A          ;YES, ILLEGAL ENTRY
005550  013737  022564  032174          MOV     BCDTAB,KSTOR1   ;SAVE INPUT
005556  005037  016112                  CLR     HIDIVR
005562  005037  016116                  CLR     HIDIVD
005566  013737  032174  016110          MOV     KSTOR1,LODIVR   ;SET UP TO DIVIDE 'VSF' TO GET NO. OF AVG.'S
005574  012737  000144  016114          MOV     #100.,LODIVD
005602  004737  016016                  JSR     PC,DIVIDE
005606  005737  016126                  TST     REMAIN          ;IS NUMBER LEGAL?
005612  001347                          BNE     REPT0A          ;NO, REQUEST NEW 'VSF'
005614  013737  016122  032202          MOV     QUOENT,KSTOR4   ;YES, SAVE IT
005622  013737  032174  032204          MOV     KSTOR1,KSTOR5
005630  006337  032204                  ASL     KSTOR5
005634  104032                          CHANEL                  ;REQUEST CHANNEL.
005636  012701  000144          REPT0:  MOV     #100.,R1        ;SET UP TO TAKE '100' CONVERSIONS
005642  012702  017670                  MOV     #TRNBF0,R2      ;SET UP TO SAVE CONVERTED VALUE
005646  104027                  REPT1:  ADCNVT                  ;TAKE 100 CONVERSION
005650  104031                          AVERAGE                 ;AVERAGE THEM
005652  012700  016120                  MOV     #LOW,R0         ;SET UP TO SAVE VALUES
005656  012703  032302                  MOV     #AVGTAB,R3      ;SAVE AVERAGE HERE
005662  012704  000003                  MOV     #3,R4
005666  012023                          MOV     (R0)+,(R3)+     ;SAVE AVG HIGH & LOW
005670  005304                          DEC     R4              ;SAVED ALL VALUES
005672  001375                          BNE     .-4             ;NO
005674  013700  016122                  MOV     QUOENT,R0       ;SET UP AVERAGE
005700  062700  000011                  ADD     #9.,R0          ;CALCULATE AVERAGE +9 VALUE
005704  010037  032176                  MOV     R0,KSTOR2       ;SAVE IT
005710  162700  000022                  SUB     #18.,R0         ;CALCULATE AVERAGE -9 VALUE
005714  010037  032200                  MOV     R0,KSTOR3       ;SAVE IT
005720  013704  032202                  MOV     KSTOR4,R4       ;SETUP TO AVERAGE OUT 'VSF'
005724  013701  032174                  MOV     KSTOR1,R1       ;SET UP TO TAKE 'X' AVERAGES
005730  022701  000001                  CMP     #1,R1           ;VSF =1?
005734  001412                          BEQ     REPT3           ;YES, NO AVERAGING NEEDED
005736  104031                  REPT2:  AVERAGE                 ;DO IT
005740  013723  016122                  MOV     QUOENT,(R3)+    ;SAVE VALUE
005744  063702  032204                  ADD     KSTOR5,R2       ;SET BUFFER POINTER TO PICK UP NEXT GROUP
005750  005304                          DEC     R4              ;DONE
005752  001371                          BNE     REPT2           ;NO
```

```
1456  005754  012702  032310          MOV     #AVGTAB+6,R2    ;SET UP TO CATEGORIZE AVERAGES
1457  005760  000402                  BR      .+6
1458  005762  012702  017670  REPT3:  MOV     #TRNBF0,R2      ;FOR VSF OF '1' USE ACTUAL VALUES
1459  005766  012700  032226          MOV     #ORLOW,R0       ;SET UP TO CLR COUNT BUFFER
1460  005772  005020                  CLR     (R0)+           ;CLR BUFFER
1461  005774  022700  032302          CMP     #ORHIGH+2,R0    ;DONE?
1462  006000  001374                  BNE     .-6             ;NO
1463  006002  013700  032202          MOV     KSTOR4,R0       ;KSTOR4 CONTAINS VSF
1464  006006  010001                  MOV     R0,R1
1465  006010  021237  032176  REPT4:  CMP     (R2),KSTOR2     ;IS VALUE > AVG. +9?
1466  006014  003403                  BLE     .+10            ;NO
1467  006016  005237  032300          INC     ORHIGH          ;YES, VALUE OUT OF RANGE
1468  006022  000414                  BR      REPT5
1469  006024  021237  032200          CMP     (R2),KSTOR3     ;IS VALUE < AVG. -9?
1470  006030  002003                  BGE     .+10            ;YES
1471  006032  005237  032226          INC     ORLOW           ;NO, OUT OF RANGE
1472  006036  000406                  BR      REPT5
1473  006040  011203                  MOV     (R2),R3         ;GET VALUE TO WORK ON IT
1474  006042  163703  032200          SUB     KSTOR3,R3       ;OBTAIN OFFSET
1475  006046  006303                  ASL     R3
1476  006050  005263  032230          INC     MINUS9(R3)      ;INCREMENT CNTR
1477  006054  005722          REPT5:  TST     (R2)+           ;INCREMENT POINTER
1478  006056  005300                  DEC     R0              ;DONE?
1479  006060  001353                  BNE     REPT4           ;NO
1480  006062  004737  021502          JSR     PC,SETRMT       ;CHK FOR AND SET UP REMOTE DST.
1481
1482                          ;*****************************************************************
1483                          ;AT THIS POINT THE AVERAGES HAVE BEEN TAKEN AND CATEGORIZED.  THE
1484                          ;NEXT SECTION DISPLAYS THE COUNTS IN A HISTOGRAM FORMAT.
1485                          ;*****************************************************************
1486
1487  006066  012702  032230  REPT6:  MOV     #MINUS9,R2      ;SET UP COUNT TABLE
1488  006072  005003                  CLR     R3
1489  006074  020122                  CMP     R1,(R2)+        ;SCAN TABLE FOR CURRENT COUNT
1490  006076  001407                  BEQ     REPT7           ;COUNT FOUND, PRINT IT
1491  006100  005203                  INC     R3
1492  006102  022702  032300  REPT6A: CMP     #ORHIGH,R2      ;SCANNED WHOLE TABLE?
1493  006106  001372                  BNE     REPT6+6         ;NO, CONTINUE
1494  006110  005301          REPT6B: DEC     R1              ;YES, CHECKED ALL COUNTS?
1495  006112  001365                  BNE     REPT6           ;NO, RE-SCAN TABLE
1496  006114  000422                  BR      REPT9           ;TYPE FINAL DATA
1497
1498  006116  104012          REPT7:  PRINT
1499  006120  031712                  DASH
1500  006122  010337  021262  REPT8:  MOV     R3,SPACEX       ;ANY SPACES TO BE TYPED?
1501  006126  001401                  BEQ     .+4             ;NO, PRINT ASTRICK
1502  006130  104016                  SPACE                   ;YES, PRINT SPACE
1503  006132  005342                  DEC     -(R2)           ;SUBTRACT '1' FROM COUNT
1504  006134  005722                  TST     (R2)+
1505  006136  104012                  PRINT
1506  006140  031700                  ASTRIC
1507  006142  005003                  CLR     R3
1508  006144  022702  032300  REPT8A: CMP     #ORHIGH,R2      ;DONE CURRENT SCAN?
1509  006150  001757                  BEQ     REPT6B          ;YES, EXIT
1510  006152  020122                  CMP     R1,(R2)+        ;NO, IS THIS COUNT EQUAL?
1511  006154  001762                  BEQ     REPT8           ;YES, PRINT IT
```

```
1512  006156  005203                      INC     R3                  ;NO, INC. SPACE CNTR.
1513  006160  000771                      BR      REPT8A
1514  006162  113701  016236      REPT9:  MOVB    RECBF0+2,R1         ;SAVE GAIN SETTING
1515  006166  122701  000114              CMPB    #'L,R1              ;RUNNING WITH LOW GAIN?
1516  006172  001003                      BNE     .+10                ;NO
1517  006174  012737  031753  006236      MOV     #X1MV,REPT10
1518  006202  122701  000115              CMPB    #'M,R1              ;RUNNING WITH MEDIUN GAIN?
1519  006206  001003                      BNE     .+10                ;NO
1520  006210  012737  031757  006236      MOV     #X100UV,REPT10
1521  006216  122701  000110              CMPB    #'H,R1              ;RUNNING WITH HIGH GAIN
1522  006222  001003                      BNE     .+10                ;NO
1523  006224  012737  031765  006236      MOV     #X10UV,REPT10
1524  006232  104012                      PRINT
1525  006234  031715                      SCALE                       ;PRINT HORIZONTAL SCALE HEADER
1526  006236  000000            REPT10:   0
1527  006240  031772                      XDIV
1528  006242  004737  006320              JSR     PC,REPT13           ;PRINT SUMMARY
1529  006246  013705  032226      REPT11: MOV     ORLOW,R5
1530  006252  063705  032300              ADD     ORHIGH,R5           ;WERE ANY COUNTS OUT OF RANGE?
1531  006256  001412                      BEQ     REPT12              ;NO, RE-CYCLE TEST
1532  006260  104012                      PRINT
1533  006262  032003                      XLOW                        ;TEXT 'OR-LOW
1534  006264  013702  032226              MOV     ORLOW,R2
1535  006270  104033                      BINDEC                      ;PRINT COUNTS LOW
1536  006272  104012                      PRINT
1537  006274  032014                      XHIGH
1538  006276  013702  032300              MOV     ORHIGH,R2
1539  006302  104033                      BINDEC                      ;PRINT COUNTS 'HI'
1540  006304  104012            REPT12:   PRINT
1541  006306  032034                      CRLF2
1542  006310  004737  021524              JSR     PC,CLRMOTE          ;CLEAR REMOTE DESTINATION
1543  006314  000137  005636      RPT12A: JMP     REPT0
1544
1545  006320  012703  000003      REPT13: MOV     #3,R3               ;SET UP PRINT LO-HI & AVG. VALUES
1546  006324  012701  032302              MOV     #AVGTAB,R1          ;SET UP BUFFER POINTER
1547  006330  012102            REPT14:   MOV     (R1)+,R2            ;GET VALUE
1548  006332  004737  007040              JSR     PC,POSTIT           ;CONVERT & PRINT IT
1549  006336  005303                      DEC     R3
1550  006340  001001                      BNE     .+4
1551  006342  000207                      RTS     PC
1552  006344  012737  000002  021262      MOV     #2,SPACEX
1553  006352  104016                      SPACE
1554  006354  000765                      BR      REPT14
1555
```

```
1556
1557                                    ;*********************************************************************
1558                                    .SBTTL M7383 A/D GAIN ACCURACY TEST
1559                                    ;THIS TEST REQUESTS OF A SERIES OF VOLTAGES A SPECIFIED GAIN SETTINGS
1560                                    ;TO BE SUPPLIED TO THE 'A/D'.  A SERIES OF A HUNDRED CONVERSIONS ARE TAKEN
1561                                    ;AT EACH OF THESE SETTINGS AND AVERAGED OUT.  THIS AVERAGE IS THEN TESTED
1562                                    ;TO BE WRITTEN '+ OR -' A COUNT FROM THE TRUE VOLTAGE VALUE FOR THAT
1563                                    ;SPECIFIED SETTING.
1564                                    ;*********************************************************************
1565
1566  006356  104012                    M7383G: PRINT
1567  006360  024641                            MES18                   ;TEXT 'A/D GAIN TEST'
1568  006362  104026                            ADDRESS
1569  006364  104035                            SETUP                   ;SET UP RESTART ADDR. POINTER
1570  006366  005037  032222                    CLR     LOPSWH
1571  006372  104032                            CHANEL                  ;REQUEST & STORE CH. TO BE TESTED.
1572
1573                                    ;TEST '+1.990V' AT 'LOW' GAIN
1574
1575  006374  104012                            PRINT
1576  006376  024666                            MES19                   ;TEXT 'SUPPLY +1.990V'
1577  006400  104012                            PRINT
1578  006402  024714                            MES20                   ;TEXT 'AT LOW GAIN
1579  006404  104034                            WAITGN
1580  006406  000114                            'L                      ;LOW GAIN
1581  006410  007625                            7625                    ;TRUE VOLTAGE VALUE + OFFSET
1582
1583                                    ;TEST -1.990V AT 'LOW' GAIN
1584
1585  006412  104012                            PRINT
1586  006414  024730                            MES21                   ;SWITCH VOLTAGE NEG.
1587  006416  104034                            WAITGN
1588  006420  000114                            'L
1589  006422  000011                            11                      ;TRUE VOLTAGE VALUE + OFFSET
1590
1591                                    ;TEST +.1990V AT LOW GAIN
1592
1593  006424  104012                            PRINT
1594  006426  025014                            MES24                   ;TEXT 'SUPPLY' +.1990V'
1595  006430  024714                            MES20                   ;TEXT 'SUPPLY +.1990V'
1596  006432  104034                            WAITGN
1597  006434  000114                            'L                      ;GAIN MED.
1598  006436  004226                            4226
1599
```

```
1600                                    ;TEST '-.1990V AT 'LOW' GAIN
1601
1602  006440  104012                            PRINT
1603  006442  024730                            MES21                   ;TEXT 'SWITCH VOLTAGE NEG.'
1604  006444  104034                            WAITGN
1605  006446  000114                            'L
1606  006450  003410                            3410
1607
1608                                    ;TEXT '0.0V' AT LOW GAIN
1609
1610  006452  104012                            PRINT
1611  006454  025072                            MES25                   ;TEXT 'SUPPLY +0.000V.'
1612  006456  104034                            WAITGN
1613  006460  000114                            'L
1614  006462  003717                            3717
1615                                    ;*************************************************************************
1616                                    ;TEST COMPLETE
1617                                    ;*************************************************************************
1618  006464  104012                            PRINT
1619  006466  024236                            MES7                    ;TEST COMPLETE
1620  006470  000735                            BR      M7383G+6        ;RE-START TEST
1621  006472  000240                            NOP
1622
1623                                    ;*************************************************************************
1624                                    .SBTTL M7383 A/D GAIN AVERAGING SUBROUTINE
1625                                    ;THIS SUBROUTINE WAITS FOR 'CR' THEN TAKES AND AVERAGES '100' A/D CONVERSIONS.
1626                                    ;THIS COMPUTED AVERAGE IS COMPARED AGAINST THE TRUE VOLTAGE VALUE FOR A
1627                                    ;SPECIFIED SETTING.  THE AVERAGE IS PRINTED OUT IF FOUND TO BE MORE THAN '+ OR -'
1628                                    ;1 COUNT FROM THE AVERAGE
1629                                    ;*************************************************************************
1630
1631  006474  017603  000000    XWATGN: MOV     @(SP),R3        ;PICK UP GAIN CODE FROM CALL +2
1632  006500  062716  000002            ADD     #2,(SP)
1633  006504  017604  000000            MOV     @(SP),R4        ;PICK UP TRUE VOLTAGE VALUE
1634  006510  104013            WAITG1: TTYIN                   ;WAIT FOR 'CR' TO CONTINUE
1635  006512  012701  000001            MOV     #1,R1
1636  006516  104027                    ADCNVT
1637  006520  120337  016236            CMPB    R3,RECBF0+2     ;IS GAIN CODE CORRECT?
1638  006524  001403                    BEQ     .+10            ;YES
1639  006526  104012                    PRINT                   ;NO, TELL HIM ABOUT IT
1640  006530  025113                    MES26
1641  006532  000766                    BR      WAITG1          ;WAIT FOR SETUP
1642  006534  012701  000144            MOV     #100.,R1        ;SET UP TO TAKE '100' CONVERSIONS
```

```
1643  006540  012702  017670          WAITG2: MOV     #TRNBF0,R2      ;SAVE THEM HERE
1644  006544  104027                          ADCNVT                  ;TAKE THE CONVERSIONS
1645  006546  104031                          AVERAGE                 ;AVERAGE THEM
1646  006550  013702  016122                  MOV     QUOENT,R2
1647  006554  020402                          CMP     R4,R2           ;AVERAGE = TRUE VALUE?
1648  006556  001441                          BEQ     GANEXT          ;YES, EXIT
1649  006560  005204                          INC     R4
1650  006562  020402                          CMP     R4,R2           ;AVERAGE = TRUE VALUE +1?
1651  006564  001436                          BEQ     GANEXT          ;YES, EXIT
1652  006566  162704  000002                  SUB     #2,R4
1653  006572  020402                          CMP     R4,R2           ;AVERAGE = TRUE VALUE -1?
1654  006574  001432                          BEQ     GANEXT          ;YES, EXIT
1655  006576  032777  020000  172546  WAITG3: BIT     #SW13,@SWR      ;NO, PRINT INHIBIT SW. SET?
1656  006604  001355                          BNE     WAITG2          ;YES
1657  006606  032777  020000  172536          BIT     #SW13,@SWR      ;SW SET?
1658  006614  001351                          BNE     WAITG2          ;YES, INHIBIT ERROR TYPEOUT.
1659  006616  005737  032222                  TST     LOPSWH          ;NO, HAS ERROR HEADER BEEN TYPED?
1660  006622  001004                          BNE     .+12
1661  006624  005237  032222                  INC     LOPSWH
1662  006630  104012                          PRINT
1663  006632  025134                          MES27
1664  006634  104012                          PRINT
1665  006636  032032                          CRLF
1666  006640  104002                          SAVREG
1667  006642  012703  000003                  MOV     #3,R3
1668  006646  012701  016120                  MOV     #LOW,R1
1669  006652  004737  006330                  JSR     PC,REPT14
1670  006656  104003                          GETREG
1671  006660  000727                          BR      WAITG2
1672
1673  006662  062716  000002          GANEXT: ADD     #2,(SP)
1674  006666  000002                          RTI
1675
```

```
1676                            ;*****************************************************************************
1677                            .SBTTL A/D CONVERSION ROUTINE
1678                            ;THIS ROUTINE TAKES AN A/D CONVERSION AND ENABLES
1679                            ;DL 0'S RECVR TO ACCEPT & STORE THE CONVERTED VALUE
1680                            ;*****************************************************************************
1681
1682  006670  104002            XADCNT: SAVREG                          ;SAVE REG.'S
1683  006672  012705  017670            MOV     #TRNBF0,R5              ;SAVE CONVERTED VALUES HERE
1684  006676  012746  000000            MOV     #0,     -(SP)           ;ENABLE  INTERRUPTS
1685  006702  012746  006710            MOV     #ADCT0, -(SP)
1686  006706  000002                    RTI
1687  006710  104005            ADCT0:  RECVR0                          ;ENABLE THE DL11 RECVR
1688  006712  004737  017220            JSR     PC,@#ADRSRC             ;ADDRESS MODULE
1689
1690  006716  005737  016224    ADCT1:  TST     RECEOT                  ;WAS 'EOT' RETURNED?
1691  006722  001775                    BEQ     .-4                     ;NO, WAIT FOR CONVERT
1692  006724  012703  016237            MOV     #RECBF0+3,R3            ;SET UP ADDRESS TO PICK UP SIGN
1693  006730  012704  016240            MOV     #RECBF0+4,R4            ;SET UP ADDRESS TO PICK UP DATA
1694  006734  005000                    CLR     R0
1695  006736  012437  015330    ADCT2:  MOV     (R4)+,INBUF             ;SET UP NO. TO BE CONVERTED
1696  006742  011437  015332            MOV     (R4),INBUF+2
1697  006746  012737  000004  032214    MOV     #4,CHRCNT
1698  006754  104030                    BCDBIN                          ;CONVERT VALUE TO BINARY
1699  006756  013715  022564            MOV     BCDTAB,(R5)             ;SAVE IT
1700  006762  122713  000053            CMPB    #53,(R3)                ;VALUE POS.?
1701  006766  001401                    BEQ     .+4                     ;YES, LEAVE AS IS
1702  006770  005415                    NEG     (R5)                    ;NO,
1703  006772  063725  032130            ADD     OFFSET,(R5)+            ;ADD OFFSET
1704  006776  132737  000010  017231    BITB    #10,SOH1                ;CONVERTING ALL '4' CH.'S?
1705  007004  001411                    BEQ     ADCT3                   ;NO, EXIT
1706  007006  005200                    INC     R0
1707  007010  022700  000004            CMP     #4,R0                   ;SAVED ALL VALUES?
1708  007014  001405                    BEQ     ADCT3                   ;YES, EXIT
1709  007016  062703  000010            ADD     #10,R3                  ;NO, PICK UP NEXT ADDRESSES
1710  007022  062704  000006            ADD     #6,R4
1711  007026  000743                    BR      ADCT2
1712  007030  005301            ADCT3:  DEC     R1
1713  007032  003326                    BGT     ADCT0                   ;TAKE NEXT CONVERSION
1714  007034  104003                    GETREG
1715  007036  000002                    RTI                             ;NO, EXIT
1716
1717                            ;*****************************************************************************
1718                            ;SUBROUTINE TO CONVERT THE VALUE IN 'R2' BACK TO A 'TRUE' A/D VALUE
1719                            ;AND PRINT IT IN DECIMAL AS EITHER '+ OR-'.
1720                            ;*****************************************************************************
1721
1722  007040  104002            POSTIT: SAVREG
1723  007042  012701  000053            MOV     #53,R1                  ;SET UP TO PRINT '+'
1724  007046  163702  032130            SUB     OFFSET,R2               ;SUBTRACT OFFSET TO OBTAIN REAL VALUE.
1725  007052  100003                    BPL     .+10                    ;VALUE POS.?
1726  007054  005402                    NEG     R2                      ;NO, COMPLIMENT IT
1727  007056  012701  000055            MOV     #55,R1                  ;NO, SET UP TO PRINT '-'
1728  007062  104010                    TYPEIT
1729  007064  104033                    BINDEC                          ;TYPE VALUE
1730  007066  104003                    GETREG
1731  007070  000207                    RTS     PC
```

```
                        ;*****************************************************************************
                        .SBTTL M7384 D/A ADDRESSING TEST
                        ;*****************************************************************************

007072  104012          M7384A: PRINT
007074  026215                  MES45                   ;TEXT 'D/A ADDRESSING TEST'
007076  104026                  ADDRESS                 ;GET THE MODULE ADDRESS
007100  104035                  SETUP                   ;SETUP TEST PARAMETERS

                        ;*****************************************************************************
                        ;THIS SUBTEST ADDRESSES THE D/A MODULE SENDS A CODE OF '70' (MODE 8)
                        ;THIS SHOULD ENABLE THE SIGNAL 'PROG L' TO BE LOW UNTIL THE 2ND CHAR.
                        ;IS SENT TO THE MODULE.
                        ;*****************************************************************************

007102  000240          DAT1:   NOP
007104  000240                  NOP
007106  004737  017234          JSR     PC,@#ADRDST     ;ADDRESS THE MODULE
007112  104006                  LDCHR0
007114  000070                  70                      ;SEND THE CHAR. '8'
007116  104012                  PRINT
007120  026242                  MES46                   ;TEXT 'SCOPE FOR 'PROG L' HI'
007122  104013                  TTYIN                   ;WAIT FOR 'CR' TO CONTINUE
007124  104006                  LDCHR0                  ;SEND 'EOT'
007126  000004                  EOT
007130  104012                  PRINT
007132  026305                  MES47                   ;SCOPE FOR 'PROG L HI & FLOP L LO'
007134  104013                  TTYIN

                        ;*****************************************************************************
                        ;THIS SUBTEST 1ST ADDRESSES THE MODULE AND SENDS MODE '9' TO SET
                        ;THE 'FLOP' FLOP.  THEN THE MODULE IS RE-ADDRESSED AND SENDS MODE '8'
                        ;TO CLR THE 'FLOP' FLOP.
                        ;*****************************************************************************

007136  104001          DAT2:   SCOPE
007140  000002                  2
007142  004737  017234          JSR     PC,ADRDST       ;ADDRESS MODULE
007146  104007                  LDPGM0
007150  007154                  .+4
007152  000401                  BR      .+4
007154     071                  .BYTE   71              ;SEND CHAR. '9'
007155     004                  .BYTE   EOT

007156  104012                  PRINT
007160  026352                  MES48                   ;SCOPE FOR 'FLOP L' HI'
007162  104013                  TTYIN

007164  004737  017234          JSR     PC,@#ADRDST     ;RE-ADDRESS MODULE
007170  104007                  LDPGM0
007172  007176                  .+4
007174  000401                  BR      .+4
007176     070                  .BYTE   70              ;SEND CHAR. '8'
007177     004                  .BYTE   EOT

007200  104012                  PRINT
```

```
1788  007202  026401                      MES49                   ;SCOPE FOR 'FLOP L' LO
1789  007204  104013                      TTYIN
1790
1791                                      ;*************************************************************************
1792                                      ;THIS SUBTEST OUTPUTS 0.00 VOLTS TO CH. '0'.
1793                                      ;*************************************************************************
1794
1795  007206  104001                      DATST3: SCOPE
1796  007210  000003                              3
1797  007212  012737  030061  007776              MOV     #30061,DATA3    ;CH. '0' 0 VOLTS
1798  007220  012737  030060  010000              MOV     #30060,DATA4
1799  007226  004737  007746                      JSR     PC,DAOUT        ;SEND DATA
1800  007232  104012                              PRINT
1801  007234  026430                              MES50
1802  007236  026514                              MES52
1803  007240  104013                              TTYIN
1804
1805                                      ;*************************************************************************
1806                                      ;THIS SUBTEST OUTPUTS 1.11 VOLTS TO CH. '0'.
1807                                      ;*************************************************************************
1808
1809  007242  104001                      DATST4: SCOPE
1810  007244  000004                              4
1811  007246  012737  030461  007776              MOV     #30461,DATA3
1812  007254  012737  030461  010000              MOV     #30461,DATA4
1813  007262  004737  007746                      JSR     PC,DAOUT
1814  007266  104012                              PRINT
1815  007270  026430                              MES50
1816  007272  026522                              MES53
1817  007274  104013                              TTYIN
1818
1819                                      ;*************************************************************************
1820                                      ;THIS SUBTEST OUTPUTS 2.22 VOLTS TO CH. '0'.
1821                                      ;*************************************************************************
1822
1823  007276  104001                      DATST5: SCOPE
1824  007300  000005                              5
1825  007302  012737  031061  007776              MOV     #31061,DATA3
1826  007310  012737  031062  010000              MOV     #31062,DATA4
1827  007316  004737  007746                      JSR     PC,DAOUT
1828  007322  104012                              PRINT
1829  007324  026430                              MES50
1830  007326  026530                              MES54
1831  007330  104013                              TTYIN
```

```
1832
1833                                    ;**********************************************************************
1834                                    ;THIS SUBTEST OUTPUTS 4.44 VOLTS TO CH. '0'.
1835                                    ;**********************************************************************
1836
1837  007332  104001                    DATST6: SCOPE
1838  007334  000006                            6
1839  007336  012737  032061  007776            MOV     #32061,DATA3
1840  007344  012737  032064  010000            MOV     #32064,DATA4
1841  007352  004737  007746                    JSR     PC,DAOUT
1842  007356  104012                            PRINT
1843  007360  026430                            MES50
1844  007362  026536                            MES55
1845  007364  104013                            TTYIN
1846
1847                                    ;**********************************************************************
1848                                    ;THIS SUBTEST OUTPUTS 8.88 VOLTS TO CH. '0'.
1849                                    ;**********************************************************************
1850
1851  007366  104001                    DATST7: SCOPE
1852  007370  000007                            7
1853  007372  012737  034061  007776            MOV     #34061,DATA3
1854  007400  012737  034070  010000            MOV     #34070,DATA4
1855  007406  004737  007746                    JSR     PC,DAOUT
1856  007412  104012                            PRINT
1857  007414  026430                            MES50
1858  007416  026544                            MES56
1859  007420  104013                            TTYIN
1860
1861                                    ;**********************************************************************
1862                                    ;THIS SUBTEST OUTPUTS 0.00 VOLTS TO CH. '1'
1863                                    ;**********************************************************************
1864
1865  007422  104001                    DATS10: SCOPE
1866  007424  000010                            10
1867  007426  012737  030062  007776            MOV     #30062,DATA3
1868  007434  012737  030060  010000            MOV     #30060,DATA4
1869  007442  004737  007746                    JSR     PC,DAOUT
1870  007446  104012                            PRINT
1871  007450  026462                            MES51
1872  007452  026514                            MES52
1873  007454  104013                            TTYIN
```

```
1874
1875                                    ;**********.*********************************************************
1876                                    ;THIS SUBTEST OUTPUTS 1.11 VOLTS TO CH '1'.
1877                                    ;*************************************************************************
1878
1879  007456  104001                    DATS11: SCOPE
1880  007460  000011                            11
1881  007462  012737  030462  007776            MOV     #30462,DATA3
1882  007470  012737  030461  010000            MOV     #30461,DATA4
1883  007476  004737  007746                    JSR     PC,DAOUT
1884  007502  104012                            PRINT
1885  007504  026462                            MES51
1886  007506  026522                            MES53
1887  007510  104013                            TTYIN
1888
1889                                    ;*************************************************************************
1890                                    ;THIS SUBTEST OUTPUTS 2.22 VOLTS TO CH. '1'.
1891                                    ;*************************************************************************
1892
1893  007512  104001                    DATS12: SCOPE
1894  007514  000012                            12
1895  007516  012737  031062  007776            MOV     #31062,DATA3
1896  007524  012737  031062  010000            MOV     #31062,DATA4
1897  007532  004737  007746                    JSR     PC,DAOUT
1898  007536  104012                            PRINT
1899  007540  026462                            MES51
1900  007542  026530                            MES54
1901  007544  104013                            TTYIN
1902                                    ;*************************************************************************
1903                                    ;THIS SUBTEST OUTPUTS 4.44 VOLTS TO CH. '1'.
1904                                    ;*************************************************************************
1905
1906  007546  104001                    DATS13: SCOPE
1907  007550  000013                            13
1908  007552  012737  032062  007776            MOV     #32062,DATA3
1909  007560  012737  032064  010000            MOV     #32064,DATA4
1910  007566  004737  007746                    JSR     PC,DAOUT
1911  007572  104012                            PRINT
1912  007574  026462                            MES51
1913  007576  026536                            MES55
1914  007600  104013                            TTYIN
1915                                    ;*************************************************************************
1916                                    ;THIS SUBTEST OUTPUTS 8.88 VOLTS TO CH. '1'.
1917                                    ;*************************************************************************
1918
1919  007602  104001                    DATS14: SCOPE
1920  007604  000014                            14
1921  007606  012737  034062  007776            MOV     #34062,DATA3
1922  007614  012737  034070  010000            MOV     #34070,DATA4
1923  007622  004737  007746                    JSR     PC,DAOUT
1924  007626  104012                            PRINT
1925  007630  026462                            MES51
1926  007632  026544                            MES56
1927  007634  104013                            TTYIN
```

```
1928
1929                                    ;*************************************************************************
1930                                    ;THIS SUBTEST OUTPUTS 0.00 VOLTS TO CH. '0' & 9.5 VOLTS TO CH. '1' AND
1931                                    ;THEN THIS SUBTEST RUNS IN A CONTINOUS LOOP UNTIL EITHER
1932                                    ;'^R' IS TYPED TO RESTART THE TEST OR '^C' IS TYPED TO
1933                                    ;RETURN TO THE MONITOR.
1934                                    ;*************************************************************************
1935
1936  007636  104001                    DATS15: SCOPE
1937  007640  000015                            15
1938  007642  005037  032144                    CLR     DLYSWH          ;ENABLE TRANSFMITTER DELAY
1939  007646  104012                            PRINT
1940  007650  026705                            MES61
1941  007652  012737  030063  007776    DAT15A: MOV     #30063,DATA3    ;MODE '3' CH. '0'
1942  007660  012737  030060  010000            MOV     #30060,DATA4
1943  007666  012737  032471  010002            MOV     #32471,DATA5    ;CH. '1'
1944  007674  012737  002060  010004            MOV     #2060,DATA6     ;SEND 'EOT' WITH 'LSB'
1945  007702  004737  007746                    JSR     PC,DAOUT
1946
1947  007706  012737  034463  007776            MOV     #34463,DATA3    ;MODE '3' CH. '0'
1948  007714  012737  030065  010000            MOV     #30065,DATA4
1949  007722  012737  030060  010002            MOV     #30060,DATA5    ;CH. '1'
1950  007730  012737  002060  010004            MOV     #2060,DATA6     ;SEND 'EOT' WITH 'LSB'
1951  007736  004737  007746                    JSR     PC,DAOUT
1952  007742  000743                            BR      DAT15A
1953  007744  000000                            HALT
1954
1955                                    ;*************************************************************************
1956                                    ;M7384 ADDRESS TEST COMPLETE
1957                                    ;*************************************************************************
1958
1959                                    ;*************************************************************************
1960                                    ;ROUTINE TO OUTPUT A PRE-LOAD DATA VALUE TO THE D/A CONVERTER.
1961                                    ;*************************************************************************
1962
1963  007746  122737  000063  007776    DAOUT:  CMPB    #63,DATA3       ;OUTPUTTING BOTH CH.'S?
1964  007754  001403                            BEQ     .+10            ;YES
1965  007756  112737  000004  010002            MOVB    #EOT,DATA5      ;NO, TERMINATE AFTER '3' CHAR.'S
1966  007764  004737  017234                    JSR     PC,ADRDST       ;ADDRESS THE MODULE
1967
1968  007770  104007                            LDPGM0                  ;TRANSMIT THE DATA
1969  007772  007776                            .+4
1970  007774  000207                            RTS     PC
1971
1972  007776  000000                    DATA3:  0                       ;LOW BYTE=MODE, HI BYTE=MSB
1973  010000  000000                    DATA4:  0                       ;HI BYTE=LSB
1974  010002  000000                    DATA5:  0                       ;LO BYTE='EOT' OR 'MSB' OF CH. '2'
1975  010004  000000                    DATA6:  0
```

```
                                ;**********.**********************************************************************
                                .SBTTL M7384 D/A EXERCISER TEST
                                ;THIS TEST ENABLES ANY VALUE THE USER TYPES IN ON THE TELEPRINTER TO BE
                                ;OUTPUTTED FROM THE D/A. WHEN SELECTED, THE TEST REQUESTS FOR TWO THREE DIGIT VALUES
                                ;(SEPARATED VIA COMMA'S) TO BE TYPED IN. THE FIRST VALUE IS THE ONLY ONE
                                ;OUTPUTTED WHEN RUNNING ONLY ONE CHANNEL. IF BOTH CHANNELS ARE SELECTED
                                ;THE FIRST VALUE WILL BE OUTPUTTED ON CHANNEL '0' (X DAC) AND THE
                                ;SECOND VALUE WILL BE OUTPUTTED ON CHANNEL '1' (Y DAC). THE CHANNELS
                                ;ARE SELECTED BY DATA SWITCHES '0 & 1' AND MAY BE SET AND RESET
                                ;AT ANYTIME. SETTING DATA SWITCH '0' WILL SELECTED CHANNEL '0'. SETTING
                                ;DATA SWITCH '1' WILL SELECT CHANNEL 1 AND SETTING BOTH '0 & 1' WILL
                                ;ENABLE BOTH CHANNELS.
                                ;**************************************************************************

010006  104012          M7384E: PRINT
010010  026552                 MES57                   ;D/A EXERCISER TEST
010012  104026                 ADDRESS                 ;GET AND SETUP MODULE ADDRESS
010014  104035                 SETUP                   ;SET UP TEST PARAMETERS
010016  104012          TAG4F:  PRINT
010020  026576                 MES58                   ;REQUEST THE D/A VALUES
010022  104013                 TTYIN                   ;GET 'EM
010024  022737  000007  032214  CMP     #7,CHRCNT       ;WERE '7' CHARACTERS INPUTTED?
010032  001371                 BNE     TAG4F           ;NO, ASK 'EM AGAIN
010034  012701  015330         MOV     #INBUF,R1       ;SET UP TO SAVE THEM
010040  012702  007777         MOV     #DATA3+1,R2
010044  112122                 MOVB    (R1)+,(R2)+     ;SAVE 'MSB' OF CH. '0'
010046  112122                 MOVB    (R1)+,(R2)+
010050  112122                 MOVB    (R1)+,(R2)+     ;SAVE 'LSB'
010052  122721  000054         CMPB    #54,(R1)+       ;DIGIT BETTER BE THE COMMA
010056  001357                 BNE     TAG4F           ;NO, ILLEGAL INPUT
010060  111103                 MOVB    (R1),R3         ;SAVE THE 'MSB' OF 2ND WORD
010062  112122                 MOVB    (R1)+,(R2)+
010064  112122                 MOVB    (R1)+,(R2)+
010066  112122                 MOVB    (R1)+,(R2)+
010070  112722  000004         MOVB    #EOT,(R2)+      ;TERMINATE WITH 'EOT'

010074  012701  007776  TAG4G: MOV     #DATA3,R1       ;SET UP SAVE SWITCHES
010100  117711  171246         MOVB    @SWR,(R1)
010104  142711  000310         BICB    #310,(R1)       ;CLR UNWANTED BITS
010110  152711  000060         BISB    #60,(R1)        ;MAKE NO. BCD
010114  110337  010002         MOVB    R3,DATA5        ;RESTORE 'MSB' OF CH. 2 EACH TIME
010120  004737  007746         JSR     PC,@#DAOUT      ;SEND THE DATA
010124  000763                 BR      TAG4G
```

```
                                .SBTTL M7385 (SERIAL) & M7388 (CHAR.) I/O ADDRESS TEST
                                ;*************************************************************************
                                ;THIS TEST EXERCISES THE 'M7385' MODULE USING THE PDP-11 VIA THE DL11
                                ;AS THE DESTINATION INPUT AND THE SOURCE OUTPUT
                                ;*************************************************************************

010126  104012                  M7385A: PRINT
010130  024127                          MES3                    ;TEXT 'M7385 MODULE TEST'.
010132  104026                          ADDRESS                 ;GET MODULE ADDRESS
010134  110037  010637          M385A1: MOVB    R0,STADR7
010140  110037  010643                  MOVB    R0,STADR8
010144  110037  010723                  MOVB    R0,STADR9
010150  110037  010727                  MOVB    R0,STAD10
010154  005037  032222                  CLR     LOPSWH
010160  104035                          SETUP                   ;SET UP TEST PARAMETERS.

                                ;*************************************************************************
                                ;THIS SUBTEST ADDRESSES THE 'SOURCE'' PORTION OF THE MODULE USING
                                ;MODE '0' AND TESTS FOR THE FORCED RETURN OF THE 'EOT'.
                                ;*************************************************************************

010162  000240                  ST7385: NOP
010164  000240                          NOP
010166  112737  000060  017231          MOVB    #60,SOH1        ;SET UP MODE '0'
010174  004737  017220                  JSR     PC,ADRSRC       ;ADDRESS THE MODULE

010200  022712  000004                  CMP     #EOT,(R2)       ;WAS IT RETURNED?
010204  001402                          BEQ     .+6             ;YES
010206  104022                          MODERR                  ;'EOT' WASN'T FORCED OUT BY SOURCE
010210  030603                          ERR5
010212  005737  032132                  TST     SIOSWH          ;SERIAL INPUT
010216  001106                          BNE     SD5             ;YES, GO TO TEST '5.

                                ;*************************************************************************
                                ;THIS SUBTEST ADDRESSES THE SOURCE IN MODE '1' AND CHECKS THAT THE
                                ;'EOT' ISN'T FORCED.
                                ;*************************************************************************

010220  104001  000002          SD2:    SCOPE,2
010224  112737  000061  017231          MOVB    #61,SOH1        ;SET UP MODE '1'
010232  004737  017220                  JSR     PC,ADRSRC       ;ADDRESS MODULE

010236  005712                          TST     (R2)            ;WAS ANY DATA RETURNED?
010240  001402                          BEQ     SD3             ;NO-OK
010242  104022                          MODERR                  ;ILLEGAL DATA TRANSFER VIA SOURCE
010244  030724                          ERR8
```

```
                                        ;*************************************************************************
                                        ;AT THIS POINT THE SOURCE MODULE IS ADDRESSED WAITING FOR DATA.
                                        ;THIS SUBTEST ADDRESSES THE DESTINATION MODULE AND TRANSFERS DATA
                                        ;TO THE SOURCE AND CHECKS THAT IT IS RETURNED.
                                        ;*************************************************************************

010246  104001  000003        SD3:    SCOPE,3
010252  004737  017234                JSR     PC,ADRDST       ;ADDRESS DESTINATION
010256  005712                        TST     (R2)            ;HAS ANY DATA RETURNED?
010260  001403                        BEQ     .+10            ;NO, OK
010262  104022                        MODERR                  ;NO DATA HAS YET BEEN TRANSFERED
010264  030724                        ERR8
010266  000436                        BR      TAG1D+2         ;EXIT ON ERROR

010270  104011                        RANDOM                  ;CREATE A RANDOM DATA BUFFER
010272  012737  010272  020774        MOV     #.,RETURN       ;RE-SET SCOPE LOOP ADDR.
010300  104005                        RECVR0                  ;ENABLE DL 0'S RECVR
010302  104007                        LDPGM0                  ;TRANSFER '500' WORDS TO SOURCE VIA DEST.
010304  017670                        TRNBF0
010306  005737  016234                TST     RECBF0          ;WAS ANY DATA RECV'D?
010312  001003                        BNE     .+10            ;YES, VERIFY IT
010314  104022                        MODERR                  ;NO DATA WAS RECV'D BACK FROM SOURCE
010316  031041                        ERR11
010320  000421                        BR      TAG1D+2         ;EXIT ON ERROR
010322  005737  016220                TST     PARITY          ;WAS PARITY ERROR DETECTED?
010326  001402                        BEQ     .+6             ;NO, VERIFY DATA
010330  104022                        MODERR                  ;DATA PARITY ERROR
010332  030677                        ERR7
010334  012701  016234                MOV     #RECBF0,R1      ;SET UP TO COMPARE RECV'D DATA
010340  012702  017670                MOV     #TRNBF0,R2      ;AGAINST TRANSMITTED DATA
010344  022122        CMP1A:  CMP     (R1)+,(R2)+     ;DATA MATCH?
010346  001403                        BEQ     .+10            ;YES, CONTINUE
010350  104022                        MODERR                  ;RECEIVED DATA DOESN'T MATCH TRANSMITTED DATA
010352  030526                        ERR3
010354  000403                        BR      TAG1D+2
010356  022702  020372                CMP     #TRNEND,R2      ;DONE?
010362  001370        TAG1D:  BNE     CMP1A           ;NO
```

```
2105                                    ;*************************************************************************
2106                                    ;AT THIS POINT DATA HAS BEEN TRANSFERED TO THE DESTINATION AND
2107                                    ;RECEIVED BACK FROM THE SOURCE.  THIS SUBTEST TRANSFERS AN 'EOT' FOLLOWED
2108                                    ;BY DATA TO VERIFY THAT THE 'EOT' CLEARS THE SOURCE & DESTINATION.
2109                                    ;*************************************************************************
2110
2111  010364  104001  000004   SD4:    SCOPE,4
2112  010370  104006                   LDCHR0                  ;TRANSMIT 'EOT'
2113  010372  000004                   EOT
2114  010374  104007                   LDPGM0                  ;FOLLOW 'EOT' WITH SOME DATA
2115
2116  010376  010402                   .+4
2117  010400  000402                   BR      TAG1E
2118
2119  010402     101                   .BYTE   'A              ;SEND A COUPLE OF DATA CHAR.'S
2120  010403     102                   .BYTE   'B
2121  010404     000                   .BYTE   0               ;TERMINATE
2122          010406                   .EVEN
2123
2124  010406  005737  016224   TAG1E:  TST     RECEOT          ;WAS 'EOT' RECV'D?
2125  010412  001003                   BNE     .+10            ;YES
2126  010414  104022                   MODERR                  ;'EOT' WASN'T RETURNED
2127  010416  030603                   ERR5
2128  010420  000405                   BR      TAG1F+2         ;EXIT ON ERROR
2129
2130  010422  022712  000004          CMP     #EOT,(R2)       ;WAS 'EOT' ONLY CHAR. RETURNED?
2131  010426  001402                   BEQ     .+6             ;YES
2132  010430  104022                   MODERR                  ;ILLEGAL DATA TRANSFER
2133  010432  030724           TAG1F:  ERR8
```

```
                                ;**********************************************************************
                                ;FIFO CHARACTER STORAGE TEST
                                ;THIS SUBTEST ADDRESSES THE DESTINATION MODULE THEN TRANSMITTS
                                ;'63' AND AN 'EOT'.  THE SOURCE MODULE IS THEN ADDRESSED
                                ;AND IT SHOULD TRANSMIT THESE CHARACTERS BACK TO THE PDP-11.
                                ;IT SHOULE BE NOTED THAT WHEN THIS TEST IS RUN USING THE
                                ;SERIAL INPUT OPTION, ONE HUNDRED AND TWENTY-EIGHT (128)
                                ;CHARACTERS WILL BE RETURNED TO THE DL11 RECEIVER.  THE FIRST
                                ;'64' CHARATERS ARE RECEIVED BACK FROM THE SERIAL INPUT
                                ;DESTINATION, AND THE SECOND '64' CHARACTERS ARE THE CHARACTERS
                                ;THAT WERE ACUTALLY STORED IN THE 'FIFO' OF THE MODULE UNDER TEST.
                                ;**********************************************************************

010434  104001  000005        SD5:    SCOPE,5
010440  012746  000000                MOV     #0,     -(SP)   ;ENABLE INTERRUPTS
010444  012746  010452                MOV     #1$,    -(SP)
010450  000002                        RTI
010452  104011                1$:     RANDOM                  ;CREATE A RANDOM DATA BUFFER
010454  112737  000004  017767        MOVB    #EOT,TRNBF0+77  ;TERMINATE BUFFER AFTER '64' BYTES
010462  005037  017770                CLR     TRNBF0+100      ;TERMINATE BUFFER
010466  004737  017234                JSR     PC,ADRDST       ;ADDRESS DESTINATION MODULE

010472  104007                TAG1H:  LDPGM0                  ;TRANSMIT DATA
010474  017670                        TRNBF0

010476  112737  000060  017231  TAG1L:  MOVB    #60,SOH1        ;SET UP FOR MODE '0'
010504  004737  017220                JSR     PC,ADRSRC       ;ADDRESS SOURCE
010510  005737  016224                TST     RECEOT          ;RECEIVED ALL DATA BACK?
010514  001775                        BEQ     .-4             ;NO, WAIT FOR 'EOT'

010516  012701  017670        CMP1C:  MOV     #TRNBF0,R1      ;TO TRANSMITTED DATA
010522  122122                CMP1B:  CMPB    (R1)+,(R2)+     ;DATA MATCH?
010524  001403                        BEQ     .+10            ;YES
010526  104022                        MODERR                  ;RECV'D DATA NOT EQUAL TO TRANS. DATA
010530  030526                        ERR3
010532  000420                        BR      SD6             ;EXIT ON ERROR
010534  020127  017770                CMP     R1,#TRNBF0+100  ;DONE?
010540  001370                        BNE     CMP1B           ;NO
010542  005737  032132                TST     SIOSWH          ;USING THE SERIAL I/O INPUT?
010546  001412                        BEQ     SD6             ;NO, CHECK ONLY '64' CHAR.'S
010550  105737  017771                TSTB    TRNBF0+101      ;YES, HAVE WE CHK'D '128' CHAR.'S?
010554  001103                        BNE     SD10            ;YES, EXIT
010556  105237  017771                INCB    TRNBF0+101      ;NO, CHK NEXT '64' CHAR.'S FROM 'FIFO'
010562  022737  000002  016224        CMP     #2,RECEOT       ;RECEIVED ALL DATA FROM FIFO?
010570  001374                        BNE     .-6             ;NO, WAIT FOR 'EOT'
010572  000751                        BR      CMP1C           ;DO IT.
```

```
2181
2182                            ;**********  ********************************************************************
2183                            ;THIS SUBTEST ADDRESSES THE 'SOURCE' USING THE WRONG MODULE ADDRESSES
2184                            ;AND TESTS THAT THE SOURCE ISN'T ENABLED.
2185                            ;*************************************************************************************
2186
2187  010574  104001  000006   SD6:    SCOPE,6
2188  010600  012746  000340           MOV     #340,   -(SP)   ;INHIBIT INTERRUPTS
2189  010604  012746  010612           MOV     #1$,    -(SP)
2190  010610  000002                    RTI
2191  010612  005737  032132   1$:     TST     SIOSWH          ;USING SERIAL INPUT OPTION?
2192  010616  001062                    BNE     SD10            ;YES, SKIP THE NEXT TEST.
2193  010620  004737  005154           JSR     PC,@#ADRSIT
2194
2195                            ;*****************************************************************
2196                            ;THIS SUBTEST CHECKS THAT 'ETX' WILL CLEAR THE SOURCE AND THAT 'STX'
2197                            ;WILL CLEAR THE DESTINATION
2198                            ;*****************************************************************
2199
2200  010624  104001  000007   SD7:    SCOPE,7
2201  010630  104007                    LDPGM0                  ;ADDRESS MODULE
2202  010632  010636                    .+4
2203  010634  000404                    BR      TAG1K
2204  010636     021                    .BYTE   DC1             ;ALERT SOURCE
2205  010637     061           STADR7:  .BYTE   61
2206  010640     001                    .BYTE   SOH
2207  010641     061                    .BYTE   61              ;MODE '1'
2208  010642     022                    .BYTE   DC2             ;ALERT DESTINATION
2209  010643     061           STADR8:  .BYTE   61
2210  010644     023                    .BYTE   DC3             ;ENABLE MODULE
2211  010645     003                    .BYTE   ETX             ;CLR SOURCE
2212
2213  010646  104006           TAG1K:   LDCHR0                  ;SEND A DATA CHAR.
2214  010650  000102                    'B
2215
2216  010652  122722  000003           CMPB    #ETX,(R2)+      ;WAS 'ETX' RETURNED?
2217  010656  001403                    BEQ     .+10            ;YES
2218  010660  104022                    MODERR                  ;'ETX' WASN'T RETURNED
2219  010662  031257                    ERR16
2220  010664  000435                    BR      TAG1W           ;EXIT ON ERROR
2221
2222  010666  105722                    TSTB    (R2)+           ;WAS ANY OTHER DATA RECV'D?
2223  010670  001403                    BEQ     .+10            ;NO-OK
2224  010672  104022                    MODERR                  ;ETX DIDN'T CLR SOURCE
2225  010674  031171                    ERR14
2226  010676  000430                    BR      TAG1W           ;EXIT ON ERROR
```

```
2227                                    ;NOW CLR DESTINATION
2228
2229  010700  104007                            LDPGM0
2230  010702  010706                            .+4
2231  010704  000402                            BR      TAG1S
2232  010706     002                            .BYTE   STX             ;CLR DESTINATION
2233  010707     101                            .BYTE   'A              ;SEND SOME DATA
2234  010710     130                            .BYTE   'X
2235  010711     000                            .BYTE   0               ;TERMINATE
2236
2237                                    ;NOW RE-ADDRESS SOURCE & DESTINATION AND EXAMINE DATA
2238
2239  010712  104005                    TAG1S:  RECVR0
2240  010714  104007                            LDPGM0                  ;RE-ADDRESS SOURCE
2241  010716  010722                            .+4
2242  010720  000404                            BR      TAG1T
2243
2244  010722     021                            .BYTE   DC1             ;ALERT SOURCE
2245  010723     061                    STADR9: .BYTE   61
2246  010724     001                            .BYTE   SOH
2247  010725     061                            .BYTE   61              ;MODE '1'
2248  010726     022                            .BYTE   DC2             ;ALERT DESTINATION
2249  010727     061                    STAD10: .BYTE   61
2250  010730     023                            .BYTE   DC3             ;ENABLE MODULE
2251  010731     000                            .BYTE   0
2252
2253  010732  005737  016226              TAG1T:  TST     RECSTX          ;WAS 'STX' RETURNED?
2254  010736  001003                            BNE     .+10            ;YES
2255  010740  104022                            MODERR                  ;'STX' WASN'T RECV'D FROM DEST.
2256  010742  030440                            ERR1
2257  010744  000405                            BR      TAG1W           ;EXIT ON ERROR
2258
2259  010746  105737  016236                    TSTB    RECBF0+2        ;WAS 'STX' THE ONLY DATA RECV'D
2260  010752  001402                            BEQ     .+6             ;YES
2261  010754  104022                            MODERR                  ;'STX' DIDN'T CLR DEST.
2262  010756  031073                            ERR12
2263
2264                                  ;SEND AN 'EOT' TO CLR MODULE
2265
2266  010760  104006                    TAG1W:  LDCHR0
2267  010762  000004                            EOT                     ;CLR MODULE
```

```
                        ;*************************************************************************
                        ;THIS SUBTEST REQUESTS THE OPERATOR TO RE-SET THE MODULE ADDRESS TO '17'.
                        ;AND INSERT THE STRAP TO INHIBIT THE 'EOT' FROM BEING TRANSMITTED.
                        ;IF DATA 'SW10' IS NOT SET THIS MANUAL INTERVENTION TEST IS SKIPPED.
                        ;*************************************************************************

010764  104001  000010        SD10:   SCOPE,10
010770  032777  002000  170354        BIT     #SW10,@SWR      ;SW10 SET?
010776  001456                      BEQ     TAG1P           ;NO, TYPE TEST COMPLETE
011000  104012                      PRINT
011002  024460                      MES14
011004  024316                      MES10                   ;TEXT 'RE-SET MODULE ADDRESS TO '17'.
011006  104013                      TTYIN                   ;WAIT FOR 'CR' TO CONTINUE

011010  012737  011010  020774  TAG1Q:  MOV     #.,RETURN       ;RE-SET SCOPE LOOP ADDRESS POINTER
011016  112737  000077  032134        MOVB    #77,MODADR      ;SET UP FOR ADDR. '17'
011024  112737  000077  017227        MOVB    #77,SRCADR
011032  112737  000077  017277        MOVB    #77,DSTADR
011040  104005                      RECVR0                  ;ENABLE DL 0'S RECVR.
011042  004737  017234              JSR     PC,ADRDST       ;ADDRESS DEST. MODULE

011046  104007          TAG1R:  LDPGM0                  ;SEND SOME DATA
011050  011054                  .+4
011052  000402                  BR      TAG1U
011054     101                  .BYTE   'A              ;SEND DATA
011055     102                  .BYTE   'B
011056     004                  .BYTE   EOT             ;TERMINATE
        011060                  .EVEN
011060  104005          TAG1U:  RECVR0                  ;CLR & RESET BUFFER
011062  112737  000060  017231        MOVB    #60,SOH1        ;SET UP FOR MODE '0'
011070  004737  017220              JSR     PC,ADRSRC       ;ADDRESS THE SOURCE

011074  022712  041101  TAG1Z:  CMP     #41101,(R2)     ;WAS THE 'A & B' RETURNED?
011100  001403                  BEQ     .+10            ;YES
011102  104022                  MODERR                  ;MODULE WASN'T ADDRESS W/ '17'
011104  031041                  ERR11
011106  000405                  BR      SD11            ;EXIT ON ERROR
011110  005737  016224          TST     RECEOT          ;WAS 'EOT' STRAPPED OUT?
011114  001402                  BEQ     .+6             ;YES
011116  104022                  MODERR                  ;'EOT' WASN'T STRAPPED OUT
011120  031223                  ERR15

                        ;*************************************************************************
                        ;TEST COMPLETE
                        ;*************************************************************************

011122  104001  000011        SD11:   SCOPE,11
011126  104012                      PRINT
011130  024527                      MES14A                  ;TEXT 'REMOVE STAP'
011132  104026                      ADDRESS                 ;SET UP NEW MODULE ADDRESS
011134  104012          TAG1P:  PRINT
011136  024236                  MES7                    ;TEXT 'TEST COMPLETE'
011140  113700  032134              MOVB    MODADR,R0
011144  000137  010134              JMP     M385A1          ;RESTART TEST
```

```
2322
2323                                    ;**********************************************************************
2324                                    .SBTTL M7385 SERIAL I/O INTERFACE TEST
2325                                    ;THIS TEST IS USED TO TEST THAT THE SERIAL I/O INTERFACE MODULE IS FUNCTIONING
2326                                    ;CORRECTLY. TO RUN THIS TEST THE 'L' JUMPER MUST BE INSERTED ON THE M7385
2327                                    ;SO AS TO BE INITIALIZED ON POWER UP.  REMOVE THE CONTROL MODULE AND
2328                                    ;TIE THE 'T&R' BUSES TOGETHER.
2329                                    ;**********************************************************************
2330
2331  011150  104012                M7385I: PRINT                   ;TEXT 'M7385 SERIAL INTERFACE TEST
2332  011152  027223                        MES66
2333  011154  104035                        SETUP
2334
2335                                    ;**********************************************************************
2336                                    ;THIS TEST SIMPLY ADDRESSES THE DESTINATION PORTION OF THE MODULE WHICH
2337                                    ;WILL ENABLE A CLOSED LOOP FOR DATA BEING SENT TO THE SOURCE.
2338                                    ;**********************************************************************
2339
2340  011156  104011                TEST1:  RANDOM                  ;CREATE A RANDOM DATA BUFFER.
2341  011160  104007                        LDPGM0                  ;ADDRESS DESTINATION
2342  011162  011166                        .+4
2343  011164  000402                        BR      TST1A
2344  011166     022                        .BYTE   DC2             ;ALERT THE DESTINATION
2345  011167     060                IADR10: .BYTE   60              ;MODIFIED BY USER
2346  011170     017                        .BYTE   SI              ;ENABLE DESTINATION
2347  011171     000                        .BYTE   0               ;TERMINATE
2348                                        .EVEN
2349
2350  011172  005712                TST1A:  TST     (R2)            ;HAS ANY DATA RETURNED?
2351  011174  001403                        BEQ     .+10            ;NO, OK
2352  011176  104022                        MODERR                  ;NO DATA HAS YET BEEN TRANSFERED
2353  011200  030724                        ERR8
2354  011202  000434                        BR      TEST2           ;EXIT ON ERROR
2355
2356  011204  104011                        RANDOM                  ;CREATE A RANDOM DATA BUFFER
2357  011206  012737  011206  020774        MOV     #.,RETURN       ;RE-SET SCOPE LOOP ADDR.
2358  011214  104005                        RECVR0                  ;ENABLE DL 0'S RECVR
2359  011216  104007                        LDPGM0                  ;TRANSFER '500' WORDS TO SOURCE VIA DEST.
2360  011220  017670                        TRNBF0
2361  011222  005712                        TST     (R2)            ;WAS ANY DATA RECV'D?
2362  011224  001003                        BNE     .+10            ;YES, VERIFY IT
2363  011226  104022                        MODERR                  ;NO DATA WAS RECV'D BACK FROM SOURCE
2364  011230  031041                        ERR11
2365  011232  000420                        BR      TEST2           ;EXIT ON ERROR
2366  011234  005737  016220              TST     PARITY          ;WAS PARITY ERROR DETECTED?
2367  011240  001403                        BEQ     .+10            ;NO, VERIFY DATA
2368  011242  104022                        MODERR                  ;DATA PARITY ERROR
2369  011244  030677                        ERR7
2370  011246  000412                        BR      TEST2
2371  011250  012701  017670              MOV     #TRNBF0,R1      ;AGAINST TRANSMITTED DATA
```

```
2372  011254  022122                CMPT1A: CMP     (R1)+,(R2)+     ;DATA MATCH?
2373  011256  001403                        BEQ     .+10            ;YES, CONTINUE
2374  011260  104022                        MODERR                  ;RECEIVED DATA DOESN'T MATCH TRANSMITTED DATA
2375  011262  030526                        ERR3
2376  011264  000403                        BR      TEST2
2377  011266  022701  020372                CMP     #TRNEND,R1      ;DONE?
2378  011272  001370                        BNE     CMPT1A          ;NO
2379
2380                                ;*************************************************************************
2381                                ;AT THIS POINT DATA HAS BEEN TRANSFERED TO THE DESTINATION AND
2382                                ;RECEIVED BACK FROM THE SOURCE.  THIS SUBTEST TRANSFERS AN 'EOT' FOLLOWED
2383                                ;BY DATA TO VERIFY THAT THE 'EOT' CLEARS THE SOURCE & DESTINATION.
2384                                ;*************************************************************************
2385
2386  011274  104001                TEST2:  SCOPE
2387  011276  000002                        2
2388  011300  104006                        LDCHR0                  ;TRANSMIT 'EOT'
2389  011302  000004                        EOT
2390  011304  104007                        LDPGM0                  ;FOLLOW 'EOT' WITH SOME DATA
2391  011306  011312                        .+4
2392  011310  000402                        BR      TST2A
2393
2394  011312     101                        .BYTE   'A              ;SEND A COUPLE OF DATA CHAR.'S
2395  011313     102                        .BYTE   'B
2396  011314     000                        .BYTE   0               ;TERMINATE
2397          011316                        .EVEN
2398
2399  011316  005737  016224          TST2A:  TST     RECEOT          ;WAS 'EOT' RECV'D?
2400  011322  001003                        BNE     .+10            ;YES
2401  011324  104022                        MODERR                  ;'EOT' WASN'T RETURNED
2402  011326  030603                        ERR5
2403  011330  000405                        BR      TST2B+2         ;EXIT ON ERROR
2404
2405  011332  022712  000004                CMP     #EOT,(R2)       ;WAS 'EOT' ONLY CHAR. RETURNED?
2406  011336  001402                        BEQ     .+6             ;YES
2407  011340  104022                        MODERR                  ;ILLEGAL DATA TRANSFER
2408  011342  030724                TST2B:  ERR8
2409
2410                                ;*************************************************************************
2411                                ;TEST COMPLETE
2412                                ;*************************************************************************
2413
2414  011344  104001                TEST3:  SCOPE
2415  011346  000003                        3
2416  011350  104012                        PRINT
2417  011352  024236                        MES7                    ;TEXT 'TEST COMPLETE
2418  011354  000137  001376                JMP     MONITR          ;RETURN TO MONITOR
```

```
                        ;*******************************************************************************
                        .SBTTL M7385 TTL I/O TEST
                        ;*******************************************************************************
                        
011360  104012          M7385T: PRINT
011362  027037                  MES62                   ;TEXT 'TTL I/O TEST'
011364  104026                  ADDRESS                 ;GET THE MODULE ADDRESS
011366  110037  011441          MOVB    R0,TTLAD1       ;SET UP MODULE ADDRESS
011372  110037  011445          MOVB    R0,TTLAD2
011376  104035                  SETUP
                        
                        ;*******************************************************************************
                        ;THIS TEST VERIFIES THAT THE TTL I/O SECTION OF THE SERIAL I/O MODULE
                        ;IS FUNCTIONING CORRECTLY.  IT REQUIRES FOR A TELEPRINTER TO BE CABLED TO
                        ;THE MATON LOCK OF THE SERIAL I/O (THIS COULD BE THE CONSOLE PRINTER ONCE
                        ;THE TEST IS SELECTED).  ALL CHARACTERS THEN INPUTTED WILL BE RECEIVED BY
                        ;THE SERIAL SOURCE AND WRAPPED AROUND (BY THE CONTROL MODULE OR
                        ;COMPUTER IF DF11 IS USED) TO THE DESTINATION.  HERE THE CHARACTER WILL BE
                        ;TRANSMITTED BACK TO THE TELEPRINTER AND PRINTED.  EFFECTIVELY, AS FAR AS
                        ;THE USER IS CONCERNED, THIS TEST ACTS LIKE A KEYBOARD ECHO TEST.
                        ;*******************************************************************************
                        
011400  012746  000340  TTLTST: MOV     #340,   -(SP)   ;INHIBIT INTERRUPTS
011404  012746  011412          MOV     #1$,    -(SP)
011410  000002                  RTI
011412  104005          1$:     RECVR0                  ;ENABLE DL11 RECVR.
011414  012746  000000          MOV     #0,     -(SP)   ;ENABLE INTERRUPTS
011420  012746  011426          MOV     #2$,    -(SP)
011424  000002                  RTI
011426  005237  032146  2$:     INC     DSTSWH
011432  104025                  SOURCE
011434  011440                  .+4
011436  000404                  BR      TAG7A           ;ADDRESS THE MODULE
011440     021                  .BYTE   DC1
011441     061          TTLAD1: .BYTE   61              ;ADDRESS MODIFIED BY USER
011442     001                  .BYTE   SOH             ;MODE 1, WAIT FOR DATA
011443     061                  .BYTE   61
011444     022                  .BYTE   DC2             ;ALERT DEST.
011445     061          TTLAD2: .BYTE   61              ;ADDRESS MODIFIED BY USER
011446     023                  .BYTE   DC3
011447     000                  .BYTE   0
                                .EVEN
                        
011450  005037  032146  TAG7A:  CLR     DSTSWH
011454  105712                  TSTB    (R2)            ;DATA READY?
011456  001776                  BEQ     .-2             ;NO
011460  005737  032132          TST     SIOSWH          ;USING SERIAL I/O
011464  001004                  BNE     TAG7B+2         ;YES, TEST ONLY FOR EOT
011466  111237  011474          MOVB    (R2),TAG7B      ;NO, SET UP TO TRANSMIT CHAR.
011472  104006                  LDCHR0
011474  000000          TAG7B:  0
011476  122722  000004          CMPB    #EOT,(R2)+      ;CHAR. = 'EOT'?
011502  001736                  BEQ     TTLTST          ;YES, RE-ADDRESS MODULE
011504  000761                  BR      TAG7A           ;NO, WAIT FOR NEXT CHAR.
```

```
                                ;**********************************************************************
                                .SBTTL M7386 KEYBOARD/DISPLAY MODULE ADDRESS TEST
                                ;**********************************************************************

011506  104012          M7386A: PRINT
011510  025726                  MES39
011512  104026                  ADDRESS                 ;GET THE MODULE ADDRESS
011514  110037  011623          MOVB    R0,KEYAD1       ;SET IT UP
011520  110037  011625          MOVB    R0,KEYAD2       ;SET UP TEST PARAMETERS
011524  104035          KEYT0:  SETUP
011526  005037  032144          CLR     DLYSWH          ;ENABLE TRANSMITTER DELAY

                                ;**********************************************************************
                                ;THIS SUBTEST ADDRESSES THE KEYBOARD MODULE AND CHECKS FOR THE
                                ;AUTOMATIC RETURN OF AN 'EOT'.
                                ;**********************************************************************

011532  000240          KEYT1:  NOP
011534  000240                  NOP
011536  004737  017220          JSR     PC,ADRSRC       ;ADDRESS THE MODULE
011542  022712  000004          CMP     #EOT,(R2)       ;WAS 'EOT' RETURNED?
011546  001402                  BEQ     KEYT2           ;YES
011550  104022                  MODERR                  ;MODULE DIDN'T RETURN 'EOT'
011552  030603                  ERR5

                                ;**********************************************************************
                                ;THIS SUBTEST ADDRESSES BOTH THE KEYBOARD & THE DISPLAY.  THE DATA
                                ;FROM THE KEYBOARD IS DISPLAYED AND ALSO PRINTED OUT ON THE TELETYPE.
                                ;THE TELETYPE OUTPUT CAN BE ELIMINATED BY SETTING DATA SW15.
                                ;**********************************************************************

011554  104001          KEYT2:  SCOPE
011556  000002                  2
011560  104036                  NODLAY                  ;INHIBIT TRANSMITTER DELAY
011562  012746  000340          MOV     #340,   -(SP)   ;INHIBIT INTERRUPTS
011566  012746  011574          MOV     #1$,    -(SP)
011572  000002                  RTI
011574  012746  000000  1$:     MOV     #0,     -(SP)   ;ENABLE INTERRUPTS
011600  012746  011606          MOV     #2$,    -(SP)
011604  000002                  RTI
011606  104005          2$:     RECVR0                  ;ENABLE DL11 RECEIVER
011610  005237  032146          INC     DSTSWH
011614  104025                  SOURCE                  ;ADDRESS THE MODULE
011616  011622                  .+4
011620  000403                  BR      TAG6A
011622     021                  .BYTE   DC1             ;ALERT SOURCE
011623     060          KEYAD1: .BYTE   60
011624     022                  .BYTE   DC2             ;ALERT DESTINATION
011625     060          KEYAD2: .BYTE   60
011626     023                  .BYTE   DC3             ;ENABLE MODULE.
011627     000                  .BYTE   0
                                .EVEN

011630  005037  032146  TAG6A:  CLR     DSTSWH
011634  105712                  TSTB    (R2)            ;DATA READY?
```

```
2531  011636  001776                          BEQ     .-2             ;NO, WAIT
2532  011640  005737  032132                  TST     SIOSWH          ;USING THE CONTROL MODULE?
2533  011644  001004                          BNE     TAG6B+2         ;YES
2534  011646  111237  011654                  MOVB    (R2),TAG6B      ;NO,SET UP TO SEND CHAR TO DISPLAY
2535  011652  104006                          LDCHR0
2536  011654  000000                  TAG6B:  0
2537  011656  122712  000004                  CMPB    #EOT,(R2)       ;REC. 'EOT'?
2538  011662  001737                          BEQ     KEYT2+6         ;YES, RE-ADDRESS MODULE
2539  011664  111201                          MOVB    (R2),R1         ;GET DATA
2540  011666  032777  020000  167456          BIT     #SW13,@SWR      ;INHIBIT PRINTOUT?
2541  011674  001002                          BNE     TAG6C           ;YES
2542  011676  004737  015434                  JSR     PC,PDMSET       ;NO, TYPE IT
2543  011702  122712  000003          TAG6C:  CMPB    #ETX,(R2)       ;REC. AN 'EXT'?
2544  011706  001412                          BEQ     KEYT3           ;YES, RUN DISPLAY TEST
2545  011710  122722  000002                  CMPB    #STX,(R2)+      ;REC. AN 'STX'?
2546  011714  001345                          BNE     TAG6A           ;NO, RE-ADDRESS MODULE
2547  011716  005737  032132                  TST     SIOSWH          ;YES, USING SERIAL INPUT?
2548  011722  001742                          BEQ     TAG6A           ;NO, 'STX' IS LEGAL
2549  011724  104012                          PRINT
2550  011726  027473                          MES73A                  ;TEXT 'RE-INITIALIZE PDM70.'
2551  011730  104013                          TTYIN                   ;WAIT FOR SETUP
2552  011732  000713                          BR      KEYT2+6         ;RESTART TEST
2553
2554                          ;*************************************************************************
2555                          ;THIS SUBTEST IS ENTERED UPON RECEIPT OF AN 'ETX' FROM THE KEYBOARD
2556                          ;IN THE PREVIOUS SUBTEST.  THIS TEST THEN ADDRESSES THE DISPLAY
2557                          ;AND DISPLAYS THE ENTIRE DISPLAY CHARACTER SET ONE CHARACTER
2558                          ;AT A TIME.  EACH CHARACTER IS DISPLAYED ACROSS THE ENTIRE SCREEN
2559                          ;FOR APPROIMATLY ONE SECOND.
2560                          ;*************************************************************************
2561
2562  011734  104001                  KEYT3:  SCOPE
2563  011736  000003                          3
2564  011740  104012                          PRINT
2565  011742  027440                          MES73                   ;TEXT 'DISPLAY TEST''
2566  011744  104013                          TTYIN                   ;WAIT FOR 'CR'
2567  011746  104036                          NODLAY                  ;INHIBIT TRANSMITTER DELAY
2568  011750  012737  011750  020774          MOV     #.,RETURN       ;RESET SCOPE LOOP POINTER
2569  011756  012737  000040  012004          MOV     #40,TAG6D+2     ;START OFF WITH DISPLAYING SPACES.
2570  011764  104005                  TAG6E:  RECVR0                  ;ENABLE DL11 RECVR.
2571  011766  004737  017234                  JSR     PC,ADRDST       ;ADDRESS THE DESTINATION
2572  011772  012702  000040                  MOV     #32.,R2         ;DISPLAY '32' CHAR./LINE
2573  011776  104006                          LDCHR0
2574  012000  000212                          212                     ;SEND 'LF' TO CLEAR SCREEN
2575  012002  104006                  TAG6D:  LDCHR0
2576  012004  000040                          40                      ;MODIFIED TO CHAR. BEING DISPLAYED.
2577  012006  005302                          DEC     R2              ;DISPLAYED 32 CHAR.'S?
2578  012010  001374                          BNE     TAG6D           ;NO, LOAD NEXT CHAR.
2579  012012  104006                          LDCHR0                  ;YES
2580  012014  000004                          EOT                     ;CLEAR DESTINATION
2581  012016  104004                          DELAY                   ;DELAY SO USER CAN VIEW SCREEN
2582  012020  104004                          DELAY
2583  012022  005237  012004                  INC     TAG6D+2         ;SETUP NEXT CHAR.
2584  012026  022737  000140  012004          CMP     #140,TAG6D+2    ;DISPLAYED ALL CHAR'S.?
2585  012034  001353                          BNE     TAG6E           ;NO,
```

```
                                ;**********************************************************************
                                ;TEST COMPLETE
                                ;**********************************************************************

012036  104001                  KEYT4:  SCOPE
012040  000004                          4
012042  104012                          PRINT
012044  024236                          MES7                    ;TEXT 'TEST COMPLETE'
012046  000626                          BR      KEYT0

                                ;**********************************************************************
                                ;SBTTL M7388 CHARACTER I/O MODULE ADDRESS (IN-HOUSE) TEST
                                ;THIS TEST USES THE SAME TEST AS THE SERIAL I/O THE
                                ;TEST HEADER IS TYPED HERE AND THEN THE PROGRAM GOES TO THE
                                ;SERIAL I/O TESTS TO EXERCISE THE MODULE
                                ;THIS IS DESIGNATED AS AN IN-HOUSE TEST SINCE A SPECIAL
                                ;WRAP-A-ROUND MODULE IS REQUIRED TO RUN THE TEST.
                                ;**********************************************************************

012050  104012                  M7388A: PRINT
012052  026161                          MES44                   ;TEXT 'CHAR. I/O ADDRESS TEST'
012054  027323                          MES69                   ;TEXT '(IN-HOUSE)'
012056  000137  010132                  JMP     @#M7385A+4

                                ;**********************************************************************
                                .SBTTL M7388F CHARACTER I/O MODULE ADDRESS (FIELD) TEST
                                ;THIS TEST REQUIRES FOR THE FIELD SERVICE TESTER BE CONNECTED TO THE
                                ;INPUT /OUTPUT OF THE CHARACTER I/O MODULE.  THE PROGRAM THEN SENDS
                                ;SPECIFIC DATA AND THEN REQUESTS THE USER TO VERIFY (WITH HIS TESTER) THIS
                                ;DATA.  THE PROGRAM ALSO REQUESTS THE USER TO INPUT DATA WHICH WILL
                                ;IN TURN BE PRINTER ON THE CONSOLE DEVICE.
                                ;**********************************************************************

012062  104012                  M7388F: PRINT
012064  026161                          MES44                   ;TEXT 'CHARACTER I/O ADDRESS TEST'
012066  027337                          MES70                   ;TEXT '(FIELD)'.
012070  104026                          ADDRESS                 ;GET THE MODULE ADDRESS
012072  104035                          SETUP                   ;SET UP TEST PARAMETERS

                                ;**********************************************************************
                                ;THIS SUBTEST ADDRESSES THE SOURCE IN MODE '0' AND CHECKS FOR A
                                ;FORCED 'EOT'.
                                ;**********************************************************************

012074  000240                  CHART1: NOP
012076  000240                          NOP
012100  112737  000060  017231          MOVB    #60,SOH1        ;SET UP MODE '0'
012106  004737  017220                  JSR     PC,ADRSRC       ;ADDRESS THE SOURCE
012112  022712  000004                  CMP     #EOT,(R2)       ;WAS 'EOT' RETURNED?
012116  001402                          BEQ     CHART2          ;YES
012120  104022                          MODERR                  ;'EOT' WASN'T FORCED BY SOURCE
012122  030603                          ERR5
```

```
                        ;**********************************************************************
                        ;THIS SUBTEST ADDRESSES THE SOURCE IN MODE '1' AND CHECKS THAT THE
                        ;'EOT' ISN'T FORCED.  IT THEN REQUESTS THE USER TO INPUT DATA TO THE MODULE.
                        ;THE INPUTTED DATA WILL BE ECHOED TO THE PRINTER UNTIL AND 'EOT' IS RECEIVED.
                        ;THIS WILL ENABLE THE PROGRAM TO CONTINUE ON TO THE NEXT SUBTEST.
                        ;**********************************************************************

012124  104001          CHART2: SCOPE
012126  000002                  2
012130  112737  000061  017231  MOVB    #61,SOH1        ;SET UP FOR MODE '1'
012136  004737  017220          JSR     PC,ADRSRC       ;ADDRESS THE SOURCE
012142  005712                  TST     (R2)            ;WAS ANY DATA RETURNED?
012144  001403                  BEQ     .+10            ;NO-OK
012146  104022                  MODERR                  ;ILLEGAL DATA TRANSFER
012150  030724                  ERR8
012152  000405                  BR      TAG8A           ;PRINT THE RECEIVED DATA
012154  004737  021626          JSR     PC,TTYENB       ;ENABLE INTERRUPTS
012160  104012                  PRINT
012162  027520                  MES74                   ;TEXT 'ECHO TEST'
012164  027350                  MES71                   ;TEXT' INPUT DATA, TERMINATE TEST W/EOT'
012166  105712          TAG8A:  TSTB    (R2)            ;WAIT FOR DATA
012170  001776                  BEQ     .-2
012172  111201                  MOVB    (R2),R1
012174  004737  015434          JSR     PC,PDMSET       ;PRINT IT
012200  122722  000004          CMPB    #EOT,(R2)+      ;WAS 'EOT' RECEIVED?
012204  001370                  BNE     TAG8A

                        ;**********************************************************************
                        ;THIS IS A 'FIFO' STORAGE TEST.  IT REQUESTS THE USER TO INPUT DATA (UP TO 63)
                        ;CHARACTERS) AND AN 'EOT'.  AFTER THE USER HAS INPUTTED ALL HIS DATA, TYPE 'CR'.
                        ;THE TEST THEN ADDRESSES THE MODULE IN MODE '0' AND THEN PRINTS THE RECEIVED
                        ;DATA WHICH WAS STORED IN THE SOURCE 'FIFO'.
                        ;**********************************************************************

012206  104001          CHART3: SCOPE
012210  000003                  3
012212  104012                  PRINT
012214  027534                  MES75                   ;TEXT 'STORAGE TEST'
012216  027350                  MES71                   ;TEXT' INPUT DATA & TERMINATE W/EOT'
012220  005237  032150          INC     SENDSW          ;SET UP TO RETURN ON TTY INTERRUPT
012224  004737  021626          JSR     PC,TTYENB       ;ENABLE INTERRUPTS
012230  000001                  WAIT                    ;WAIT FOR RECVR. INTERRUPTS
012232  000776                  BR      .-2             ;TTY INTERRUPTS RETURN .+2
012234  005037  032150          CLR     SENDSW
012240  112737  000060  017231  MOVB    #60,SOH1        ;SET UP FOR MODE '0'
012246  004737  017220          JSR     PC,ADRSRC       ;ADDRESS THE MODULE
012252  104037                  PRTRBF                  ;PRINT CONTENTS OF THE RECVR. BUFFER
```

```
                                ;**********************************************************************
                                ;THIS SUBTEST LOAD '16','4' CHARACTER DATA PATTERNS (TOTAL OF 64 CHAR.'S)
                                ;INTO THE DESTINATION 'FIFO'.  THE USER IS THEN REQUESTED TO STROBE OUT
                                ;THESE '64' CHARACTERS AND VERIFY THEM.
                                ;THE '4' CHARACTER PATTERN IS: ALL 1'S, ALL 0'S, ALTERNATE ''1&0'S'', AND
                                ;REVERSED ALTERNATE ''1&0'S''.
                                ;**********************************************************************

012254  104001                CHART4: SCOPE
012256  000004                        4
012260  012701  000016                MOV     #16,R1          ;SET UP THE CHARACTER PATTERN
012264  012702  017670                MOV     #TRNBF0,R2      ;SAVE IT IN TRANSMITTER BUFFER
012270  112722  000377        TAG88A: MOVB    #377,(R2)+      ;ALL 1'S
012274  112722  000200                MOVB    #200,(R2)+      ;ALL 0'S
012300  112722  000125                MOVB    #125,(R2)+      ;ALTERNATE ''1&0'S''
012304  112722  000252                MOVB    #252,(R2)+      ;REVERSED ALTERNATE ''1&0'S''
012310  005301                        DEC     R1              ;LOAD '16' PATTERN'S?
012312  001366                        BNE     TAG88A          ;NO
012314  012712  000004                MOV     #EOT,(R2)       ;TERMINATE W/EOT
012320  012737  012320  020774        MOV     #.,RETURN       ;RESET SCOPE LOOP POINTER
012326  004737  017234                JSR     PC,ADRDST       ;ADDRESS DESTINATION
012332  104007                        LDPGM0                  ;TRANSMIT THE '64' CHARACTERS
012334  017670                        TRNBF0
012336  104012                        PRINT
012340  027413                        MES72                   ;TEXT 'EXAMINE '64' CHARACTERS
012342  104013                        TTYIN                   ;WAIT FOR 'CR'

                                ;**********************************************************************
                                ;THIS SUBTEST ADDRESSES THE 'SOURCE' USING ALL THE WRONG MODULE
                                ;ADDRESSES AND CHECKS THAT THE SOURCE ISN'T ENABLED.
                                ;**********************************************************************

012344  104001                CHART5: SCOPE
012346  000005                        5
012350  004737  005154                JSR     PC,ADRSIT       ;DO IT

                                ;**********************************************************************
                                ;TEST COMPLETE
                                ;**********************************************************************

012354  104001                CHART6: SCOPE
012356  000006                        6
012360  104012                        PRINT
012362  024236                        MES7                    ;TEXT 'TEST COMPLETE''
012364  000137  012072                JMP     M7388F+10

                                .SBTTL M7377A  REMOTE SERIAL I/O TEST
```

```
                                        ;
                                        ;**********  ********************************************************
                                        ;M7377A REMOTE SERIAL I/O TEST
                                        ;*************************************************************************
                                        ;
                                        ;
                                        ;*************************************************************************
                                        ;THIS TEST EXERCISES THE 'M7377' MODULE USING THE PDP-11 VIA THE DL11
                                        ;AS THE DESTINATION INPUT AND THE SOURCE OUTPUT
                                        ;*************************************************************************
                                        ;
012370  104012                  M7377A: PRINT                   ;TEXT 'M7377A REMOTE SERIAL I/O TEST''.
012372  027726                          MES80                   ;
012374  104026                          ADDRESS                 ;GET MODULE ADDRESS OF MODULE UNDER TEST
012376  110037  013103          M7377B: MOVB    R0,STDR7
012402  110037  013125                  MOVB    R0,STDR8
012406  110037  013165                  MOVB    R0,STDR9
012412  110037  013170                  MOVB    R0,STDR10
012416  110037  013207                  MOVB    R0,STDR11
012422  110037  013467                  MOVB    R0,STDR12
012426  110037  013531                  MOVB    R0,STDR13
012432  110037  013577                  MOVB    R0,STDR14
012436  110037  013617                  MOVB    R0,STDR15
012442  104035                  M377A1: SETUP
012444  005037  032222                  CLR     LOPSWH
                                        ;*************************************************************************
                                        ;THIS SUBTEST ADDRESSES THE 'SOURCE'' PORTION OF THE MODULE USING
                                        ;MODE '2' AND TESTS FOR THE FORCED RETURN OF THE 'EOT'.
                                        ;*************************************************************************
012450  104001  000001          ST7377: SCOPE,1
012454  112737  000062  017231          MOVB    #62,SOH1        ;SET UP MODE '2'
012462  004737  017220                  JSR     PC,ADRSRC       ;ADDRESS THE MODULE
                                        
012466  104004                          DELAY
012470  022712  000004                  CMP     #EOT,(R2)       ;WAS IT RETURNED?
012474  001402                          BEQ     SD4A            ;YES
012476  104022                          MODERR                  ;'EOT' WASN'T FORCED OUT BY SOURCE
012500  030603                          ERR5
```

```
012502  104001  000002          SD4A:   SCOPE,2
                                ;*************************************************************************
                                ;FIFO CHARACTER STORAGE TEST
                                ;THIS SUBTEST ADDRESSES THE DESTINATION MODULE THEN TRANSMITTS
                                ;'63' AND AN 'EOT'.  THE SOURCE MODULE IS THEN ADDRESSED
                                ;AND IT SHOULD TRANSMIT THESE CHARACTERS BACK TO THE PDP-11.
                                ;IT SHOULE BE NOTED THAT WHEN THIS TEST IS RUN USING THE
                                ;SERIAL INPUT OPTION, ONE HUNDRED AND TWENTY-EIGHT (128)
                                ;CHARACTERS WILL BE RETURNED TO THE DL11 RECEIVER.  THE FIRST
                                ;'64' CHARATERS ARE RECEIVED BACK FROM THE SERIAL INPUT
                                ;DESTINATION, AND THE SECOND '64' CHARACTERS ARE THE CHARACTERS
                                ;THAT WERE ACTUALLY STORED IN THE FIFO OF THE MODULE UNDER TESR.
                                ;*************************************************************************



                                ;NOTE: THE CONTENTS OF THE RECEIVER BUFFER ARE:
                                ;LOCATIONS 1-62 (1-75 BASE 8) ARE XMITTD/RCVD CHARACTERS.
                                ;LOC 63:        XMITTED/RCVD EOT (76 BASE 8)
                                ;LOC 64:        (77 BASE 8)
                                ;LOC 65:        TERMINATE IF=1,INITIALLLY SET TO 0 (2ND BUFFER SWITCH)



012506  012746  000000          S5:     MOV     #0,     -(SP)   ;ENABLE INTERRUPTS
012512  012746  012520                  MOV     #1$,    -(SP)
012516  000002                          RTI
012520  104011                  1$:     RANDOM                  ;CREATE A RANDOM DATA BUFFER
012522  112737  000004  017767          MOVB    #EOT,TRNBF0+77  ;TERMINATE BUFFER AFTER '63' BYTES
012530  005037  017770                  CLR     TRNBF0+100      ;TERMINATE BUFFER
012534  004737  017234                  JSR     PC,ADRDST       ;ADDRESS DESTINATION MODULE

012540  104007                  TG1H:   LDPGM0                  ;TRANSMIT DATA
012542  017670                          TRNBF0

012544  112737  000062  017231  TG1L:   MOVB    #62,SOH1        ;SET UP FOR MODE '2'
012552  104020                          DELAYL                  ;WAIT FOR THE DATA
012554  104020                          DELAYL
012556  104020                          DELAYL
012560  004737  017220                  JSR     PC,ADRSRC       ;ADDRESS SOURCE
012564  005737  016224                  TST     RECEOT          ;RECEIVED ALL DATA BACK?
012570  001775                          BEQ     .-4             ;NO, WAIT FOR 'EOT'

                                ;NOTE: HANGS HERE WAITING FOR EOT



012572  012701  017670          CP1C:   MOV     #TRNBF0,R1      ;TO TRANSMITTED DATA
012576  122122                  CP1B:   CMPB    (R1)+,(R2)+     ;DATA MATCH?
012600  001403                          BEQ     .+10            ;YES
012602  104022                          MODERR                  ;RECV'D DATA NOT EQUAL TO TRANS. DATA
012604  030526                          ERR3
012606  000420                          BR      S5B             ;EXIT ON ERROR
012610  120127  017770                  CMPB    R1,#TRNBF0+100  ;DONE?
```

```
 2833  012614  001370                        BNE     CP1B            ;NO
 2834  012616  005737  032132                TST     SIOSWH          ;USING THE SERIAL I/O INPUT?
 2835  012622  001412                        BEQ     S5B             ;NO, CHECK ONLY '63' CHAR.'S
 2836  012624  105737  017771                TSTB    TRNBF0+101      ;YES, HAVE WE CHK'D '128' CHAR.'S?
 2837  012630  001007                        BNE     S5B             ;YES, EXIT
 2838  012632  105237  017771                INCB    TRNBF0+101      ;NO, CHK NEXT '63' CHARACTERS FROM FIFO
 2839  012636  022737  000002  016224        CMP     #2,RECEOT       ;RECEIVED ALL DATA FROM FIFO?
 2840  012644  001374                        BNE     .-6             ;NO, WAIT FOR 'EOT'
 2841  012646  000751                        BR      CP1C            ;DO IT.
 2842
```

```
 2843  012650  005737  032132          S5B:    TST     SIOSWH          ;USING SERIAL I/O? (SYSTEM TEST)?
 2844  012654  001402                          BEQ     SD5A            ;YES, SKIP THE FOLLOWING TEST.
 2845  012656  000137  013644                  JMP     TAG1PD
```

```
2846
2847                                    ;**********.***********************************************************
2848                                    ;THIS TEST CHECKS VARIABLE TERMINATORS BY REQUESTING
2849                                    ;THAT THE MODULE BE CHANGED TO MODE 2 AND CHECKING THAT
2850                                    ;THE VARIABLE TERMINATOR EVOKES
2851                                    ;A TRANSFER.
2852
2853                                    ;62 CHARACTERS +DEFINED VARIABLE TERMINATOR ARE XMITTED
2854                                    ;TO THE MODULE.
2855
2856                                    ;THIS  ADDRESSES THE DESTINATION MODULE THEN TRANSMITTS
2857                                    ;62  CHARACTERS FOLLOWED BY THE CUSTOMER SELECTED TERMINATOR.
2858                                    ;THE SOURCE MODULE IS THEN ADDRESSED
2859                                    ;AND IT SHOULD TRANSMIT THESE CHARACTERS BACK TO THE PDP-11.
2860                                    ;IT SHOULE BE NOTED THAT WHEN THIS TEST IS RUN USING THE
2861                                    ;SERIAL INPUT OPTION, ONE HUNDRED AND TWENTY-EIGHT (128)
2862                                    ;CHARACTERS WILL BE RETURNED TO THE DL11 RECEIVER.  THE FIRST
2863                                    ;'64' CHARACTERS ARE RECEIVED BACK FROM THE SERIAL INPUT
2864                                    ;DESTINATION, AND THE SECOND '64' CHARACTERS ARE THE CHARACTERS
2865                                    ;THAT WERE ACTUALLY STORED IN THE 'FIFO' OF THE MODULE UNDER TEST.
2866                                    ;**********************************************************************
2867                                    ;
2868                                    ;
2869                                    ;THIS TEST CAN ONLY BE CHECKED IF WE ARE NOT USING THE SERIAL I/O MODULE
2870                                    ;FROM THE PDP-11 TO THE PDM-70.
2871
2872
2873
2874
2875
2876                                    ;THE REMOTE SERIAL I/O MODULE HAS 4 MODES:
2877                                    ;
2878                                    ;MODE:                          FUNCTION:
2879
2880                                    ;0                              CLEAR ALL MODE FUNCTIONS
2881                                    ;1                              TIME-OUT MODE
2882                                    ;2                              VARIABLE TERMINATOR MODE
2883                                    ;4                              REMOTE POWER CLEAR
2884                                    ;7                              ENABLE ALL FUNCTIONS
2885
2886                                    ;IMPORTANT:  NOTE THAT THIS SUBTEST WILL "HANG" IF EOT IS NOT RETURNED
2887
2888
2889
2890                                    ;NOTE THAT THE REMOTE SERIAL I/O ALWAYS RESPONDS TO 'EOT'
2891                                    ;IN  ALL MODES, BUT ONLY RESPONDS TO VARIABLES IN MODE 2.
2892
2893
2894
2895  012662  104012                    SD5A:   PRINT                   ;TEXT 'SELECT 12 (LF) ON SWITCH V (CR)'.
2896  012664  027767                            MES81
2897  012666  104013                            TTYIN                   ;WAIT FOR CR.
2898  012670  104001  000003                    SCOPE,3
2899  012674  112737  000062  017231            MOVB    #62,SOH1
2900                                                                    ;USE MODE 2
2901  012702  012746  000000                    MOV     #0,     -(SP)   ;ENABLE INTERRUPTS
```

```
2902  012706  012746  012714            MOV     #1$,    -(SP)
2903  012712  000002                    RTI
2904  012714  104011            1$:     RANDOM                  ;CREATE A RANDOM DATA BUFFER
2905  012716  005037  017766            CLR     TRNBF0+76               ;CLR HIGH BYTE .
2906  012722  012737  002012  017766    MOV     #2012,TRNBF0+76 ;VARIABLE TERMINATOR=LINEFEED.
2907                                                            ;EOT AFTER LF GETS STRAPPED OUT.
2908                                                            ;INTO THE LOW BYTE.
2909                            ;NOTE THAT AN EOT WILL BE RETURNED AFTER THE LINEFEED...
2910  012730  005037  017770            CLR     TRNBF0+100      ;TERMINATE BUFFER
2911
2912  012734  004737  017234            JSR     PC,ADRDST       ;ADDRESS DESTINATION MODULE
2913
2914  012740  104007            TAG1HA: LDPGM0                  ;TRANSMIT DATA
2915  012742  017670                    TRNBF0
2916
2917  012744  004737  017220    TAG1LA: JSR     PC,ADRSRC       ;ADDRESS SOURCE
2918  012750  005737  016224            TST     RECEOT          ;RECEIVED ALL DATA BACK?
2919  012754  001775                    BEQ     .-4             ;NO, WAIT FOR 'EOT'
2920
2921                            ;NOTE: HANGS HERE WAITNG FOR AN EOT....
2922
2923
2924
2925                            ;DATA PLUS AN EOT SHOULD BE RETURNED.
2926
2927  012756  012701  017670    CMP1CA: MOV     #TRNBF0,R1      ;TO TRANSMITTED DATA
2928  012762  122122            CMP1BA: CMPB    (R1)+,(R2)+     ;DATA MATCH?
2929  012764  001403                    BEQ     CMP1DA          ;YES
2930  012766  104022                    MODERR                  ;RECV'D DATA NOT EQUAL TO TRANS. DATA
2931  012770  030526                    ERR3
2932  012772  000420                    BR      SD6A            ;EXIT ON ERROR
2933  012774  020127  017766    CMP1DA: CMP     R1,#TRNBF0+76   ;DONE?
2934
2935                            ;NOTE: DON'T TRY TO COMPARE THE 'EOT'....
2936  013000  001370                    BNE     CMP1BA          ;NO
2937  013002  005737  032132            TST     SIOSWH          ;USING THE SERIAL I/O INPUT?
2938  013006  001412                    BEQ     SD6A            ;NO, CHECK ONLY '64' CHAR.'S
2939  013010  105737  017771            TSTB    TRNBF0+101      ;YES, HAVE WE CHK'D '128' CHAR.'S?
2940  013014  001010                    BNE     SD6B            ;YES, EXIT
2941  013016  105237  017771            INCB    TRNBF0+101      ;NO, CHK NEXT '64' CHAR.'S FROM 'FIFO'
2942  013022  022737  000002  016224    CMP     #2,RECEOT       ;RECEIVED ALL DATA FROM FIFO?
2943  013030  001374                    BNE     .-6             ;NO, WAIT FOR 'EOT'
2944  013032  000751                    BR      CMP1CA          ;DO IT.
2945  013034  000240            SD6A:   NOP
2946
2947
2948
```

```
                        ;**********.*************************************************************
                        ;THIS SUBTEST ADDRESSES THE 'SOURCE' USING THE WRONG MODULE ADDRESSES
                        ;AND TESTS THAT THE SOURCE ISN'T ENABLED.
                        ;*****************************************************************************

013036  104001  000004  SD6B:   SCOPE,4
013042  012746  000340          MOV     #340,   -(SP)   ;INHIBIT INTERRUPTS
013046  012746  013054          MOV     #1$,    -(SP)
013052  000002                  RTI
013054  005737  032132  1$:     TST     SIOSWH          ;USING SERIAL INPUT OPTION?
013060  001074                  BNE     SD10A           ;YES, SKIP THE NEXT TEST.
013062  004737  005154          JSR     PC,@#ADRSIT

                        ;*****************************************************************
                        ;THIS SUBTEST CHECKS THAT 'ETX' WILL CLEAR THE SOURCE AND THAT 'STX'
                        ;WILL CLEAR THE DESTINATION
                        ;*****************************************************************
013066  104001  000005  SD7A:   SCOPE,5
013072  104005                  RECVR0
013074  104007                  LDPGM0                  ;ADDRESS MODULE
013076  013102                  .+4
013100  000402                  BR      TG1KA
013102     022                  .BYTE   DC2             ;ALERT DESTIN
013103     067          STDR7:  .BYTE   67              ;SEND THE ETX TO CLEAR THE SOURCE.
013104     023                  .BYTE   DC3
013105     003                  .BYTE   ETX
                                                        ;SEND THE 'B'' AS DATA.
013106  104007          TG1KA:  LDPGM0
013110  013114                  .+4
013112  000401                  BR      TG1LA
013114     102                  .BYTE   'B
013115     004                  .BYTE   EOT
                                                        ;THIS EOT SHOULD CLEAR THE DESTINATION.
013116  104007          TG1LA:  LDPGM0
013120  013124                  .+4
013122  000402                  BR      TAG1KA
013124     021                  .BYTE   DC1             ;ALERT SOURCE
013125     067          STDR8:  .BYTE   67
013126     023                  .BYTE   DC3             ;ENABLE MODULE TO RECEIVE ANY DATA.
013127     000                  .BYTE   0
                                .EVEN
                                                        ;ONLY 'ETX'' SHOULD BE RETURNED.
013130  122722  000003  TAG1KA: CMPB    #ETX,(R2)+      ;WAS 'ETX' RETURNED?
013134  001403                  BEQ     .+10            ;YES
013136  104022                  MODERR                  ;'ETX' WASN'T RETURNED
013140  031257                  ERR16
013142  000443                  BR      SD10A           ;EXIT ON ERROR

013144  105722                  TSTB    (R2)+           ;WAS ANY OTHER DATA RECV'D?
013146  001403                  BEQ     .+10            ;NO-OK
013150  104022                  MODERR                  ;ETX DIDN'T CLR SOURCE
013152  031171                  ERR14
013154  000436                  BR      SD10A           ;EXIT ON ERROR
```

```
3004
3005                                    ;REMEMBER TO CLEAR THE 'B' AND 'EOT ' THAT ARE IN THE BUFFER.
3006
3007  013156  104007                    TAG1SA: LDPGM0
3008  013160  013164                            .+4
3009  013162  000405                            BR TAG1SB
3010  013164     021                            .BYTE   DC1             ;SEND THE 'B' & 'EOT' OUT OF FIFO.
3011  013165     061                    STDR9:  .BYTE   61
3012  013166     023                            .BYTE   DC3
3013  013167     022                            .BYTE   DC2
3014                                                                    ;NOW RE-ENABLE THE DESTINATION.
3015  013170     061                    STDR10: .BYTE   61
3016  013171     023                            .BYTE   DC3
3017  013172     002                            .BYTE   STX
3018  013173     101                            .BYTE   'A
3019  013174     130                            .BYTE   'X
3020  013175     000                            .BYTE   0
3021                                            .EVEN
3022                                    ;NOW RE-ADDRESS SOURCE & DESTINATION AND EXAMINE DATA
3023
3024  013176  104005                    TAG1SB: RECVR0
3025  013200  104007                            LDPGM0                  ;RE-ADDRESS SOURCE
3026  013202  013206                            .+4
3027  013204  000402                            BR      TAG1TA
3028
3029  013206     021                            .BYTE   DC1             ;ALERT SOURCE
3030  013207     061                    STDR11: .BYTE   61
3031  013210     023                            .BYTE   DC3
3032  013211     000                            .BYTE   0
3033                                            .EVEN
3034
3035  013212  005737  016226              TAG1TA: TST     RECSTX          ;WAS 'STX' RETURNED?
3036  013216  001003                            BNE     .+10            ;YES
3037  013220  104022                            MODERR                  ;'STX' WASN'T RECV'D FROM DEST.
3038  013222  030440                            ERR1
3039  013224  000405                            BR      TAG1WA          ;EXIT ON ERROR
3040
3041
3042                                    ;SKIP OVER EOT HERE AND LOOK FOR AN 'X'.
3043                                    ;SINCE NO DATA SHOULD HAVE BEEN RETURNED, IT SHOULD BE 0.
3044                                    ;IF NON-ZERO ,THEN WE HAVE AN ERROR.
3045
3046
3047  013226  105737  016236                    TSTB    RECBF0+2        ;WAS 'STX' THE ONLY DATA RECV'D
3048  013232  001402                            BEQ     .+6             ;YES
3049  013234  104022                            MODERR                  ;'STX' DIDN'T CLR DEST.
3050  013236  031073                            ERR12
3051
3052                                    ;SEND AN 'EOT' TO CLR MODULE
3053
3054  013240  105737  016240              TAG1WA: TSTB    RECBF0+4        ;LOOK FOR THE 'X' HERE...
3055  013244  001402                            BEQ     SD10A           ;BRANCH IF NO ERRORS.
3056  013246  104022                            MODERR
3057  013250  031073                            ERR12
```

```
                        ;*************************************************************************
                        ;THIS SUBTEST REQUESTS THE OPERATOR TO RE-SET THE MODULE ADDRESS TO '17'.
                        ;IF DATA 'SW10' IS NOT SET THIS MANUAL INTERVENTION TEST IS SKIPPED.
                        ;*************************************************************************

013252  104001  000006        SD10A:  SCOPE,6
013256  032777  002000  166066        BIT     #SW10,@SWR      ;SW10 SET?
013264  001166                       BNE     TAG1PC          ;YES, TYPE TEST COMPLETE
013266  104012                       PRINT
013270  024316                       MES10                   ;TEXT 'RE-SET MODULE ADDRESS TO '17'.
013272  104013                       TTYIN                   ;WAIT FOR 'CR' TO CONTINUE

013274  012737  013274  020774  TAG1QA: MOV     #.,RETURN       ;RE-SET SCOPE LOOP ADDRESS POINTER
013302  112737  000077  032134        MOVB    #77,MODADR      ;SET UP FOR ADDR. '17'
013310  112737  000077  017227        MOVB    #77,SRCADR
013316  112737  000077  017277        MOVB    #77,DSTADR
013324  104005                       RECVR0                  ;ENABLE DL 0'S RECVR.
013326  004737  017234                JSR     PC,ADRDST       ;ADDRESS DEST. MODULE

013332  104007                TAG1RA: LDPGM0                  ;SEND SOME DATA
013334  013340                       .+4
013336  000402                       BR      TAG1UA
013340     101                       .BYTE   'A              ;SEND DATA
013341     102                       .BYTE   'B
013342     004                       .BYTE   EOT             ;TERMINATE
        013344                       .EVEN
013344  104005                TAG1UA: RECVR0                  ;CLR & RESET BUFFER
                                                             ;FOR THE NEXT TEST.
013346  004737  017220                JSR     PC,ADRSRC       ;ADDRESS THE SOURCE
013352  104004                       DELAY
013354  022712  041101        TAG1ZA: CMP     #41101,(R2)     ;WAS THE 'A & B' RETURNED?
013360  001403                       BEQ     .+10            ;YES
013362  104022                       MODERR                  ;MODULE WASN'T ENABLED WITH ADDRESS '17'
013364  031041                       ERR11
013366  000405                       BR      SD11A           ;EXIT ON ERROR
013370  005737  016224                TST     RECEOT          ;WAS 'EOT' STRAPPED OUT?
013374  001002                       BNE     .+6             ;NO.

013376  104022                       MODERR                  ;'EOT' WAS STRAPPED OUT
013400  031223                       ERR15
013402  104012                SD11A: PRINT                   ;TEXT 'RESET MODULE ADDRESS<CR>'
013404  030362                       MES88
013406  113737  013103  032134        MOVB    STDR7,MODADR    ;RE-STUFF THE ORIGINAL ADDRESSES.
013414  113737  013103  017227        MOVB    STDR7,SRCADR
013422  113737  013103  017277        MOVB    STDR7,DSTADR


                        ;*************************************************************************
                        ; THIS SUBTEST CHECKS MODE 1 FOR TIMEOUT
                        ;*************************************************************************

013430  104001  000007                SCOPE,7
013434  104035                       SETUP

013436  104012                       PRINT                   ;TEXT SET CLOCK 3  ON CLOCK MODULE TO 100 MILLISEC
```

```
                                                MES84                   ;TEXT SET SWITCH 1 OF P TO ON.
                                                MES85
                                                TTYIN
                                                MOVB #61,SOH1           ;SET UP MODE 1
                                                JSR PC,ADRSRC
                                                LDPGM0                  ;NOW CHECK THE TIME-OUT CLEAR.
                                                .+4
                                                BR      TG1PA
                                                .BYTE   DC2
                                        STDR12: .BYTE   61
                                                .BYTE   DC3
                                                .BYTE   'X
                                                .BYTE   'A
                                                .BYTE   EOT


                                        ;ADDRESS SOURCE USING MODE 3



                                        ;ADDRESS NON-EXISTENT SOURCE (240=SPACE).
                                        ;VIA THIS PROGRAM: DC1,240,DC3

                                        TG1PA:  MOVB    #240,SRCADR     ;SET SPACE=ADDRESS TO BE ADDRESSED.
                                                JSR     PC,ADRSRC       ;ADDRESS THE SOURCE MODULE.
                                                MOV     #-15,COUNT
                                                RECVR0

                                        ;WAIT  FOR APPROXIMATELY 15 SECONDS...


                                                JSR     PC,CNTLOP

                                                LDPGM0
                                                .+4
                                                BR      TG1PB
                                                .BYTE   DC1
                                        STDR13: .BYTE   61
                                                .BYTE   DC3
                                                .BYTE   0
                                        TG1PB:  TSTB    (R2)+           ;SKIP OVER THE EOT.
                                                TSTB    (R2)+           ;LOOK AT THE BYTE.

                                                BEQ     TG1PC           ;OK,NO DATA RETURNED.
                                                MODERR                  ;CLEAR LEFT GARBAGE IN MODULE FIFO.
                                                ERR24

                                        ;NOW CHECK THE REMOTE CLEAR FUNCTION.

                                                RECVR0
                                        TG1PC:  MOVB    #64,SOH1        ;LEAVE IN MODE 4.
                                                MOVB    STDR7,SRCADR
                                                JSR     PC,ADRSRC       ;ADDRESS THE SOURCE

                                        ;DON'T DELAY THIS TIME.
```

```
3170  013570  104007                  LDPGM0                  ;RETURNS FIRST EOT
3171
3172  013572  013576                  .+4
3173  013574  000405                  BR      TG1PE
3174  013576     022                  .BYTE   DC2             ;ALERT DESTINATION.
3175  013577     061          STDR14: .BYTE   61
3176  013600     023                  .BYTE   DC3
3177  013601     130                  .BYTE   'X              ;SEND SOME DATA.
3178  013602     101                  .BYTE   'A
3179  013603     005                  .BYTE   ENQ             ;SEND ENQ TO DESTINATION.
3180                                                          ;ENQ SHOULD CLEAR OUT THE DESTINATION.
3181  013604     000                  .BYTE   0
3182           013606                 .EVEN
3183  013606  104020                  DELAYL
3184
3185  013610  104007          TG1PE:  LDPGM0
3186  013612  013616                  .+4
3187  013614  000402                  BR      TG1PF
3188  013616     021                  .BYTE   DC1
3189  013617     061          STDR15: .BYTE   61              ;ALERT THE SOURCE.
3190  013620     023                  .BYTE   DC3
3191                                                          ;2ND EOT RETURNED HERE
3192  013621     000                  .BYTE   0
3193                                  .EVEN
3194  013622  005722          TG1PF:  TST     (R2)+           ;TWO EOT'S ARE EXPECTED BACK.
3195
3196  013624  005722                  TST     (R2)+           ;SKIP OVER THE EOT'S.
3197  013626  005722                  TST     (R2)+           ;AND LOOK TO SEE IF ANY DATA WAS RETURNED.
3198                                                          ;IF DATA CAME BACK, THEN REMOTE CLEAR
3199                                                          ;DIDN'T WORK.
3200
3201  013630  001402                  BEQ     TG1PG           ;REMOTE CLEARED WORKED ?
3202  013632  104022                  MODERR
3203  013634  031557                  ERR23                   ;NO, IT DIDN'T
3204                                                          ;REMOTE CLEAR LEFT GARBAGE IN FIFO.
3205  013636  104001  000010  TG1PG:  SCOPE,8.                ;YES, REMOTE CLEAR WORKED.
3206                  ;*****************************************************************************
3207                  ;TEST COMPLETE
3208                  ;*****************************************************************************
3209
3210  013642  104026  TAG1PC: ADDRESS                        ;SET UP NEW MODULE ADDRESS
3211  013644  113700  032134  TAG1PD: MOVB    MODADR,R0       ;RESET THE ADDRESS.
3212  013650  104012                  PRINT
3213  013652  024236                  MES7                    ;TEXT 'TEST COMPLETE'
3214  013654  000137  012376          JMP     M7377B          ;RESTART TEST
3215                  .SBTTL M7378A FOUNDATION MODULE TEST
3216
```

```
                                ;*******************************************************************************
                                ;M7378 FOUNDATION MODULE TEST
                                ;*******************************************************************************



                                ;THIS TEST SETS THE SERIAL I/O UP AS A SOURCE AND THE FOUNDATION
                                ; MODULE AS THE DESTINATION . A RANDOM(PSEUDO) BUFFER
                                ; IS CREATED AND TRANSMITTED FROM SERIAL I/O TO THE FOUNDATION
                                ; MODULE.  THEN THE FOUNDATION MODULE IS ADDRESSED AS THE SOURCE
                                ; AND THE SERIAL I/O IS ADDRESSED AS THE DESTINATION.  BECAUSE
                                ; OF THE 'WRAP-AROUND' CABLE, THE DATA IS RETURNED
                                ; FROM FOUNDATION MODULE TO SERIAL I/O.

                                ;

                                ;IF THE SERIAL I/O IS BEING USED, A TOTAL OF 128 CHARACTERS
                                ;RATHER THAN 64 CHARACTERS WILL BE RETURNED.

                                ;THE TEST THEN CHECKS TO MAKE SURE THAT ADDRESS 17
                                ; WILL ALSO RETURN THE DATA.

013660  000000                  FLAB7:  .WORD 0                 ;THIS LOC IS USED TO RESTORE
                                                                ;THE CONTENTS OF ADDRESS
                                                                ;WHEN LOOPING.

013662  000000                  FOUNSW: .WORD   0
013664  104012                  M7378A: PRINT
013666  027572                          MES77                   ;TEXT 'FOUNDATION
                                                                ;MODULE TEST''.
013670  005037  013662          FLO:    CLR     FOUNSW                  ;CLEAR OUT OUR SUBTEST SWITCH.
013674  104035                  FLOP:   SETUP                   ;GET THE MODULE ADDRESS.
013676  104026                          ADDRESS                 ;PUT ADDRESS INTO R0.

013700  110037  013660                  MOVB    R0,FLAB7        ;SAVE THE ADDRESS IN FLAB7.
013704  113700  013660          FLOPB:  MOVB    FLAB7,R0
                                                                ;MODIFY THE FOUNDATION ADDRESS
                                                                ;IN THE PDM-70 PROGRAMS.
013710  004737  014660                  JSR PC,FSTUF
013714  113737  017202  014046        MOVB    IADRS9,IADR11   ;SET UP SER I/O ADDR.
013722  113737  017202  014032        MOVB    IADRS9,IADR12
013730  113737  017202  014051        MOVB    IADRS9,IADR14
013736  113737  017202  014036        MOVB    IADRS9,IADR13

                                ;
                                ;
                                ;*******************************************************************************
                                ;THIS SUBTEST XMITS A RANDOM BUFFER TO THE FOUNDATION MODULE.
                                ;*******************************************************************************
                                ;
                                ;NOTE THAT FOUNSW=0 HERE.
                                ;
013744  104001  000001                  SCOPE,1
013750  113737  013660  014042        MOVB    FLAB7,FLAB1     ;MODIFY THE FOUNDATION ADDRESS IN PROG.
013756  012746  000000                  MOV     #0,     -(SP)   ;ENABLE INTERRUPTS
013762  012746  013770                  MOV     #1$,    -(SP)
```

```
3273  013766  000002                          RTI
3274  013770  104011                  1$:     RANDOM                          ;GENERATE RANDOM BUFFER
3275  013772  112737  000004  017767          MOVB    #EOT,TRNBF0+77          ;TERMINATE AFTER 64 BYTES.
3276  014000  005037  017770                  CLR     TRNBF0+100              ;END OF BUFFER.
3277  014004  104005                          RECVR0
3278
3279  014006  112737  000060  017231          MOVB    #60,SOH1                ;MODE X
3280  014014  005737  032132          FOUNDL: TST     SIOSWH                  ;USING THE SERIAL I/O?
3281  014020  001417                          BEQ     FNORM                   ;NO, SO BRANCH TO NORMAL LOAD.
3282  014022  104007                          LDPGM0                          ;ELSE USE PADDED PROGRAM.
3283  014024  014030                          .+4
3284  014026  000421                          BR      FDATA                   ;XMIT THE DATA NEXT.
3285  014030     002                  FPROG:  .BYTE   STX
3286  014031     021                          .BYTE   DC1
3287  014032     075                  IADR12: .BYTE   75                      ;SERIAL I/O SRC.
3288  014033     001                          .BYTE   SOH
3289  014034     061                          .BYTE   61
3290  014035     022                          .BYTE   DC2
3291  014036     075                  IADR13: .BYTE   75
3292  014037     075                  FLAB2:  .BYTE   75                      ;FOUNDATION MODULE
3293  014040     023                          .BYTE   DC3
3294  014041     021                          .BYTE   DC1                     ;ADDRESS FOUNDATION AS SRC.
3295  014042     075                  FLAB1:  .BYTE   75
3296  014043     001                          .BYTE   SOH
3297  014044     060                          .BYTE   60
3298  014045     022                          .BYTE   DC2
3299
3300                                  ;ADDRESS THE SERIAL I/O AS DESTINATION.
3301
3302  014046     075                  IADR11: .BYTE   75
3303  014047     023                          .BYTE   DC3
3304  014050     021                          .BYTE   DC1
3305  014051     075                  IADR14: .BYTE   75
3306  014052     001                          .BYTE   SOH
3307  014053     061                          .BYTE   61
3308  014054     023                          .BYTE   DC3
3309  014055     003                          .BYTE   ETX
3310  014056     000                          .BYTE   0
3311          014060                          .EVEN
3312  014060  104007                  FNORM:  LDPGM0
3313  014062  014066                          .+4
3314  014064  000402                          BR      FDATA
3315  014066     022                  FLAB3A: .BYTE   DC2
3316  014067     075                  FLAB3:  .BYTE   75                      ;FOUNDATION MODULE.
3317  014070     023                          .BYTE   DC3                     ;AS DESTINATION
3318  014071     000                          .BYTE   0
3319                                          .EVEN
3320  014072  104007                  FDATA:  LDPGM0
3321  014074  017670                          TRNBF0                          ;XMIT THE DATA.
3322  014076  005737  032132                  TST     SIOSWH
3323  014102  001005                          BNE     FTST                    ;;BRANCH IF USING SER I/O.
3324
3325  014104  104007                          LDPGM0
3326  014106  014112                          .+4
3327  014110  000402                          BR      FTST                    ;FOUNDATION AS SOURCE.
3328  014112     021                  FLAB5A: .BYTE   DC1
```

```
3329  014113  071                     FLAB5:  .BYTE   71
3330  014114  023                             .BYTE   DC3
3331  014115  000                             .BYTE   0
3332                                          .EVEN
3333
3334
3335                                  ;DELAY AND CHECK TO MAKE SURE THAT AN EOT HAS BEEN RETURNED.
3336
3337
3338  014116  104020                  FTST:   DELAYL
3339  014120  104004                          DELAY                   ;GIVE IT TIME TO RETURN.
3340  014122  005737  016224                  TST     RECEOT          ;LOOK FOR AN EOT.
3341  014126  001002                          BNE     FND1C           ;YES, EOT WAS RETURNED.
3342  014130  104022                          MODERR                  ;'EOT' NOT RETURNED.
3343  014132  030603                          ERR5
3344
3345
3346
3347
3348                                  ;NOW CHECK THE DATA IN THE RECEIVER AND TRANSMITER BUFFERS.
3349                                  ;LOOK FOR MATCHES.
3350
3351  014134  012701  017670          FND1C:  MOV     #TRNBF0,R1      ;XMITTED DATA.
3352  014140  122122                  FND1B:  CMPB    (R1)+,(R2)+     ;DATA MATCH?
3353  014142  001403                          BEQ FND1D               ;YES.
3354  014144  104022                          MODERR                  ;ELSE ERROR
3355  014146  030526                          ERR3                    ;XMITTED DATA NOT = RECVD DATA.
3356  014150  000420                          BR      . FOUND2        ;NON-FATAL ERROR.
3357
3358
3359                                  ;NOW CHECK TO SEE IF WE SHOULD LOOK FOR 64 CHARACTERS OR 128
3360                                  ;CHARACTERS. IF WE ARE USING THE SERIAL I/O WE WILL
3361                                  ;HAVE 128 CHARACTERS RETURNED (INCLUDIND TWO 'EOTS').
3362
3363                                  ;NOTE THAT THE LOW BYTE OF TRNBF0+100
3364                                  ;SERVES AS A BUFFER TERMINATOR AND THAT THE
3365                                  ;HIGH BYTE SERVES AS A SWITCH. IF THE HIGH BYTE IS SET, THEN
3366                                  ;WE HAVE CHECKED ALL 128 CHARACTERS.
3367
3368
3369
3370  014152  020127  017770          FND1D:  CMP     R1,#TRNBF0+100  ;DONE?
3371  014156  001370                          BNE     FND1B           ;NOT DONE YET.
3372  014160  005737  032132                  TST     SIOSWH          ;USING THE SERIAL I/O?
3373  014164  001412                          BEQ     FOUND2          ;NO, CK ONLY 64 CHARS
3374  014166  105737  017771                  TSTB    TRNBF0+101      ;CHECKED 128 CHARS?
3375  014172  001007                          BNE     FOUND2          ;YES, EXIT.
3376  014174  105237  017771                  INCB    TRNBF0+101      ;NO, CK NEXT 64 CHARS FROM FIFO.
3377  014200  022737  000002  016224          CMP     #2,RECEOT       ;EOT RECVD YET?
3378  014206  001374                          BNE     .-6             ;NO, WAIT FOR IT.
3379  014210  000751                          BR      FND1C           ;GO CHECK THE DATA FROM FIFO.
3380
3381
3382                                  ;IF THE 'FOUNSW' IS SET , THEN WE ARE EXECUTING
3383                                  ;THE 'ADDRESS 17' SUBTEST AND WE SHOULD SKIP OVER THE
3384                                  ;FOLLOWING SECTION. SET MEANS=-1.
```

```
3385
3386
3387  014212  005737  013662          FOUND2: TST     FOUNSW          ;LOOK AT THE SOFTWARE SWITCH.
3388  014216  003035                          BGT     FOUND5          ;IF SWITCH=+1, THEN
3389                                                                  ;WE ARE IN SUBTEST 3.
3390  014220  100423                          BMI     FOUND3          ;SW=-1 MEANS WE HAVE
3391                                                                  ;JUST FINISHED SUBTEST 2.
3392                                                                  ;ELSE FALL THROUGH TO SUBTEST 2.
3393                                                                          ;(SWITCH=0).
3394  014222  005737  032132                  TST     SIOSWH
3395  014226  001067                          BNE     FOUND6
3396  014230  000240                          NOP
3397  014232  000240                          NOP
```

```
3398                                    ;*************************************************************************
3399                                    ;THIS SUBTEST USES ADDRESS '17' AND XMITS A RANDOM BUFFER.
3400                                    ;*************************************************************************
3401
3402                                    ;NOTE: FOUNSW=-1 HERE.
3403
3404  014234  104001  000002                      SCOPE,2                 ;****SUBTEST 2
3405
3406  014240  104012                        PRINT
3407  014242  024316                        MES10                   ;TEXT RESET MODULE ADDRESS TO '17'.
3408  014244  104013                        TTYIN                   ;WAIT FOR CR
3409  014246  112700  000077               MOVB    #77,R0          ;REPLACE THE FOUNDATION ADDRESS WITH 17.
3410  014252  004737  014660               JSR PC,FSTUF
3411                                  ;SET THE SWITCH SO THAT WE WON'T ENTER THIS AGAIN.
3412
3413  014256  012737  177777  013662       MOV     #-1,FOUNSW      ;-1 MEANS WE ARE IN THIS TEST.
3414  014264  000137  014014               JMP     FOUNDL          ;SEND 2 CHARACTERS AND
3415                                                                 ;CHECK TO MAKE SURE THAT ADDRESS 17
3416                                                                 ;WILL RETURN THEM.
3417
3418
```

```
                                ;*****************************************************************************
                                ;THIS SUBTEST USES THE WRONG ADDRESSES AND CHECK TO MAKE
                                ;SURE THAT THE MODULE IS NOT ENABLED.
                                ;*****************************************************************************

014270  005737  032132         FOUND3: TST     SIOSWH                  ;SKIP THIS SUBTEST IF WE ARE USING SERIAL I/O.
014274  001402                         BEQ     FND3A                   ;SIO NOT IN USE.
014276  000137  013670                 JMP     FLO                     ;ELSE LOOP TO BEGINNING OF MODULE TEST.

                                ;ADDRESS THE MODULE WITH ADDRESSES  0-16.
                                ;ASSUME PRESENT ADDRESS SELECTED TO BE 17.


014302  104001  000003         FND3A:  SCOPE,3                 ;****SUBTEST 3
014306  004737  005154                 JSR     PC,ADRSIT               ;MULTIPLE
                                                                ;ADDRESS TEST.
                                                                ;(DESTINATION)
```

```
                        ;*****************************************************************
                        ;               ROUTINE TO CHECK CUSTOMER DEFINED
                        ;               MODE FLIP FLOP (SUB-PROGRAM).
                        ;*****************************************************************
014312  104001  000005  FOUND5: SCOPE,5                ;****SUBTEST 5
014316  104012                  PRINT
014320  027634                  MES78                   ;TEXT
                                                        ;PUT SCOPE PROBE
                                                        ;ON PIN 78(CR).

014322  027670                  MES79                   ;'USE ^E TO EXIT
014324  104013                  TTYIN                   ;WAIT FOR CR
                        ;
014326  012737  014406  014404          MOV     #FOUND6,EVECTOR
                        ;OUTPUT THE FOLLOWING PROGRAM.
                        ;THIS PROGRAM WILL LOOP ENDLESSLY
                        ;UNTIL A '^E' IS INPUTTED VIA TTY.
                        ;THE APPROXIMATE SIGNAL TO BE SCOPED WILL
                        ;BE 1 MILLISEC @ 9600 BAUD.
                        ;
                        ;SW 14=SET TO SCOPE LOOP.
                        ;SW 11 =SET TO ITERATE.
                        ;
014334  005737  032132  FND5:   TST     SIOSWH          ;USING THE SERIAL I/O?
014340  001013                  BNE     FND5B           ;YES, SO USE PADDED PROGRAM.
                                                        ;ELSE, USE THE FOLLOWING:


                        ;LOAD THIS PROGRAM IF MODULE TEST
014342  104007          FND5A:  LDPGM0                  ;LOAD THE PROGRAM
014344  014350                  .+4
014346  000402                  BR      FND5C           ;GO HERE WHEN DONE
014350     022                  .BYTE   DC2
014351     077          FLAB6:  .BYTE   77              ;FOUNDATION AS DESTIN.
014352     023                  .BYTE   DC3
014353     004                  .BYTE   EOT             ;SEND THE EOT


014354  104007          FND5C:  LDPGM0
014356  014362                  .+4
014360  000770                  BR      FND5A
014362     021                  .BYTE   DC1
014363     077          FLAB4:  .BYTE   77
014364     001                  .BYTE   SOH
014365     023                  .BYTE   DC3
014366     000                  .BYTE   0
        014370                  .EVEN

                        ;USE THIS PROGRAM IF SYSTEM TEST
014370  104007          FND5B:  LDPGM0                  ;LOAD THE FOLLOWING PROGRAM.
                                                        ;(SERIAL I/O IN USE).

014372  014030                  FPROG
014374  104006                  LDCHR0                  ;SEND AN EOT
014376  000004                  EOT
014400  000137  014370          JMP     FND5B
```

```
 3494
 3495  014404  000000                EVECTOR:        .WORD   0       ;ADDRESS TO GET ME OUT OF INFINITE LOOPS.
```

```
3496
3497                                    ;**********  **********
3498                                    ;           TEST COMPLETE
3499                                    ;**********  **********
3500
3501  014406  104001  000006          FOUND6: SCOPE,6
3502
3503  014412  104012                          PRINT
3504  014414  024236                          MES7                    ;TEXT 'TEST COMPLETE'
3505  014416  000137  013670                  JMP     FLO             ;LOOP THE TEST.
3506
3507                                          .SBTTL  SUBROUTINES
```

```
                                ;*****************************************************************
                                ;                          SUBROUTINE SENDAX
                                ;*****************************************************************
                                ;
                                ;SUBROUTINE TO LOAD AND SEND THE CHARACTERS
                                ;''A'' AND ''X''
                                ;
                                ;
014422  104007                  SENDAX: LDPGM0
014424  014430                          .+4
014426  000420                          BR      SNDAX1          ;GO HERE WHEN DONE.
014430     101                  BYTEA:  .BYTE   'A
014431     130                  BYTEX:  .BYTE   'X
014432     004                          .BYTE   EOT
014433     000                          .BYTE   0

                                        .EVEN


                                ;**********SUBROUTINE SENDPG**********
                                ;SUBROUTINE TO SEND A PROGRAM.
                                ;(USED FOR DEBUGGING PURPOSES.)

014434  104007                  SENDPG: LDPGM0
014436  014442                          .+4
014440  000413                          BR      SNDAX1
014442     002                          .BYTE   STX
014443     021                          .BYTE   DC1
014444     060                          .BYTE   60
014445     001                          .BYTE   SOH
014446     061                          .BYTE   61
014447     022                          .BYTE   DC2
014450     060                          .BYTE   60
014451     023                          .BYTE   DC3
014452     021                          .BYTE   DC1
014453     060                          .BYTE   60
014454     022                          .BYTE   DC2
014455     060                          .BYTE   60
014456     023                          .BYTE   DC3
014457     021                          .BYTE   DC1
014460     060                          .BYTE   60
014461     001                          .BYTE   SOH
014462     060                          .BYTE   60
014463     000                          .BYTE   0
014464     000                          .BYTE   0
014465     000                          .BYTE   0
014466     000                          .BYTE   0
014470                                  .EVEN
014470  000207                  SNDAX1: RTS     PC              ;RETURN


                                ;**********SUBROUTINE CNTLOP**********
                                ;SUBROUTINE TO PROVIDE AN ''X'' SECOND WAIT.
                                ;ENTERS WITH COUNT EQUAL TO THE COMPLEMENT OF THE NUMBER
                                ;OF SECONDS DESIRED TO WAIT.
```

```
3564
3565  014472  104023                  CNTLOP: NULL1                   ;DELAY ONE SECOND.
3566  014474  005237  032160                  INC     COUNT           ;UP THE DELAY COUNTER.
3567  014500  001374                          BNE     CNTLOP  ;CONTINUE LOOPING UNTIL COUNTER IS ZERO.
3568  014502  000207                          RTS     PC              ;RETURN WHEN DONE.
3569
3570
3571                                  ;*************************************************************************
3572                                  ;ROUTINE TO ADDRESS A MODULE USING ALL OF THE WRONG ADDRESSES
3573                                  ;AND CHECK TO MAKE SURE THAT DATA ISN'T RETURNED.
3574                                  ;*************************************************************************
3575
3576
3577                                  ;THIS ROUTINE IS DESIGNED FOR THE FOUNDATION MODULE
3578                                  ;BUT WILL WORK FOR OTHER MODULES.
3579  014504  112737  000060  017277  MATD:   MOVB    #60,DSTADR      ;SET UP 1ST ADDRESS
3580                                                                  ;TO BE TESTED.
3581  014512  113700  017277          ADSLOP: MOVB    DSTADR,R0
3582  014516  004737  014660                  JSR     PC,FSTUF        ;STUFF MODULE ADDRESS.
3583  014522  005027  016236                  CLR     #RECBF0+2       ;CLEAR 1ST LOC.
3584  014526  123737  032134  017277          CMPB    MODADR,DSTADR   ;EQUAL TO SELECTED ADDRESS?
3585  014534  001434                          BEQ     ADSNXT          ;YES, SELECT NEXT ADDR.
3586  014536  005737  032132                  TST     SIOSWH          ;SERIAL I/O IN USE?
3587  014542  001403                          BEQ     ADSLP1          ;NOPE
3588
3589  014544  104007                          LDPGM0
3590  014546  014030                          FPROG                   ;USE PADDED SERIAL PROGRAM.
3591
3592  014550  000410                          BR      ADSLP2
3593  014552  104007          ADSLP1: LDPGM0
3594  014554  014112                          FLAB5A
3595                                  ;ADDRESS THE FOUNDATION MODULE AS A SOURCE (NON-SERIAL I/O).
3596  014556  104007                          LDPGM0
3597  014560  014564                          .+4
3598  014562  000403                          BR      ADSLP2
3599  014564     021                          .BYTE   DC1
3600  014565     060          FLAB17: .BYTE   60
3601  014566     001                          .BYTE   SOH
3602  014567     060                          .BYTE   60
3603  014570     023                          .BYTE   DC3
3604          014572                          .EVEN
3605
3606  014572  004737  014422          ADSLP2: JSR     PC,SENDAX       ;SEND 2 CHARS.
3607  014576  104005                          RECVR0                  ;ENABLE DL-11 RCVR.
3608  014600  104004                          DELAY
3609
3610
3611                                  ;CHECK THE DATA TO SEE IF IT IS A,B,EOT.
3612                                  ;SINCE OTHER MODULES MAY INDEED BE IN THE SYSTEM, OTHER
3613                                  ;THAN THE FOUNDATION MOD, THEY COULD POSSIBLY XMIT DATA WHEN
3614                                  ;ADDRESSED.
3615
3616  014602  123722  000101                  CMPB    'A,(R2)+        ;WAS AN ''A'' RETURNED?
3617  014606  001007                          BNE     ADSNXT          ;NOPE.
3618  014610  123722  000102                  CMPB    'B,(R2)+                ;B?
3619  014614  001004                          BNE     ADSNXT          ;NOT A B.
```

```
3620  014616  122722  000004                  CMPB    #EOT,(R2)+      ;EOT?
3621  014622  001001                          BNE     ADSNXT
3622
3623                                  ;ONLY THE STRING A,B,EOT CAN MAKE IT TO HERE.
3624
3625  014624  000407                          BR      ADSER1
3626                                                                  ;THAT STRING SHOULD NOT  HAVE
3627                                                                  ;BEEN RECEIVED.
3628
3629  014626  105237  017277          ADSNXT: INCB    DSTADR          ;UPDATE MODULE ADDRESS.
3630  014632  122737  000077  017277          CMPB    #77,DSTADR      ;DONE?
3631  014640  001324                          BNE     ADSLOP          ;NO.
3632  014642  000207                          RTS     PC              ;YES.
3633  014644  113737  017277  031166  ADSER1: MOVB    DSTADR,ERR13A
3634  014652  104022                          MODERR                  ;MODULE ENABLED
3635  014654  031124                          ERR13                   ;WITH ILLEGAL
3636                                                                  ;ADDRESS.
3637  014656  000763                          BR      ADSNXT
```

```
3638
3639
3640                            ;*********************************************************************************
3641                            ;ROUTINE TO STUFF THE ADDRESS IN R0 INTO THE PADDED SERIAL
3642                            ;I/O PROGRAM AND UN-PADDED PROGRAM.
3643                            ;*********************************************************************************
3644
3645
3646  014660  110037  014042   FSTUF:  MOVB    R0,FLAB1
3647  014664  110037  014037           MOVB    R0,FLAB2
3648  014670  110037  014067           MOVB    R0,FLAB3
3649  014674  110037  014363           MOVB    R0,FLAB4
3650  014700  110037  014113           MOVB    R0,FLAB5
3651  014704  110037  014351           MOVB    R0,FLAB6
3652  014710  110037  013660           MOVB    R0,FLAB7
3653  014714  000207                   RTS PC                          ;RETURN.
3654
```

```
                        ;**********************************************************************
                        ;KEYBOARD SERVICE ROUTINE.  CHARACTERS ARE ACCEPTED FROM THE KEYBOARD,
                        ;TESTED FOR DIFFERENT FUNCTIONS AND SAVED IN A BUFFER.
                        ;**********************************************************************

014716  104002          XTTYIN: SAVREG                  ;SAVE REGISTERS
014720  005037  032136          CLR     REPTSW          ;CLR SOFTWARE SW.
014724  005037  032214          CLR     CHRCNT          ;CHARACTER COUNTER
014730  005037  032216          CLR     RUBSWH          ;RUBOUT SW.
014734  012704  015330          MOV     #INBUF,R4       ;SET UP BUFFER POINTER
014740  105777  164376  INPUTA: TSTB    @TKS            ;CHARACTER READY?
014744  100375                  BPL     INPUTA          ;NO, WAIT
014746  117701  164372          MOVB    @TKB,R1         ;YES, SAVE IT
014752  142701  000200          BICB    #200,R1         ;STRIPE OFF PARITY BIT
014756  105701                  TSTB    R1              ;WAS 'HERE IS' TYPED?
014760  001757                  BEQ     XTTYIN+2        ;YES, IGNORE IT
014762  005737  032150          TST     SENDSW          ;INTERRUPTED FROM SEND ROUTINE
014766  001407                  BEQ     INPUTC          ;NO
014770  005737  032122          TST     PRTSWH          ;INTERRUPT FROM PRINT?
014774  001066                  BNE     EXTTY           ;YES, IGNORE IT
014776  110114                  MOVB    R1,(R4)         ;NO, SAVE CHAR.
015000  062716  000002          ADD     #2,(SP)         ;YES, RETURN CALL +4
015004  000462                  BR      EXTTY           ;EXIT
015006  120127  000060  INPUTC: CMPB    R1,#60          ;SPECIAL CHARACTER
015012  100426                  BMI     SPCHR1          ;YES, TEST IT
015014  122701  000132          CMPB    #132,R1         ;SPECIAL CHARACTER
015020  100423                  BMI     SPCHR1          ;YES, TEST IT
015022  005737  032122          TST     PRTSWH          ;INTERRUPTED FROM PRINT ROUTINE?
015026  001051                  BNE     EXTTY           ;YES, IGNORE IT
015030  005737  032216  INPUTB: TST     RUBSWH          ;RUBOUT SW. SET?
015034  001404                  BEQ     .+12            ;NO, NORMAL ECHO.
015036  005037  032216          CLR     RUBSWH          ;YES, CLR IT.
015042  104012                  PRINT
015044  032026                  SLASH                   ;PRINT '\' TO TERMINATE RUBOUT MODE
015046  110124                  MOVB    R1,(R4)+        ;SAVE CHARACTER
015050  005237  032214          INC     CHRCNT
015054  022737  000102  032214  CMP     #66.,CHRCNT     ;BUFFER FULL?
015062  100516                  BMI     TYPEQM          ;YES, TYPE '?'
015064  104010          ECHO:   TYPEIT                  ;NO, ECHO CHAR.
015066  000724                  BR      INPUTA          ;WAIT FOR NEXT CHAR.
```

```
3696
3697                                    ;SUBROUTINE ENTERED TO TEST FOR SPECIAL CHARACTERS
3698
3699  015070  005737  032122    SPCHR1: TST     PRTSWH          ;INTERRUPTED FROM PRINT ROUTINE?
3700  015074  001036                    BNE     CNTRLG          ;YES, CHECK FOR '^G'
3701  015076  122701  000177            CMPB    #177,R1         ;CHAR. = RUBOUT?
3702  015102  001016                    BNE     SPCHR3          ;NO
3703  015104  005737  032214            TST     CHRCNT          ;YES, IS IT VALID?
3704  015110  001713                    BEQ     INPUTA          ;NO, IGNORE IT
3705  015112  005337  032214            DEC     CHRCNT          ;YES, DECREMENT COUNTER
3706  015116  005737  032216            TST     RUBSWH          ;IN 'RUBOUT' MODE?
3707  015122  001002                    BNE     .+6             ;YES, JUST ECHO BACK CHAR.
3708  015124  104012                    PRINT
3709  015126  032026                    SLASH                   ;PRINT '\' TO INDICATE RUBOUT
3710  015130  114401                    MOVB    -(R4),R1        ;GET LAST CHAR.
3711  015132  005237  032216            INC     RUBSWH          ;SET 'RUBOUT' MODE
3712  015136  000752                    BR      ECHO
3713  015140  122701  000015    SPCHR3: CMPB    #15,R1          ;CHAR. = 'CR' !
3714  015144  001004                    BNE     SPCHR5          ;NO
3715  015146  104012                    PRINT
3716  015150  032032                    CRLF                    ;YES, PRINT 'CR-LF'
3717
3718  015152  104003    EXTTY:  GETREG                          ;RESTORE REGISTERS
3719  015154  000002                    RTI                     ;EXIT
3720  015156  122701  000040    SPCHR5: CMPB    #40,R1          ;CHAR. = SPACE?
3721  015162  001740                    BEQ     ECHO            ;YES, ECHO BUT DON'T SAVE IT
3722  015164  122701  000054            CMPB    #54,R1          ;CHAR = 'COMMA'?
3723  015170  001717                    BEQ     INPUTB          ;YES, SAVE IT
3724  015172  104000    CNTRLG: PRCNTR
3725  015174  122701  000007            CMPB    #7,     R1      ;CONTROL-G?
3726  015200  001003                    BNE     CNTRLC          ;NO
3727  015202  004737  023304            JSR     PC,     UPDAT1  ;CHECK FOR SOFTWARE SWR
3728  015206  000761                    BR      EXTTY           ;EXIT
3729  015210  122701  000003    CNTRLC: CMPB    #3,R1           ;CHAR. = '^C'
3730  015214  001002                    BNE     CNTRLA          ;NO CHECK FOR '^A'
3731  015216  000137  001376            JMP     MONITR          ;RETURN TO MONITOR
3732  015222  122701  000001    CNTRLA: CMPB    #1,R1           ;CHAR. = '^A' ?
3733  015226  001004                    BNE     CNTRLR          ;NO, CHECK FOR '^R'
3734  015230  012706  001000            MOV     #1000,SP        ;RESET STACK POINTER
3735  015234  000177  014666            JMP     @AVECTR         ;GO TO THE RESTART ADDRESS
3736  015240  122701  000022    CNTRLR: CMPB    #22,R1          ;CHAR. = '^R'
3737  015244  001006                    BNE     CNTRLE          ;NO, TEST FOR '^E'
3738  015246  104012                    PRINT
3739  015250  032032                    CRLF
3740  015252  012706  001000            MOV     #1000,SP        ;RESET STACK POINTER
3741  015256  000177  014642            JMP     @RVECTR         ;GO TO RESTART ADDRESS
3742  015262  122701  000005    CNTRLE: CMPB    #5,R1           ;CHAR.='^E'?
3743  015266  001003                    BNE     CNTRLO          ;NO,TEST FOR '^O'.
3744  015270  104005                    RECVR0                  ;CLEAR OUT THE BUFFER.
3745  015272  000177  177106            JMP     @EVECTOR        ;CONTINUE ON TO NEXT SUBTEST.
3746  015276  005737  032122    CNTRLO: TST     PRTSWH          ;INTERRUPTED IN FROM PRINT ROUTINE?
3747  015302  001406                    BEQ     TYPEQM          ;NO, ILLEGAL ENTRY
3748  015304  122701  000017            CMPB    #17,R1          ;CHAR. = '^O'?
3749  015310  001320                    BNE     EXTTY           ;NO, IGNORE IT
3750  015312  005137  032152            COM     OPRTSW          ;YES, SET/RESET PRINT INHIBIT SW.
3751  015316  000715                    BR      EXTTY           ;EXIT
```

```
 3752  015320  104012                TYPEQM: PRINT
 3753  015322  031702                        QMARK
 3754  015324  000137  014720                JMP     XTTYIN+2
 3755  015330  000000                INBUF:  0
 3756          015434                        .=.+66.
 3757
```

```
                                ;SUBROUTINE TO CHECK FOR AND PRINT PDP-70 CONTROL CHAR.'S
015434  122701  000021  PDMSET: CMPB    #DC1,R1         ;YES, CHAR = 21?
015440  004737  015650          JSR     PC,PDMPRT       ;PRINT PDM CNTRL CHAR.
015444  032037                  MESDC1                  ;TEXT 'DC1'
015446  122701  000022          CMPB    #DC2,R1         ;CHAR = 22?
015452  004737  015650          JSR     PC,PDMPRT       ;PRINT PDM CNTRL CHAR.
015456  032044                  MESDC2                  ;TEXT 'DC2'
015460  122701  000023          CMPB    #DC3,R1         ;CHAR. = 23?
015464  004737  015650          JSR     PC,PDMPRT       ;PRINT PDM CNTRL CHAR.
015470  032051                  MESDC3                  ;TEST 'DC3'
015472  122701  000024          CMPB    #DC4,R1         ;CHAR. = 24?
015476  004737  015650          JSR     PC,PDMPRT       ;PRINT PDM CNTRL CHAR.
015502  032056                  MESDC4
015504  122701  000002          CMPB    #STX,R1
015510  004737  015650          JSR     PC,PDMPRT       ;PRINT PDM CNTRL CHAR.
015514  032063                  MESSTX
015516  122701  000026          CMPB    #SYN,R1
015522  004737  015650          JSR     PC,PDMPRT       ;PRINT PDM CNTRL CHAR.
015526  032070                  MESSYN
015530  122701  000001          CMPB    #SOH,R1
015534  004737  015650          JSR     PC,PDMPRT       ;PRINT PDM CNTRL CHAR.
015540  032075                  MESSOH
015542  122701  000017          CMPB    #SI,R1
015546  004737  015650          JSR     PC,PDMPRT       ;PRINT PDM CNTRL CHAR.
015552  032102                  MESSI
015554  122701  000004          CMPB    #EOT,R1
015560  004737  015650          JSR     PC,PDMPRT       ;PRINT PDM CNTRL CHAR.
015564  032106                  MESEOT
015566  122701  000003          CMPB    #ETX,R1
015572  004737  015650          JSR     PC,PDMPRT       ;PRINT PDM CNTRL CHAR.
015576  032113                  MESETX
015600  132701  000140          BITB    #140,R1         ;IS CHAR. PRINTABLE?
015604  001417                  BEQ     PDMST1          ;NO, PRINT AS CONTROL CHAR.
015606  104010                  TYPEIT                  ;YES, TYPE IT
015610  005737  032150          TST     SENDSW
015614  001006                  BNE     PDMST0
015616  005237  032142          INC     FORMT1
015622  023727  032142  000110  CMP     FORMT1,#72.
015630  002406                  BLT     PDMST2
015632  104012          PDMST0: PRINT
015634  032032                  CRLF
015636  005037  032142          CLR     FORMT1
015642  000401                  BR      .+4
015644  104000          PDMST1: PRCNTR                  ;PRINT AS CONTROL CHAR.
015646  000207          PDMST2: RTS     PC
015650  001011          PDMPRT: BNE     PEXT2           ;CHAR. MATCH?
015652  017637  000000  015662  MOV     @(SP),XPDMES    ;YES, GET ADDRESS OF MESSAGE
015660  104012                  PRINT
015662  000000          XPDMES: 0
015664  005037  032142          CLR     FORMT1          ;RE-SET 'CR/LF' FORMAT SW.
015670  005726                  POP1SP                  ;CLEAN UP STACK
015672  000207                  RTS     PC              ;EXIT
015674  062716  000002  PEXT2:  ADD     #2,(SP)         ;CHECK NEXT WORD
015700  000207                  RTS     PC
```

```
                        ;*****************************************************************
                        ;COMPUTE THE RESULT OF 'X' CONVERSIONS AS HIGH,LOW AND AVERAGE
                        ;THE ROUTINE IS ENTERED WITH THE NUMBER OF CONVERSIONS TO BE TAKEN IN 'R1'
                        ;AND WITH 'R2' CONTAINING THE ADDRESS OF THE DATA TO BE AVERAGED.
                        ;*****************************************************************

015702  104002         XAVRAGE:SAVREG                  ;SAVE REGISTERS
015704  005037  016116         CLR     HIDIVD         ;CLR HI-ORDER DIVIDEND
015710  005037  016114         CLR     LODIVD         ;CLR LO-ORDER DIVIDEND
015714  005037  016124         CLR     HIGH           ;HIGH
015720  005037  016120         CLR     LOW            ;& LOW
015724  010137  016110         MOV     R1,LODIVR      ;SET UP DIVISOR FOR DIVIDE
015730  012204         GETDAT:  MOV     (R2)+,R4       ;GET VALUE
015732  005737  016124         TST     HIGH
015736  001403                 BEQ     .+10
015740  020437  016124         CMP     R4,HIGH        ;IS NEW NO. GREATER THAN OLD NO.?
015744  003402                 BLE     TSTLO          ;NO, TEST IF LESS THAN
015746  010437  016124         MOV     R4,HIGH        ;YES, SAVE NEW HIGH
015752  005737  016120  TSTLO:  TST     LOW
015756  001403                 BEQ     .+10
015760  020437  016120         CMP     R4,LOW         ;NEW NO LESS THAN OLD NO.?
015764  003002                 BGT     .+6            ;NO
015766  010437  016120         MOV     R4,LOW         ;YES, SAVE NEW LOW
015772  060437  016114         ADD     R4,LODIVD      ;ADD VALUE TO LOW-ORDER DIVIDEND
015776  005537  016116         ADC     HIDIVD         ;ADD CARRY TO HI-ORDER DIVIDEND
016002  005301                 DEC     R1             ;DONE?
016004  001351                 BNE     GETDAT         ;NO
016006  004737  016016  AVGDAT: JSR     PC,DIVIDE      ;PREFORM DIVIDE
016012  104003                 GETREG                 ;YES, RESTORE REG.'S
016014  000002                 RTI                    ;EXIT
```

```
                        ;*****************************************************************
                        ;DOUBLE PERCISION DIVIDE SUBROUTINE
                        ;THIS ROUTINE IS ENTERED THIS WITH THE DIVISOR AND DIVIDENT PRE-LOADER
                        ;INTO THE ROUTINE.
                        ;*****************************************************************

016016  104002          DIVIDE: SAVREG                  ;SAVE REG.'S
016020  013701  016110          MOV     LODIVR,R1       ;GET LOW ORDER DIVISOR
016024  013702  016112          MOV     HIDIVR,R2       ;GET HIGH ORDER DIVISOR
016030  013703  016114          MOV     LODIVD,R3       ;GET LOW ORDER DIVIDEND
016034  013704  016116          MOV     HIDIVD,R4       ;GET HIGH ORDER DIVIDEND
016040  005005                  CLR     R5              ;USE 'R5' TO STORE QUOTIENT
016042  160103          DIVDIT: SUB     R1,R3           ;SUBTRACT L-O DIVISOR FROM DIVIDEND
016044  005604                  SBC     R4              ;SUB CARRY FROM HI-ORDER DIVIDEND
016046  160204                  SUB     R2,R4           ;SUBTRACT HI-ORDER DIVISOR
016050  005704                  TST     R4              ;SUBTRACTION SUCCESSFUL?
016052  100402                  BMI     .+6             ;NO, EXIT
016054  005205                  INC     R5              ;YES, INCREMENT QUOTIENT
016056  000771                  BR      DIVDIT          ;PREFORM NEXT SUBTRACTION
016060  060103                  ADD     R1,R3           ;ADD BACK OVERFLOW
016062  010337  016126          MOV     R3,REMAIN       ;SAVE AS REMAINDER
016066  006201                  ASR     R1
016070  001403                  BEQ     .+10
016072  020103                  CMP     R1,R3           ;IS REMAINED > THAN HALF DIVISOR?
016074  101001                  BHI     .+4             ;NO
016076  005205                  INC     R5              ;YES, ADD '1' TO QUOIENT
016100  010537  016122          MOV     R5,QUOENT       ;SAVE QUOIENT
016104  104003                  GETREG                  ;RESTORE REGISTER
016106  000207                  RTS     PC              ;EXIT
016110  000000          LODIVR: 0
016112  000000          HIDIVR: 0
016114  000000          LODIVD: 0
016116  000000          HIDIVD: 0
016120  000000          LOW:    0
016122  000000          QUOENT: 0
016124  000000          HIGH:   0
016126  000000          REMAIN: 0

```

```
3880
3881                            ;**********************************************************************
3882                            ;DL11 RECEIVER INITIALIZATION ROUTINE.
3883                            ;THIS ROUTINE SETS UP A RECEIVER BUFFER WHERE DATA IS STORED AS IT COMES
3884                            ;IN FROM THE DL11 RECEIVER.
3885                            ;**********************************************************************
3886
3887  016130  012700  016234   XRECR0: MOV     #RECBF0,R0
3888  016134  010037  016232           MOV     R0,RECVPT
3889  016140  005020                   CLR     (R0)+           ;CLR 1ST '20' LOCATIONS OF BUFFER
3890  016142  022700  016274           CMP     #RECBF0+40,R0
3891  016146  001374                   BNE     .-6
3892  016150  005037  016220           CLR     PARITY
3893  016154  005037  016224           CLR     RECEOT
3894  016160  005037  016234           CLR     RECBF0
3895  016164  005037  016222           CLR     RECDC3
3896  016170  005037  016226           CLR     RECSTX
3897  016174  005037  016230           CLR     RECETX
3898  016200  005777  163154           TST     @RBUF0          ;CLR RECVR. FLAGS
3899  016204  052777  000100  163144   BIS     #100,@RCSR0     ;ENABLE THE INTERRUPT
3900  016212  012702  016234           MOV     #RECBF0,R2      ;SET UP BUFFER POINTER
3901  016216  000002                   RTI
3902  016220  000000           PARITY: 0
3903  016222  000000           RECDC3: 0
3904  016224  000000           RECEOT: 0
3905  016226  000000           RECSTX: 0
3906  016230  000000           RECETX: 0
3907  016232  016234           RECVPT: RECBF0
3908  016234  000000           RECBF0: 0
3909          016736                   .=.+500
3910  016736  000000           RECEND: 0
3911
```

```
3912
3913                            ;**********.*************************************************************
3914                            .SBTTL DL11 RECEIVER SUBROUTINE.
3915                            ;ROUTINE IS ENTERED ON DL11 RECEIVER INTERRUPTS WHERE THE CHARACTER IS
3916                            ;READ & SAVED IN A BUFFER.
3917                            ;*************************************************************************
3918
3919  016740  010146            RECVER: MOV     R1,-(SP)        ;SAVE REG'S 'R1&R2' ON STACK
3920  016742  010246                    MOV     R2,-(SP)
3921  016744  013701  016232            MOV     RECVPT,R1       ;SET UP BUFFER POINTER
3922  016750  017702  162404            MOV     @RBUF0,R2       ;READ & SAVE CHAR.
3923  016754  110221                    MOVB    R2,(R1)+        ;SAVE CHAR. IN BUFFER
3924  016756  105011                    CLRB    (R1)            ;TERMINATE BUFFER W/ NULL CHAR.
3925  016760  012737  024070  017136    MOV     #MES2,ERRMES    ;NO, SET UP 1ST ERROR MESSAGE
3926  016766  020127  016736            CMP     R1,#RECEND      ;RECEIVER BUFFER FULL?
3927  016772  003054                    BGT     RECERR          ;YES PRINT BUFFER FULL MESSAGE
3928  016774  005702                    TST     R2              ;WAS RECVR. ERROR DETECTED?
3929  016776  100013                    BPL     RECVR1          ;NO
3930  017000  012737  024161  017136    MOV     #MES4,ERRMES    ;SETUP 2ND ERROR MESSAGE
3931  017006  032702  040000            BIT     #40000,R2       ;OVERRUN FLAG SET?
3932  017012  001044                    BNE     RECERR          ;YES, PRINT OVERRUN ERROR MESSAGE
3933  017014  032702  010000            BIT     #10000,R2       ;PARITY BIT SET?
3934  017020  001402                    BEQ     .+6             ;NO, OK
3935  017022  005237  016220            INC     PARITY          ;YES, SET PARITY ERROR FLAG
3936  017026  122702  000004    RECVR1: CMPB    #EOT,R2         ;CHAR. =EOT?
3937  017032  001003                    BNE     .+10            ;NO
3938  017034  005237  016224            INC     RECEOT
3939  017040  000424                    BR      RECEXT
3940  017042  005737  032132            TST     SIOSWH          ;USING SERIAL INPUT OPTION?
3941  017046  001021                    BNE     RECEXT          ;YES, EXIT
3942  017050  122702  000023            CMPB    #DC3,R2         ;CHAR. =DC3?
3943  017054  001003                    BNE     .+10            ;NO
3944  017056  005237  016222            INC     RECDC3          ;YES, SET FLAG
3945  017062  000413                    BR      RECEXT
3946  017064  122702  000002            CMPB    #STX,R2         ;CHAR. = STX?
3947  017070  001003                    BNE     .+10            ;NO
3948  017072  005237  016226            INC     RECSTX          ;YES, SET FLAG.
3949  017076  000405                    BR      RECEXT
3950  017100  122702  000003            CMPB    #ETX,R2         ;CHAR. = ETX?
3951  017104  001002                    BNE     .+6             ;NO
3952  017106  005237  016230            INC     RECETX          ;YES, SET FLAG
3953  017112  010137  016232    RECEXT: MOV     R1,RECVPT
3954  017116  012602                    MOV     (SP)+,R2
3955  017120  012601                    MOV     (SP)+,R1
3956  017122  000002                    RTI
3957  017124  005077  162226    RECERR: CLR     @RCSR0          ;DISABLE FURTHER INTERRUPTS
3958  017130  005037  032150            CLR     SENDSW
3959  017134  104012                    PRINT
3960  017136  024070            ERRMES: MES2                    ;MODIFIED DEPENDING ON TYPE OF ERROR
3961  017140  000137  001376            JMP     MONITR          ;RETURN TO MONITOR ON RECVR. ERRORS
```

```
                                ;**********************************************************************
                                ;IF THE CONTROL MODULE IS BEING USED THIS ROUTINE PADS THE DATA
                                ;BEING TRANSMITTED SO THAT THE DESTINATION PORTION OF THE
                                ;SERIAL I/O MODULE GETS ADDRESSED.
                                ;**********************************************************************

017144  005737  032132        XSOURC: TST     SIOSWH          ;SERIAL I/O INPUT?
017150  001463                        BEQ     XLDADD          ;NO, NORMAL LOAD
017152  104006                        LDCHR0                  ;YES, SEND 'STX' TO ENTER ADDRESS MODE
017154  000002                        STX
017156  005237  032154                INC     TERMSW
017162  000456                        BR      XLDADD

                                ;**********************************************************************
                                ;IF THE CONTROL MODULE IS BEING USED THIS ROUTINE PADS THE DATA
                                ;BEING TRANSMITTED SO THAT THE SOURCE PORTION OF THE SERIAL I/O
                                ;MODULE GETS ADDRESSED.
                                ;**********************************************************************

017164  005737  032132        XDSTIN: TST     SIOSWH          ;SERIAL I/O INPUT?
017170  001453                        BEQ     XLDADD          ;NO, NORMAL LOAD
017172  104007                        LDPGM0                  ;ADD, ADD CODE TO ADDRESS SOURCE
017174  017200                        .+4
017176  000403                        BR      XDSTG1
017200     002                        .BYTE   STX             ;CLEAR FIFO
017201     021                        .BYTE   DC1             ;ALERT SOURCE
017202     075                IADRS9: .BYTE   75              ;MODIFIED BY USER
017203     001                        .BYTE   SOH             ;SET UP MODE '1'; WAIT
017204     061                        .BYTE   61
017205     000                        .BYTE   0

017206  005237  032154        XDSTG1: INC     TERMSW
017212  005237  032146                INC     DSTSWH
017216  000440                        BR      XLDADD
```

```
                                ;*****************************************************************************
                                ;SUBROUTINE TO ADDRESS ANY SOURCE MODULE
                                ;*****************************************************************************

017220  104025          ADRSRC: SOURCE                  ;ADDRESS AS SOURCE
017222  017226                  .+4
017224  000207                  RTS     PC
017226     021                  .BYTE   DC1             ;ALERT MODULE
017227     060          SRCADR: .BYTE   60              ;ADDRESS MODIFIED BY USER
017230     001                  .BYTE   SOH
017231     060          SOH1:   .BYTE   60              ;ADDRESS MODIFIED BY ME
017232     023                  .BYTE   DC3
017233     000                  .BYTE   0
                                .EVEN

                                ;*****************************************************************************
                                ;SUBROUTINE TO ADDRESS ANY DESTINATION MODULE
                                ;*****************************************************************************

017234  005737  032132  ADRDST: TST     SIOSWH          ;USING SERIAL I/O?
017240  001004                  BNE     .+12            ;NO,
017242  122737  000023  017300          CMPB    #DC3,DSTADR+1   ;YES, USING 'DC3'?
017250  001404                  BEQ     .+12            ;YES, LOAD 'SI'
017252  112737  000023  017300          MOVB    #DC3,DSTADR+1   ;NO, LOAD DC3
017260  000403                  BR      .+10
017262  112737  000017  017300          MOVB    #SI,DSTADR+1
017270  104024                  DESTIN                  ;ADDRESS DESTINATION
017272  017276                  .+4
017274  000207                  RTS     PC
017276     022                  .BYTE   DC2             ;ALERT MODULE
017277     060          DSTADR: .BYTE   60              ;ADDRESS MODIFIED BY USER
017300     023                  .BYTE   DC3
017301     000                  .BYTE   0
                                .EVEN

                                ;*****************************************************************************
                                ;SUBROUTINE TO TRANSMIT A SINGLE CHARACTER VIA THE DL11.
                                ;*****************************************************************************

017302  005237  017664  XLDCHR: INC     SNGCHR          ;SET SOFTWARE FLAG
017306  011637  017666          MOV     (SP),TRANPT     ;SET UP ADDRESS OF CHAR. TO BE TRANSMITTED
017312  062716  000002  XLD1:   ADD     #2,(SP)         ;SET UP STACK TO EXIT
017316  000404                  BR      TRNSMT

                                ;*****************************************************************************
                                ;SUBROUTINE TO SETUP AN ADDRESS FROM WHICH DATA IS TO BE TRANSMITTED VIA
                                ;THE DL11.
                                ;*****************************************************************************

017320  017637  000000  017666  XLDADD: MOV     @(SP),TRANPT    ;SETUP ADDRESS OF DATA TO BE TRANSFERRED
017326  000771                  BR      XLD1
```

```
                                ;**********************************************************************
                                .SBTTL DL11 TRANSMITTER ROUTINE
                                ;THIS ROUTINE IS ENTERED WITH THE ADDRESS OF THE CHARACTER OR CHARACTERS
                                ;TO BE TRANSMITTED IN ADDRESS 'TRANPT'.  CHARACTERS ARE TRANSMITTED UNTIL
                                ;EITHER AND 'EOT', 'EXT' OR A NULL CHARACTER IS TRANSMITTED.  IF 'SW11'
                                ;IS SET, THE SAME CHARACTER IS TRANSMITTED EVERY TIME.  IF 'SW12' IS SET,
                                ;THE PROGRAM WAITS FOR A 'CR' TO BE TYPED BEFORE THE CHARACTER IS TRANS-
                                ;MITTED.  AS IT IS TRANSMITTED, IT IS ALSO PRINTED.
                                ;**********************************************************************

017330  104002          TRNSMT: SAVREG
017332  012746  000000          MOV     #0,     -(SP)   ;ENABLE INTERRUPTS
017336  012746  017344          MOV     #1$,    -(SP)
017342  000002                  RTI
017344  013701  017666  1$:     MOV     TRANPT,R1       ;SET UP TRANSMITTER BUFFER POINTER.
017350  032777  010000  161774  TRAN0:  BIT     #SW12,@SWR      ;SINGLE STEP TRANSFER?
017356  001406                  BEQ     TRAN1           ;NO,
017360  005237  032214          INC     CHRCNT          ;YES, SET TTY SOFTWARE FLAG
017364  000001                  WAIT                    ;WAIT FOR 'CR'
017366  005737  032214          TST     CHRCNT          ;WAS THE INTERRUPT FROM TTY?
017372  001374                  BNE     .-6             ;NO, WAIT AGAIN
017374  032777  004000  161750  TRAN1:  BIT     #SW11,@SWR      ;TRANSMIT SAME CHAR.?
017402  001401                  BEQ     .+4             ;NO
017404  105741                  TSTB    -(R1)           ;YES, BACK UP POINTER
017406  105711                  TSTB    (R1)            ;DONE?
017410  001446                  BEQ     TRAN4           ;YES, EXIT
017412  122711  000004          CMPB    #EOT,(R1)
017416  001443                  BEQ     TRAN4
017420  122711  000023          CMPB    #DC3,(R1)
017424  001453                  BEQ     TRAN5
017426  105711          TRAN3:  TSTB    (R1)            ;TERMINATOR CHAR.?
017430  001422                  BEQ     TRNEXT          ;YES, EXIT
017432  032777  010000  161712  BIT     #SW12,@SWR      ;TRNSMITTING SINGLE STEP?
017440  001103                  BNE     TRAN6           ;YES, PRINT CHAR. TO BE TRANSMITTED
017442  105777  161714  TRAN7:  TSTB    @XCSR0          ;WAIT FOR READY
017446  100375                  BPL     .-4
017450  111177  161710          MOVB    (R1),@XBUF0     ;TRANSMIT CHAR.
017454  005737  017664          TST     SNGCHR          ;SINGLE CHAR. TRANSFER?
017460  001006                  BNE     TRNEXT          ;YES, EXIT
017462  122711  000004  TRAN2:  CMPB    #EOT,(R1)       ;TRANSMITTED LAST CHAR.?
017466  001403                  BEQ     TRNEXT          ;YES, EXIT
017470  122721  000003          CMPB    #ETX,(R1)+
017474  001325                  BNE     TRAN0           ;NO, TRANSMIT NEXT CHAR.
017476  005037  017664  TRNEXT: CLR     SNGCHR
017502  032777  001000  161642          BIT     #SW09,@SWR      ;IS DATA 'SW9' SET?
017510  001004                  BNE     .+12            ;YES, INHIBIT DELAY
017512  005737  032144          TST     DLYSWH          ;ISSUE DELAY?
017516  001001                  BNE     .+4             ;NO, SKIP IT
017520  104004                  DELAY                   ;DELAY BEFORE EXITING
017522  104003                  GETREG                  ;RESTORE REG.'S
017524  000002                  RTI                     ;EXIT
```

```
4102  017526  005737  032154          TRAN4:  TST     TERMSW          ;ADDRESS SERIAL I/O?
4103  017532  001735                          BEQ     TRAN3           ;NO
4104  017534  005037  032154                  CLR     TERMSW
4105  017540  104007                  TRAN4A: LDPGM0                  ;YES, ADD CODE TO ADDRESS SOURCE
4106  017542  017546                          .+4
4107  017544  000754                          BR      TRNEXT
4108  017546     021                  IADRS7: .BYTE   DC1             ;ALERT SOURCE
4109  017547     075                          .BYTE   75              ;MODIFIED BY USER
4110  017550     001                          .BYTE   SOH
4111  017551     061                          .BYTE   61
4112  017552     023                          .BYTE   DC3             ;ENABLE IT
4113  017553     003                          .BYTE   ETX
4114
4115  017554  005737  032154          TRAN5:  TST     TERMSW          ;SOURCE INPUT SW. SET?
4116  017560  001722                          BEQ     TRAN3           ;NO, NORMAL TRANSMIT
4117  017562  005037  032154                  CLR     TERMSW          ;YES, ADDRESS DESTINATION
4118  017566  005737  032146                  TST     DSTSWH          ;CURRENTLY ADDR. A DST. MODULE?
4119  017572  001413                          BEQ     TRAN5C          ;NO, SEND 'DC2'  TO ALERT DST.
4120  017574  005737  032136                  TST     REPTSW          ;YES,USING REMOTE DST.?
4121  017600  001404                          BEQ     TRAN5B          ;NO
4122  017602  012737  017644  017636  TRAN5A: MOV     #TRAN5G,TRAN5E  ;YES, DON'T ENABLE MY DST.
4123  017610  000407                          BR      TRAN5D
4124  017612  012737  017643  017636  TRAN5B: MOV     #IADRS8,TRAN5E  ;YES, SEND ONLY THE ADDR.
4125  017620  000403                          BR      TRAN5D
4126  017622  012737  017642  017636  TRAN5C: MOV     #TRAN5F,TRAN5E  ;SEND 'DC2'
4127  017630  005037  032146          TRAN5D: CLR     DSTSWH
4128  017634  104007                          LDPGM0
4129  017636  017642                  TRAN5E: .+4
4130  017640  000402                          BR      .+6
4131  017642     022                  TRAN5F: .BYTE   DC2             ;ALERT DEST.
4132  017643     075                  IADRS8: .BYTE   75              ;MODIFIED BY USER
4133  017644     023                  TRAN5G: .BYTE   DC3
4134  017645     000                          .BYTE   0
4135  017646  000734                          BR      TRAN4A
4136
4137  017650  104002                  TRAN6:  SAVREG
4138  017652  111101                          MOVB    (R1),R1
4139  017654  004737  015434                  JSR     PC,PDMSET
4140  017660  104003                          GETREG
4141  017662  000667                          BR      TRAN7
4142  017664  000000                  SNGCHR: 0
4143  017666  017670                  TRANPT: TRNBF0
4144  017670  000000                  TRNBF0: 0
4145          020372                          .=.+500
4146  020372  000000                  TRNEND: 0
```

```
                        ;*****************************************************************************
                        ;ROUTINE TO REQUEST & SAVE MODULE ADDRESS TO BE USED FOR TESTING
                        ;*****************************************************************************

020374  104012          XADRES: PRINT
020376  025263                  MES30                   ;TEXT 'MODULE ADDR.?'
020400  104015                  ASEMBL                  ;WAIT & DECODE INPUT
020402  152700  000060          BISB    #60,R0          ;CONVERT TO ASCII
020406  005737  032132          TST     SIOSWH          ;SERIAL INPUT?
020412  001403                  BEQ     .+10            ;NO, ALLOW ANY ADDRESS
020414  123700  002214          CMPB    IADRS0,R0       ;YES, CHECK AGAINST SERIAL I/O
020420  001765                  BEQ     XADRES          ;SAME, REQUEST IT AGAIN
020422  110037  032134          MOVB    R0,MODADR
020426  110037  017227          MOVB    R0,SRCADR       ;SET UP SOURCE ADDR.
020432  110037  017277          MOVB    R0,DSTADR       ;SET UP PARAMETERS ADDR.
020436  000002                  RTI                     ;YES, EXIT

                        ;*****************************************************************************
                        ;SUBROUTINE ENTERED ON AN ILLEGAL TRAP. THE ROUTINE REPORTS WHERE IT
                        ;TRAPPED 'FROM' AND WHERE IT TRAP 'TO'.
                        ;*****************************************************************************

020440  011637  032156  ERTRAP: MOV     (SP),TOPC       ;SAVE LOCATION WHERE IT TRAPPED 'TO'
020444  022626                  POP2SP
020446  011637  032162          MOV     (SP),FROMPC     ;SAVE WHERE IT TRAPPED FROM.
020452  104012                  PRINT
020454  024205                  MES5                    ;TEXT 'ILLEGAL TRAP TO'
020456  162737  000004  032156  SUB     #4,TOPC
020464  104014                  PRTOCT
020466  032156                  TOPC                    ;TYPE 'PC' TRAPPED TO
020470  104012                  PRINT
020472  024227                  MES6                    ;TEXT 'FROM'
020474  162737  000002  032162  SUB     #2,FROMPC
020502  104014                  PRTOCT
020504  032162                  FROMPC                  ;TYPE WHERE IT TRAPPED FROM
020506  000137  001376          JMP     MONITR          ;RETURN TO MONITOR

                        ;*****************************************************************************
                        ;SUBROUTINE TO REQUEST A/D CHANNEL FROM TELETYPE
                        ;*****************************************************************************

020512  104012          XCHANEL:PRINT
020514  024633                  MES17                   ;TEXT 'CH.?'
020516  104013                  TTYIN                   ;WAIT FOR INPUT
020520  122737  000064  015330  CMPB    #64,INBUF       ;LEGAL CH.
020526  003771                  BLE     XCHANEL         ;NO, REQUEST NEW CH.
020530  113737  015330  017231  MOVB    INBUF,SOH1      ;YES, SETUP CH.
020536  000002                  RTI                     ;EXIT
```

```
4195
4196                            ;*********************************************************************
4197                            ;MODULE ERROR REPORT ROUTINE.
4198                            ;THIS ROUTINE IS ENTERED WHEN A MODULE ERROR IS DETECTED.  IT PRINTS THE
4199                            ;FAILING TEST NUMBER, THE MEMORY ADDRESS (MA) WHERE ERROR OCCURRED AND
4200                            ;AN ERROR MESSAGE OBTAINED IN THE ERROR CALL+2
4201                            ;*********************************************************************
4202
4203  020540  042777  000100  160610  XERMES: BIC     #100,@RCSR0      ;CLEAR RECVR. INTERRUPT ENABLES.
4204  020546  011637  032200          MOV     (SP),KSTOR3      ;SAVE 'PC'
4205  020552  017637  000000  020616  MOV     @(SP),MESADR     ;SAVE MESSAGE ADDRESS
4206  020560  062716  000002          ADD     #2,(SP)          ;SET UP STACK TO EXIT
4207  020564  032777  020000  160560  BIT     #SW13,@SWR       ;PRINT ERROR MESSAGE?
4208  020572  001012                  BNE     ERREXT           ;NO, EXIT
4209  020574  104014                  PRTOCT                   ;YES
4210  020576  032206                  TSTNUM                   ;PRINT FAILING TEST NO.
4211  020600  104016                  SPACE
4212  020602  162737  000002  032200  SUB     #2,KSTOR3
4213  020610  104014                  PRTOCT
4214  020612  032200                  KSTOR3                   ;PRINT 'MA' WHERE ERROR OCCURRED
4215  020614  104012                  PRINT
4216  020616  000000          MESADR: 0                        ;PRINT ERROR MESSAGE
4217
4218  020620  005777  160526  ERREXT: TST     @SWR             ;HALT ON ERROR
4219  020624  100403                  BMI     .+10             ;NO
4220  020626  004737  021626          JSR     PC, TTYENB
4221  020632  000001                  WAIT                     ;WAIT FOR 'CR' TO CONTINUE
4222  020634  000002                  RTI
4223
4224                            ;*********************************************************************
4225                            ;SCOPE AND/OR ITERATION LOOP FOR EACH LOGIC TEST
4226                            ;*********************************************************************
4227
4228  020636  104017  XSCOPE: TSTTKS                          ;CHECK FOR KEYBOARD FLAG
4229  020640  104005          RECVR0                           ;ENABLE DL11 RECEIVER
4230  020642  032777  040000  160502  BIT     #40000,@SWR      ;TEST SW-14 FOR SCOPE
4231  020650  001012                  BNE     SCOPEB           ;YES, SCOPE
4232  020652  032777  004000  160472  BIT     #4000,@SWR       ;NO-TEST SW-11 FOR ITERATION
4233  020660  001015                  BNE     SCOPEG           ;INHIBIT ITERATION
4234  020662  023737  020772  020770  CMP     SCOPEF,ICOUNT    ;COMPARE CURRENT COUNT TO MAX NUMBER
4235  020670  100011                  BPL     SCOPEG           ;EXIT-DONE
4236  020672  005237  020772          INC     SCOPEF           ;INCREMENT COUNT
4237  020676  022606          SCOPEB: CMP     (6)+,SP          ;REPOSITION STACK
4238  020700  012646                  MOV     (6)+,   -(SP)    ;RESTORE PREVIOUS PROCESSOR STATUS
4239  020702  012746  020710          MOV     #1$,    -(SP)
4240  020706  000002                  RTI
4241  020710  000177  000060  1$:     JMP     @RETURN          ;REPEAT TEST
4242  020714  005037  020772  SCOPEG: CLR     SCOPEF           ;CLEAR COUNT
4243  020720  011601                  MOV     @SP,R1           ;SAVE TEST NO.
4244  020722  011137  032206          MOV     (R1),TSTNUM
4245  020726  062716  000002          ADD     #2,(SP)
4246  020732  017701  160414          MOV     @SWR,R1          ;READ SW'S
4247  020736  042701  177700          BIC     #177700,R1       ;CLR UNWANTED BITS
4248  020742  020137  032206          CMP     R1,TSTNUM        ;HALT ON THIS TEST
4249  020746  001005                  BNE     .+14             ;NO
4250  020750  104012                  PRINT                    ;YES
```

```
4251  020752  024437                    MES13                   ;TEXT 'BREAK AT SCOPE X'
4252  020754  104014                    PRTOCT
4253  020756  032206                    TSTNUM
4254  020760  104013                    TTYIN                   ;WAIT FOR 'CR' TO CONTINUE
4255  020762  011637  020774            MOV     @SP,RETURN      ;SAVE SCOPE RETURN POINTER
4256  020766  000002                    RTI                     ;RETURN INLINE-NEXT TEST
4257  020770  000000            ICOUNT: 0                       ;ITERATION COUNT
4258  020772  000000            SCOPEF: 0                       ;COUNT LOCATION FOR ITERATION LOOP
4259  020774  000000            RETURN: 0
4260
4261
4262
4263                              ;*****************************************************************************
4264                              ;RANDOM NUMBER SUBROUTINE
4265                              ;THIS ROUTINE CREATES A RANDOM NUMBER, MASKS IT TO EIGHT BITS AND SAVES
4266                              ;IT IN THE TRANSMITTER BUFFER AREA.
4267                              ;*****************************************************************************
4268
4269  020776  012701  017670    XRANGN: MOV     #TRNBF0,R1
4270  021002  063737  021136  021134    ADD     RANB,RANA
4271  021010  063737  021140  021134    ADD     RANC,RANA
4272  021016  006137  021134            ROL     RANA
4273  021022  063737  021134  021136    ADD     RANA,RANB
4274  021030  063737  021140  021136    ADD     RANC,RANB
4275  021036  006137  021136            ROL     RANB
4276  021042  063737  021134  021140    ADD     RANA,RANC
4277  021050  063737  021136  021140    ADD     RANB,RANC
4278  021056  006137  021140            ROL     RANC
4279  021062  013711  021140            MOV     RANC,(R1)       ;SAVE NUMBER
4280  021066  042711  100200            BIC     #100200,(R1)    ;STRIPE NO. TO 7 BIT ASCII
4281  021072  032711  060000            BIT     #60000,(R1)     ;IS BIT 5 OR 6 HIGH BYTE SET
4282  021076  001002                    BNE     .+6             ;YES, LEAVE AS IS
4283  021100  052711  040000            BIS     #40000,(R1)     ;NO, FORCE BIT 6.
4284  021104  032711  000140            BIT     #140,(R1)       ;IS BIT 5 OR 6 OF LOW BYT SET
4285  021110  001002                    BNE     .+6             ;YES, LEAVE AS IS
4286  021112  052711  000040            BIS     #40,(R1)        ;NO, FORCE BIT '5'
4287  021116  005721                    TST     (R1)+
4288  021120  022701  020372            CMP     #TRNEND,R1      ;DONE
4289  021124  001326                    BNE     XRANGN+4
4290  021126  005037  020372            CLR     TRNEND          ;TERMINATE BUFFER.
4291  021132  000002                    RTI
4292  021134  072701            RANA:   072701
4293  021136  126543            RANB:   126543
4294  021140  101234            RANC:   101234
4295
```

```
                        ;*****************************************************************************
                        ;ROUTINE TO LOOP THRU A SINGLE LOGIC SUBTEST.  ENTERED FROM THE 'MONITOR'
                        ;VIA SELECTING TEST '?'.
                        ;*****************************************************************************

021142  104012          SUBX:   PRINT
021144  024257                  MES8                    ;TEXT 'TEST ADDR.? '
021146  104015                  ASEMBL                  ;YES, GET ADDR. FROM TTY.
021150  005700                  TST     R0              ;WAS AN ADDRESS ENTERED?
021152  001006                  BNE     SUBX1           ;YES, LOAD IT
021154  005737  032174          TST     KSTOR1          ;NO, WAS ONE PREVIOUSLY SET UP?
021160  001016                  BNE     XLOOP           ;YES, RUN OLD ADDRESS
021162  104012                  PRINT                   ;NO, ILLEGAL ENTRY
021164  031702                  QMARK
021166  000766                  BR      SUBX+2          ;ASK FOR NEW ADDRESS
021170  010037  032174  SUBX1:  MOV     R0,KSTOR1       ;SAVE ADDRESS
021174  062737  000002  032174  ADD     #2,KSTOR1       ;ADD '2' TO POINT TO INSTRUCTION AFTER SCOPE
021202  017737  010766  032206  MOV     @KSTOR1,TSTNUM  ;LOAD TEST NO.
021210  062737  000002  032174  ADD     #2,KSTOR1
021216  005037  020772  XLOOP:  CLR     SCOPEF          ;KEEP COUNT AT ZERO
021222  012737  021216  020774  MOV     #XLOOP,RETURN   ;LOAD SCOPE LOOP RETURN POINTER
021230  000177  010740          JMP     @KSTOR1         ;JUMP TO TEST

                        ;*****************************************************************************
                        ;SUBROUTINE TO ISSUE N SPACES
                        ;N IS ONE PLUS VALUE CONTAINED IN SPACEX
                        ;SPACEX IS CLEARED WITHIN THE SUBROUTINE, SO THAT A CALL ON
                        ;SPACE WITHOUT LOADING SPACEX ISSUES ONLY ONE SPACE
                        ;*****************************************************************************

021234  104002          XSPACE: SAVREG                  ;SAVE REG'S
021236  112701  000240          MOVB    #240,R1
021242  104010                  TYPEIT                  ;OUTPUT A SPACE
021244  005337  021262          DEC      SPACEX         ;DECREMENT COUNT
021250  003372                  BGT     XSPACE+2        ;LOOP IF NOT DONE
021252  005037  021262          CLR     SPACEX          ;RESET COUNT TO ZERO
021256  104003                  GETREG                  ;RESTORE REG'S
021260  000002                  RTI                     ;RETURN
021262  000000          SPACEX: 0

                        ;*****************************************************************************
                        ;SUBROUTINE TO TEST FOR THE KEYBOARD FLAG BEING SET
                        ;*****************************************************************************

021264  105777  160052  TKSFLG: TSTB    @TKS            ;FLAG SET?
021270  100001                  BPL     .+4             ;NO, EXIT
021272  104013                  TTYIN                   ;YES,INQUIRE
021274  000002                  RTI
```

```
4344
4345                                    ;*********************************************************************
4346                                    ;SUBROUTINE TO SETUP PARAMETERS FOR THE MODULE PROGRAM TESTS.
4347                                    ;*********************************************************************
4348
4349  021276  011637  020774           XSETUP: MOV     (SP),RETURN     ;SET UP THE 'SCOPE' RETURN ADDRESS.
4350  021302  011637  032124                   MOV     (SP),RVECTR
4351  021306  162737  000002  032124           SUB     #2,RVECTR       ;SET UP THE RESTART ADDRESS
4352  021314  013737  032124  032224           MOV     RVECTR,RESTRT   ;AND THE 'C' POINTER
4353  021322  005037  020770                   CLR     ICOUNT
4354  021326  012737  000001  032206           MOV     #1,TSTNUM       ;SET UP TEST '1'
4355  021334  104005                           RECVR0                  ;ENABLE DL11 RECEIVER
4356  021336  000002                           RTI
4357
4358                                    ;*********************************************************************
4359                                    ;SUBROUTINE TO PRINT CHARACTER IN 'R1'
4360                                    ;*********************************************************************
4361
4362  021340  004737  021626           XTYPIT: JSR     PC,TTYENB       ;ENABLE INTERRUPTS
4363  021344  105777  157776                   TSTB    @TPS            ;PRINTER READY
4364  021350  100375                           BPL     .-4             ;NO
4365  021352  005737  032136                   TST     REPTSW          ;REMOTE DST.?
4366  021356  001404                           BEQ     XTYPE2          ;NO
4367  021360  110137  021366                   MOVB    R1,XTYPE1       ;YES, SET UP TO TRANSMIT CHAR.
4368  021364  104006                           LDCHR0
4369  021366  000004           XTYPE1: EOT
4370  021370  110177  157754           XTYPE2: MOVB    R1,@TPB         ;PRINT CHAR.
4371  021374  000002                           RTI
4372
4373                                    ;*********************************************************************
4374                                    ;SUBROUTINE TO PRINT THE CONTROL CHARACTER IN 'R1'.
4375                                    ;*********************************************************************
4376
4377  021376  122701  000012           XPRCNT: CMPB    #12,R1          ;CHAR = LF?
4378  021402  001413                           BEQ     XPRCT1          ;YES
4379  021404  122701  000015                   CMPB    #15,R1          ;CHAR. = 'CR'?
4380  021410  001410                           BEQ     XPRCT1
4381  021412  013746  032122                   MOV     PRTSWH,-(SP)    ;SAVE SW. STATUS
4382  021416  104012                           PRINT
4383  021420  032030                           UPAROW
4384  021422  012637  032122                   MOV     (SP)+,PRTSWH
4385  021426  052701  000100                   BIS     #100,R1         ;MAKE CHAR. PRINTABLE
4386  021432  104010           XPRCT1: TYPEIT
4387  021434  042701  000100                   BIC     #100,R1         ;RESTORE ORGINAL VALUE
4388  021440  000002                           RTI
```

```
                                ;**********************************************************************
                                ;SUBROUTINE TO CHECK FOR AND SET UP A REMOTE DESTINATION MODULE.
                                ;**********************************************************************

021442  110005          REMOTE: MOVB    R0,R5           ;TEMPORARILY SAVE MODULE ADDRESS
021444  005037  032140          CLR     KSTOR0          ;CLR SOFTWARE SW.
021450  104012                  PRINT
021452  027256                  MES67                   ;TEXT 'REMOTE DEST.?''
021454  104013                  TTYIN                   ;WAIT FOR INPUT
021456  122737  000131  015330  CMPB    #'Y,INBUF       ;WAS YES TYPED?
021464  001003                  BNE     .+10            ;NO
021466  104026                  ADDRESS                 ;YES, REQUEST IT'S ADDRESS
021470  010037  032140          MOV     R0,KSTOR0       ;SAVE IT, THIS ALSO SETS SOFTWARE SW.
021474  110537  017227          MOVB    R5,SRCADR       ;SET UP A/D SOURCE ADDR.
021500  000207                  RTS     PC              ;RETURN

021502  013737  032140  032136  SETRMT: MOV     KSTOR0,REPTSW   ;SET UP THE REMOTE DESTINATION SW.
021510  005737  032136          TST     REPTSW          ;USING REMOTE DEST.?
021514  001402                  BEQ     .+6             ;NO, EXIT
021516  004737  017234          JSR     PC,ADRDST       ;YES, ADDRESS IT
021522  000207                  RTS     PC

021524  005737  032136  CLRMOT: TST     REPTSW          ;OUTPUTTING TO THE DEMOTE DST.?
021530  001402                  BEQ     .+6             ;NO, EXIT
021532  104006                  LDCHR0                  ;YES, SEND 'EOT' TO CLR MODULE
021534  000004                  EOT
021536  005037  032136          CLR     REPTSW
021542  000207                  RTS     PC              ;RETURN

021544  012737  000001  032144  XNODLY: MOV     #1,DLYSWH       ;SET THE TRANS. DELAY INHIBIT SW.
021552  000002                  RTI
                                ;**********************************************************************
                                ;SUBROUTINE TO TRANSMIT A 'NULL' CHAR. TO THE PRINTER.
                                ;**********************************************************************

021554  012737  000002  021262  XNULL:  MOV     #2,SPACEX
021562  000410                  BR      XNULL2
021564  012746  000000          XNULL1: MOV     #0,     -(SP) ;ENABLE INTERRUPTS
021570  012746  021576          MOV     #1$,    -(SP)
021574  000002                  RTI
021576  012737  000011  021262  1$:     MOV     #11,SPACEX
021604  105777  157536          XNULL2: TSTB    @TPS
021610  100375                  BPL     .-4
021612  005077  157532          CLR     @TPB            ;TRANSMIT A NULL CHAR.
021616  005337  021262          DEC     SPACEX
021622  001370                  BNE     XNULL2
021624  000002                  RTI
```

```
                                        ;**********************************************************************
                                        ;SUBROUTINE ENABLE KEYBOARD INTERRUPTS.
                                        ;**********************************************************************

021626  012777  000100  157506  TTYENB: MOV     #100,@TKS       ;YES, ENABLE TTY INTERRUPTS
021634  012746  000000                  MOV     #0,     -(SP)   ;ENABLE INTERRUPTS
021640  012746  021646                  MOV     #1$,    -(SP)
021644  000002                        1$: RTI
021646  000207                        1$: RTS     PC

                                        ;**********************************************************************
                                        ;MESSAGE PRINT ROUTINE, ENTERED VIA EMT DISPATCH HANDLER.
                                        ;ROUTINE PICKS UP CONTENTS OF THE 'PC' AND USES THIS AS
                                        ;THE ADDRESS OF MESSAGE TO BE TYPED.
                                        ;  IS NEXT MESSAGE SWITCH
                                        ;% IS CRLF SWITCH
                                        ;@ IS END OF MESSAGE SWITCH
                                        ;**********************************************************************

021650  104002                  XPRINT: SAVREG                  ;SAVE REGISTERS ON STACK
021652  005037  032152                  CLR     OPRTSW
021656  005237  032122                  INC     PRTSWH
021662  004737  021626                  JSR     PC,TTYENB       ;ENABLE TTY INTERRUPTS
021666  017602  000000          TYPER3: MOV     @(SP),R2        ;GET THE MESSAGE ADDRESS FROM STACK
021672  062716  000002                  ADD     #2,(SP)         ;SET UP STACK TO EXIT
021676  112201                  TYPERA: MOVB    (R2)+,R1        ;GET CHAR.
021700  005701                          TST     R1              ;=NULL CHAR.?
021702  001414                          BEQ     PRTEXT          ;YES, EXIT
021704  122701  000004                  CMPB    #4,R1           ;TEST FOR 'EOT'
021710  001003                          BNE     .+10            ;NOT EOT
021712  104012                          PRINT                   ;YES, PRINT 'EOT'
021714  032106                          MESEOT
021716  000406                          BR      PRTEXT          ;EXIT
021720  122701  000137                  CMPB    #137,R1         ;TEST FOR ' '
021724  001760                          BEQ     TYPER3          ;YES PICK UP NEXT MESSAGE ADDRESS.
021726  122701  000100                  CMPB    #100,R1         ;TEST FOR '@'
021732  001006                          BNE     TYPER1          ;BRANCH IF NO EQUAL
021734  005037  032122          PRTEXT: CLR     PRTSWH
021740  005037  032152                  CLR     OPRTSW
021744  104003                          GETREG                  ;RESTORE REGISTERS FROM STACK.
021746  000002                          RTI                     ;OTHERWISE EXIT
021750  005737  032152          TYPER1: TST     OPRTSW          ;INHIBIT TYPEOUT?
021754  001350                          BNE     TYPERA          ;YES, SCAN DATA
021756  122701  000045                  CMPB    #45,R1          ;TEST FOR '%'
021762  001402                          BEQ     TYPECL          ;IF = TYPE 'CR-LF'
021764  104010                  TYPER2: TYPEIT                  ;OUTPUT CHAR.
021766  000743                          BR      TYPERA
021770  012701  000015          TYPECL: MOV     #15,R1          ;TYPE 'CR'
021774  104010                          TYPEIT
021776  104010                          TYPEIT
022000  012701  000012                  MOV     #12,R1
022004  104010                          TYPEIT                  ;INCREMENT BUFFER
022006  000733                          BR      TYPERA
```

```
                                ;*****************************************************************************
                                ;SUBROUTINE TO TYPEOUT A '6' DIGIT OCTAL NO. THE 'PC' CONTAINS
                                ;THE ADDRESS OF 'WORD' TO BE TYPED
                                ;*****************************************************************************

022010  004737  021626        XOCTPR: JSR     PC,TTYENB       ;ENABLE TTY INTERRUPTS
022014  104002                        SAVREG                  ;SAVE REGISTERS ON STACK
022016  017601  000000                MOV     @(SP),R1        ;THE ADDRESS OF WORD TO BE TYPED
022022  062716  000002                ADD     #2,(SP)         ;SET UP STACK TO EXIT
022026  012703  000006                MOV     #6,R3
022032  012737  000376  022114        MOV     #376,MASK       ;MASK FOR FIRST BIT
022040  000401                        BR      .+4
022042  006111                MOVEIT: ROL     (R1)
022044  006111                        ROL     (R1)
022046  006111                        ROL     (R1)
022050  111102                        MOVB    (R1),R2
022052  143702  022114                BICB    MASK,R2
022056  052702  000260                BIS     #260,R2
022062  132777  000200  157256        BITB    #200,@TPS
022070  100374                        BPL     .-6
022072  110277  157252                MOVB    R2,@TPB         ;PRINT CHAR.
022076  012737  000370  022114        MOV     #370,MASK       ;MASK FOR NEXT '5' DIGITS
022104  005303                        DEC     R3
022106  001355                        BNE     MOVEIT
022110  104003                        GETREG                  ;RESTORE REGISTERS FROM STACK.
022112  000002                        RTI
022114  000376                MASK:   376

                                ;*****************************************************************************
                                ;SUBROUTINE TO SET UP AN APPROXIMATE '1' SECOND DELAY.
                                ;*****************************************************************************

022116  012737  161000  032212  XDELAY: MOV     #161000,TEMP2           ;SET UP SHORT DELAY
022124  000402                        BR      .+6
022126  005037  032212        XDLAYL: CLR     TEMP2                   ;SET UP LONG DELAY
022132  004737  021626                JSR     PC,TTYENB               ;ENABLE TTY INTERRUPTS
022136  012737  177777  032210        MOV     #-1,TEMP1
022144  005237  032212        XDLAY3: INC     TEMP2
022150  001375                        BNE     XDLAY3
022152  005237  032210                INC     TEMP1
022156  001372                        BNE     XDLAY3
022160  000002                XDLAY2: RTI
```

```
                        ;*****************************************************************************
                        ;SUBROUTINE TO PRINT THE DATA IN THE DL11 RECEIVER & TRANSMITTER BUFFER.
                        ;*****************************************************************************

022162  104012          PRTBF1: PRINT
022164  032032                  CRLF
022166  005712          PRTBF2: TST     (R2)            ;BUFFER EMPTY?
022170  001003                  BNE     .+10            ;NO, PRINT IT
022172  104012                  PRINT                   ;YES
022174  024275                  MES9                    ;TEXT 'BUFFER EMPTY'
022176  000411                  BR      PRT1B           ;EXIT
022200  004737  021626          JSR     PC,TTYENB       ;ENABLE INTR.'S.
022204  005037  032142          CLR     FORMT1          ;'CR/LF' FORMAT SW.
022210  112201          PRT1A:  MOVB    (R2)+,R1        ;GET CHARACTER
022212  004737  015434          JSR     PC,PDMSET       ;PRINT CHAR.
022216  105712                  TSTB    (R2)            ;DONE?
022220  001373                  BNE     PRT1A
022222  000207          PRT1B:  RTS     PC              ;RETURN

                        ;*****************************************************************************
                        ;SUBROUTINE TO PRINT THE CONTENTS OF THE DL11 RECVR. BUFFER.
                        ;*****************************************************************************

022224  012702  016234  RECBUF: MOV     #RECBF0,R2      ;SET UP BUFFER POINTER
022230  000402                  BR      TRNBUF+4

                        ;*****************************************************************************
                        ;SUBROUTINE TO PRINT THE CONTENTS OF THE DL11 TRANSMITTER BUFFER
                        ;*****************************************************************************

022232  012702  017670  TRNBUF: MOV     #TRNBF0,R2      ;SET UP BUFFER POINTER
022236  004737  022162          JSR     PC,PRTBF1
022242  000137  001376          JMP     MONITR          ;RETURN TO MONITOR

                        ;*****************************************************************************
                        ;SUBROUTINE, ENTERED AS A SUBROUTINE, TO PRINT CONTENTS OF THE DL11
                        ;RECEIVER BUFFER.
                        ;*****************************************************************************

022246  104002          XPRTRB: SAVREG                  ;SAVE REG'S
022250  012702  016234          MOV     #RECBF0,R2      ;SETUP BUFFER POINTER
022254  004737  022166          JSR     PC,PRTBF2
022260  104003                  GETREG                  ;RESTORE REG.'S
022262  000002                  RTI
```

```
4579                                    .SBTTL SEND ROUTINE
4580                                    ;**********************************************************
4581                                    ;THIS ROUTINE ACCEPTS CHARACTERS FROM THE TELETYPE AND TRANSMITS THEM
4582                                    ;TO THE DL11.  THIS ROUTINE USES '^E' TO ESCAPE BACK TO THE MONITOR.
4583                                    ;CONTROL C (^C) IS ECHOED AND SENT AS AN 'EXT':
4584                                    ;**********************************************************
4585
4586  022264  104035                SEND:   SETUP                   ;SETUP RESTART ADDRESS
4587  022266  104012                        PRINT
4588  022270  031700                        ASTRIC
4589  022272  104036                        NODLAY                  ;INHIBIT TRANSMITTER DELAY
4590  022274  005237  032150               INC     SENDSW          ;SET SOFTWARE SW.
4591  022300  104005                        RECVR0                  ;ENABLE DL 0'S RECVR
4592  022302  012702  017670               MOV     #TRNBF0,R2      ;SET UP BUFFER TO SAVE CHAR.S
4593  022306  004737  021626               JSR     PC,TTYENB       ;ENABLE TTY INTERRUPTS
4594  022312  000001                SEND1:  WAIT                    ;WAIT FOR KEYBOARD & RECEIVER INTERRUPTS
4595  022314  000776                        BR      .-2             ;KEYBOARD INTERRUPTS RETURN .+2
4596  022316  113701  015330               MOVB    INBUF,R1        ;GET CHAR.
4597  022322  122701  000005               CMPB    #5,R1           ;CHAR. = '^E' ?
4598  022326  001003                        BNE     .+10            ;NO
4599  022330  104000                        PRCNTR                  ;YES, TYPE IT
4600  022332  000137  001376               JMP     MONITR          ;EXIT
4601  022336  110112                        MOVB    R1,(R2)         ;SAVE CHAR.
4602  022340  112237  022354               MOVB    (R2)+,SEND2
4603  022344  105012                        CLRB    (R2)            ;LOAD '0' TO TERMINATE BUFFER
4604  022346  004737  015434               JSR     PC,PDMSET       ;PRINT CHAR.
4605  022352  104006                        LDCHR0                  ;TRANSMIT CHAR.
4606  022354  000000                SEND2:  0
4607  022356  000755                        BR      SEND1
4608
4609                                    .SBTTL RUN ROUTINE
4610                                    ;**********************************************************
4611                                    ;THIS ROUTINE IS USED TO LOAD AND RUN TRANSMIT THE USERS SEND
4612                                    ;IN PROGRAM.  DATA SW.'S '0-15' CAN BE USED TO SET UP
4613                                    ;A LOOP DELAY.  IF THIS SERIAL I/O OPTION INPUT IS BEING USED,
4614                                    ;THE USERS PROGRAM ISN'T LOOPED, IT IS JUST LOADED AND RUN.
4615                                    ;**********************************************************
4616
4617  022360  104012                RUN:    PRINT
4618  022362  031700                        ASTRIC
4619  022364  104036                        NODLAY                  ;INHIBIT TRANS. DELAY
4620  022366  012746  000000               MOV     #0,     -(SP)   ;ENABLE INTERRUPTS
4621  022372  012746  022400               MOV     #1$,    -(SP)
4622  022376  000002                        RTI
4623  022400  104005                1$:     RECVR0                  ;ENABLE DL RECVR
4624  022402  104007                        LDPGM0                  ;LOAD THE USERS PROGAM FROM
4625  022404  017670                        TRNBF0                  ;THE TRANSMITTER BUFFER
4626  022406  005737  032132               TST     SIOSWH          ;SERIAL I/O INPUT?
4627  022412  001375                        BNE     .-4             ;YES, STAY HERE
4628  022414  017701  156732               MOV     @SWR,R1         ;LOAD THE SW.'S TO SET DELAY
4629  022420  005101                        COM     R1
4630  022422  005201                        INC     R1
4631  022424  001757                        BEQ     RUN+4
4632  022426  000775                        BR      .-4
```

```
                                .SBTTL SUBROUTINES
                                ;*****************************************************************************
                                ;SUBROUTINE WILL CONVERT 'N' BCD WORDS (SEPARATED VIA COMMA'S)
                                ;WHICH WERE STORED IN A TABLE VIA 'TTYIN' TO OCTAL AND STORE THEM.
                                ;*****************************************************************************
022430  104002                  XBCDBIN:SAVREG                  ;SAVE REG.'S
022432  012704  015330                  MOV     #INBUF,R4       ;SETUP ASCII STORAGE TABLE
022436  012703  022564                  MOV     #BCDTAB,R3      ;TABLE FOR STORAGE OF CONVERTED WORDS
022442  005037  022566                  CLR     BCDTAB+2
022446  005005                  BCDBN1: CLR     R5
022450  005001                          CLR     R1              ;REG. TO STORE RUNNING TOTAL
022452  005002                          CLR     R2              ;TEMP. STORAGE FOR 'R1'
022454  005737  032214          BCDBN2: TST     CHRCNT          ;END OF DATA?
022460  003426                          BLE     BCDEND          ;YES, EXIT
022462  005337  032214                  DEC     CHRCNT          ;DECREMENT CHARACTER COUNTER
022466  122714  000054                  CMPB    #54,(R4)        ;IS CHARACTER = TO ','?
022472  001421                          BEQ     BCDEND          ;YES, DECODE NEW WORD
022474  121427  000060                  CMPB    (R4),#60
022500  002425                          BLT     BCDERR          ;TEST FOR LEGAL NO.
022502  121427  000071                  CMPB    (R4),#71
022506  003022                          BGT     BCDERR
022510  142714  000360                  BICB    #360,(R4)       ;STRIPE NO. TO BCD
022514  112405                          MOVB    (R4)+,R5        ;SAVE NO. IN R0.
022516  010102                          MOV     R1,R2           ;SAVE CURRENT TOTAL
022520  006301                          ASL     R1              ;NX2
022522  006301                          ASL     R1              ;NX4
022524  006301                          ASL     R1              ;NX8
022526  060201                          ADD     R2,R1           ;NX9
022530  060201                          ADD     R2,R1           ;NX10
022532  060501                          ADD     R5,R1           ;N+NEW NO.
022534  000747                          BR      BCDBN2
022536  105724                  BCDEND: TSTB    (R4)+           ;UPDATE BUFFER
022540  010123                          MOV     R1,(R3)+        ;SAVE CONVERTED VALUE & SETUP TO SAVE NEXT
022542  005737  032214                  TST     CHRCNT          ;FINISHED?
022546  001337                          BNE     BCDBN1          ;NO, CONVERT NEXT WORD
022550  104003                          GETREG
022552  000002                          RTI                     ;YES, EXIT
022554  104012                  BCDERR: PRINT
022556  027274                          MES68                   ;TEXT 'ILLEGAL DECIMAL NO.'
022560  000137  001376                  JMP     MONITR          ;RETURN TO THE MONITOR
022564  000000                  BCDTAB: 0                       ;OCTAL STORAGE TABLE
022566  000000                          0
022570  000000                          0
022572  000000                          0
```

```
                                        ;*****************************************************************************
                                        ;PRINT DECIMAL VALUE IN R2
                                        ;*****************************************************************************

022574  004737  021626        XBINDEC:JSR     PC,TTYENB
022600  104002                        SAVREG
022602  012703  177774                MOV     #-4,R3
022606  012704  022712                MOV     #DECPNT+2,R4
022612  012737  000260  022706        MOV     #260,ZERO
022620  012701  177777        TYPT1:  MOV     #-1,R1
022624  005201                TYPT2:  INC     R1
022626  161402                        SUB     (R4),R2
022630  100375                        BPL     TYPT2
022632  062402                        ADD     (R4)+,R2
022634  004737  022650                JSR     PC,DECOUT
022640  005203                        INC     R3
022642  001366                        BNE     TYPT1
022644  104003                        GETREG
022646  000002                        RTI
022650  005701                DECOUT: TST     R1
022652  001006                        BNE     DEC1
022654  022703  177777                CMP     #-1,R3
022660  001403                        BEQ     DEC1
022662  013701  022706                MOV     ZERO,R1
022666  000405                        BR      DEC2
022670  012737  000260  022706  DEC1:   MOV     #260,ZERO
022676  052701  000260                BIS     #260,R1
022702  104010                DEC2:   TYPEIT
022704  000207                        RTS     PC
022706  000240                ZERO:   240
022710  022712                DECPNT: .+2
022712  001750                        1000.
022714  000144                        100.
022716  000012                        10.
022720  000001                        1.

```

```
                                ;**********************************************************************************
                                ;POWER FAIL HANDLER
                                ;**********************************************************************************

022722  010046                PWRFAL: MOV     R0,-(SP)
022724  010146                        MOV     R1,-(SP)
022726  010246                        MOV     R2,-(SP)
022730  010346                        MOV     R3,-(SP)
022732  010446                        MOV     R4,-(SP)
022734  010546                        MOV     R5,-(SP)
022736  013746  000024                MOV     24,-(SP)
022742  010637  032210                MOV     SP,TEMP1
022746  012737  022756  000024        MOV     #PWRUP,@#24
022754  000000                        HALT
022756  012746  000340        PWRUP:  MOV     #340,   -(SP)   ;INHIBIT INTERRUPTS
022762  012746  022770                MOV     #1$,    -(SP)
022766  000002                        RTI
022770  013706  032210        1$:     MOV     TEMP1,SP
022774  012637  000024                MOV     (SP)+,@#24
023000  012605                        MOV     (SP)+,R5
023002  012604                        MOV     (SP)+,R4
023004  012603                        MOV     (SP)+,R3
023006  012602                        MOV     (SP)+,R2
023010  012601                        MOV     (SP)+,R1
023012  012600                        MOV     (SP)+,R0
023014  104021                        NULL                    ;POWER UP DELAY
023016  104012                        PRINT
023020  025161                        MES28
023022  000137  001376                JMP     MONITR

                                ;**********************************************************************************
                                ;SUBROUTINE TO SAVE 'R1-R5' ON STACK
                                ;**********************************************************************************

023026  012637  032164        XSAVRG: MOV     (SP)+,SAVEPC
023032  012637  032166                MOV     (SP)+,SAVPSW
023036  012637  032170                MOV     (SP)+,SAV2PC
023042  012637  032172                MOV     (SP)+,SAV2SW
023046  010146                        MOV     R1,-(SP)
023050  010246                        MOV     R2,-(SP)
023052  010346                        MOV     R3,-(SP)
023054  010446                        MOV     R4,-(SP)
023056  010546                        MOV     R5,-(SP)
023060  013746  032172                MOV     SAV2SW,-(SP)
023064  013746  032170                MOV     SAV2PC,-(SP)
023070  013746  032166                MOV     SAVPSW,-(SP)
023074  013746  032164                MOV     SAVEPC,-(SP)
023100  000002                        RTI
```

```
                        ;*****************************************************************************
                        ;SUBROUTINE TO RESTORE 'R1-R5' FROM THE STACK
                        ;*****************************************************************************

023102  012637  032164  XGETRG: MOV     (SP)+,SAVEPC
023106  012637  032166          MOV     (SP)+,SAVPSW
023112  012637  032170          MOV     (SP)+,SAV2PC
023116  012637  032172          MOV     (SP)+,SAV2SW
023122  012605                  MOV     (SP)+,R5
023124  012604                  MOV     (SP)+,R4
023126  012603                  MOV     (SP)+,R3
023130  012602                  MOV     (SP)+,R2
023132  012601                  MOV     (SP)+,R1
023134  013746  032172          MOV     SAV2SW,-(SP)
023140  013746  032170          MOV     SAV2PC,-(SP)
023144  013746  032166          MOV     SAVPSW,-(SP)
023150  013746  032164          MOV     SAVEPC,-(SP)
023154  000002                  RTI
                        ;*****************************************************************************
                        ;SUBROUTINE TO WAIT FOR AND ASSEMBLE CHARACTERS INPUT
                        ;FROM THE KEYBOARD INTO OCTAL NUMBERS.
                        ;*****************************************************************************

023156  104013          XASEMB: TTYIN                   ;GET CHAR.'S FROM KEYBOARD
023160  005000                  CLR     R0
023162  005737  032214          TST     CHRCNT          ;ANY CHARACTERS ENTERED
023166  001001                  BNE     .+4             ;YES
023170  000002                  RTI                     ;NO, EXIT
023172  012701  015330          MOV     #INBUF,R1       ;SET UP CHAR. BUFFER POINTER
023176  004737  023232          JSR     PC,STRIPN       ;STRIPE NO.
023202  010400          XASEM1: MOV     R4,R0           ;RETURNS HERE IF ONLY '1' NO.
023204  000002                  RTI

023206  105721          WORD2:  TSTB    (R1)+           ;ADVANCE POINTER PAST COMMA
023210  006204                  ASR     R4
023212  006204                  ASR     R4
023214  006204                  ASR     R4
023216  005337  032214          DEC     CHRCNT          ;DEC. CHAR. CNTR.
023222  001767                  BEQ     XASEM1          ;COMMA LAST CHAR.?
023224  010400                  MOV     R4,R0           ;NO, SAVE 1ST NO.
023226  062716  000002          ADD     #2,(SP)         ;SET UP STACK TO EXIT
023232  005004          STRIPN: CLR     R4
023234  122711  000054          CMPB    #54,(R1)        ;CHAR. = COMMA?
023240  001762                  BEQ     WORD2           ;YES, SAVE 1ST NO.
023242  142711  000370          BICB    #370,(R1)       ;NO, STRIPE NO. TO OCTAL
023246  152104                  BISB    (R1)+,R4
023250  005337  032214          DEC     CHRCNT          ;FINISHED?
023254  003003                  BGT     .+10            ;NO
023256  005237  032214          INC     CHRCNT          ;CHARACTERS WERE ENTERRED
023262  000207                  RTS     PC              ;YES, EXIT
023264  006304                  ASL     R4
023266  006304                  ASL     R4
023270  006304                  ASL     R4
023272  000760                  BR      STRIPN+2
                        ;*****************************************************************************
                        ;SUBROUTINE TO OUTPUT CURRENT SWR VALUE IF USING SOFTWARE
```

```
 4820                                   ;SWR AND TO ASSEMBLE CHARACTERS INPUT FROM THE KEYBOARD
 4821                                   ;TO FORM THE NEW SWR VALUE.
 4822                                   ;*****************************************************************
 4823  023274  022737  000176  001352  UPDATE: CMP     #SWSWR, SWR     ;USING SOFTWARE SWR?
 4824  023302  001021                          BNE     A               ;NO-BRANCH
 4825  023304  022737  000176  001352  UPDAT1: CMP     #SWSWR, SWR     ;USING SOFTWARE SWR?
 4826  023312  001014                          BNE     1$              ;NO-BRANCH
 4827  023314  104012                          PRINT                   ;YES-PRINT ''SWR=''
 4828  023316  030415                          MES89
 4829  023320  104014                          PRTOCT                  ;PRINT VALUE
 4830  023322  000176                          SWSWR
 4831  023324  104012                          PRINT                   ;PRINT 'NEW SWR=''
 4832  023326  030424                          MES90
 4833  023330  104015                          ASEMBL                  ;WAIT AND DECODE
 4834  023332  005737  032214                  TST     CHRCNT          ;WAS A NEW VALUE ENTERRED?
 4835  023336  001402                          BEQ     1$              ;NO-SAVE OLD VALUE
 4836  023340  010037  000176                  MOV     %0,     SWSWR   ;YES-USE NEW VALUE
 4837  023344  000207                  1$:     RTS     PC              ;EXIT
 4838  023346  104013                  A:      TTYIN                   ;WAIT FOR CR
 4839  023350  000207                          RTS     PC              ;EXIT
```

```
4840                                    ;*****************************************************************
4841                                    .SBTTL MESSAGES
4842                                    ;*****************************************************************
4843  023352     000                            .BYTE
4844  023353     045  041445  050132  TITLE:  .ASCII  ;%%CZPMACO PDM-70 DIAGNOSTIC TEST @;
4845  023360  040515  030103  050040
4846  023366  046504  033455  020060
4847  023374  044504  043501  047516
4848  023402  052123  041511  052040
4849  023410  051505  020124     100
4850
4851  023415     045  054524  042520  HEADER: .ASCII  ;%TYPE IN THE FOLLOWING TO RUN THE DESIRED TEST:%;
4852  023422  044440  020116  044124
4853  023430  020105  047506  046114
4854  023436  053517  047111  020107
4855  023444  047524  051040  047125
4856  023452  052040  042510  042040
4857  023460  051505  051111  042105
4858  023466  052040  051505  035124
4859  023474     045
4860
4861  023475     115  031467  030070  TSTLST: .ASCII  ;M7380A, M7381A, M7381E, M7382A, BCDIO, M7383A, M7383C, M7383R, M7383G,
4862  023502  026101  046440  031467
4863  023510  030470  026101  046440
4864  023516  031467  030470  026105
4865  023524  046440  031467  031070
4866  023532  026101  041040  042103
4867  023540  047511  020054  033515
4868  023546  034063  040463  020054
4869  023554  033515  034063  041463
4870  023562  020054  033515  034063
4871  023570  051063  020054  033515
4872  023576  034063  043463  020054
4873  023604  046445  031467  032070          .ASCII  ;%M7384A, M7384E, M7385A, M7385I, M7385T, M7386A, M7387A, M7388A, ;
4874  023612  026101  046440  031467
4875  023620  032070  026105  046440
4876  023626  031467  032470  026101
4877  023634  046440  031467  032470
4878  023642  026111  046440  031467
4879  023650  032470  026124  046440
4880  023656  031467  033070  026101
4881  023664  046440  031467  033470
4882  023672  026101  046440  031467
4883  023700  034070  026101     040
4884  023705     115  031467  034070          .ASCII  ;M7388F,%M7377A,M7378A, SUBX, RECBUF, TRNBUF, SEND, RUN,@;
4885  023712  026106  046445  031467
4886  023720  033467  026101  033515
4887  023726  033463  040470  020054
4888  023734  052523  054102  020054
4889  023742  042522  041103  043125
4890  023750  020054  051124  041116
4891  023756  043125  020054  042523
4892  023764  042116  020054  052522
4893  023772  026116     100
4894
4895
```

```
 4896
 4897
 4898  023775    045  051525  047111  MES0:   .ASCII  ;%USING SERIAL I/O INTERFACE OPTION? @;
 4899  024002  020107  042523  044522
 4900  024010  046101  044440  047457
 4901  024016  044440  052116  051105
 4902  024024  040506  042503  047440
 4903  024032  052120  047511  037516
 4904  024040  040040
 4905
 4906
 4907  024042  047503  052116  047522  MES1:   .ASCII  ;CONTROL MODULE TEST.%@;
 4908  024050  020114  047515  052504
 4909  024056  042514  052040  051505
 4910  024064  027124  040045
 4911
 4912
 4913  024070  042045  030514  020061  MES2:   .ASCII  ;%DL11 RECVR. BUFFER OVERFLOW.%@;
 4914  024076  042522  053103  027122
 4915  024104  041040  043125  042506
 4916  024112  020122  053117  051105
 4917  024120  046106  053517  022456
 4918  024126     100
 4919
 4920  024127     123  051105  040511  MES3:   .ASCII  ;SERIAL I/O ADDRESS TEST.%@;
 4921  024134  020114  027511  020117
 4922  024142  042101  051104  051505
 4923  024150  020123  042524  052123
 4924  024156  022456     100
 4925  024161     104  030514  020061  MES4:   .ASCII  ;DL11 OVERRUN ERROR.@;
 4926  024166  053117  051105  052522
 4927  024174  020116  051105  047522
 4928  024202  027122     100
 4929
 4930  024205     045  046111  042514  MES5:   .ASCII  ;%ILLEGAL TRAP TO @;
 4931  024212  040507  020114  051124
 4932  024220  050101  052040  020117
 4933  024226     100
 4934
 4935  024227     040  051106  046517  MES6:   .ASCII  ; FROM @;
 4936  024234  040040
 4937
 4938  024236  052045  051505  020124  MES7:   .ASCII  ;%TEST COMPLETE.%@;
 4939  024244  047503  050115  042514
 4940  024252  042524  022456     100
 4941
 4942  024257     045  042524  052123  MES8:   .ASCII  ;%TEST ADDR.? @;
 4943  024264  040440  042104  027122
 4944  024272  020077     100
 4945
 4946  024275     102  043125  042506  MES9:   .ASCII  ;BUFFER IS EMPTY.@;
 4947  024302  020122  051511  042440
 4948  024310  050115  054524  040056
 4949  024316  051045  026505  042523  MES10:  .ASCII  ;%RE-SET MODULE ADDR. TO '17'(OCTAL). @;
 4950  024324  020124  047515  052504
 4951  024332  042514  040440  042104
```

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 4952  024340  027122  052040  020117
 4953  024346  030447  023467  047450
 4954  024354  052103  046101  027051
 4955  024362  040040
 4956  024364  027501  020104  042101  MES11:  .ASCII  ;A/D ADDRESSING TEST.@;
 4957  024372  051104  051505  044523
 4958  024400  043516  052040  051505
 4959  024406  027124     100
 4960  024411     101  042057  041440  MES12:  .ASCII  ;A/D CALIBRATION TEST.@;
 4961  024416  046101  041111  040522
 4962  024424  044524  047117  052040
 4963  024432  051505  027124     100
 4964  024437     045  051102  040505  MES13:  .ASCII  ;%BREAK AT SCOPE @;
 4965  024444  020113  052101  051440
 4966  024452  047503  042520  040040
 4967  024460  044445  051516  051105  MES14:  .ASCII  ;%INSERT D JUMPER TO INHIBIT 'EOT' AND _;
 4968  024466  020124  020104  052512
 4969  024474  050115  051105  052040
 4970  024502  020117  047111  044510
 4971  024510  044502  020124  042447
 4972  024516  052117  020047  047101
 4973  024524  020104     137
 4974  024527     045  042522  047515  MES14A: .ASCII  ;%REMOVE JUMPER, CLR MODULE AND ENTER@;
 4975  024534  042526  045040  046525
 4976  024542  042520  026122  041440
 4977  024550  051114  046440  042117
 4978  024556  046125  020105  047101
 4979  024564  020104  047105  042524
 4980  024572  040122
 4981  024574  027501  020104  042522  MES15:  .ASCII  ;A/D REPEATIBILITY TEST.@;
 4982  024602  042520  052101  041111
 4983  024610  046111  052111  020131
 4984  024616  042524  052123  040056
 4985  024624  053045  043123  020077  MES16:  .ASCII  ;%VSF? @;
 4986  024632     100
 4987  024633     103  027110  020077  MES17:  .ASCII  ;CH.? @;
 4988  024640     100
 4989
 4990  024641     107  044501  020116  MES18:  .ASCII  ;GAIN ACCURACY TEST.%@;
 4991  024646  041501  052503  040522
 4992  024654  054503  052040  051505
 4993  024662  027124  040045
 4994
 4995  024666  051445  050125  046120  MES19:  .ASCII  ;%SUPPLY +1.990V WITH @;
 4996  024674  020131  030453  034456
 4997  024702  030071  020126  044527
 4998  024710  044124  040040
 4999
 5000  024714  040507  047111  023440  MES20:  .ASCII  ;GAIN 'LOW'.@;
 5001  024722  047514  023527  040056
 5002
 5003  024730  053523  052111  044103  MES21:  .ASCII  ;SWITCH VOLTAGE NEGATIVE.@;
 5004  024736  053040  046117  040524
 5005  024744  042507  047040  043505
 5006  024752  052101  053111  027105
 5007  024760     100
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 5008
 5009  024761     107  044501  020116  MES22:  .ASCII  ;GAIN 'MEDIUM'.@;
 5010  024766  046447  042105  052511
 5011  024774  023515  040056
 5012
 5013  025000  040507  047111  023440  MES23:  .ASCII  ;GAIN 'HIGH'@;
 5014  025006  044510  044107  040047
 5015
 5016  025014  051445  050125  046120  MES24:  .ASCII  ;%SUPPLY +.1990V WITH _;
 5017  025022  020131  027053  034461
 5018  025030  030071  020126  044527
 5019  025036  044124  057440
 5020
 5021  025042  051445  050125  046120  MES24A: .ASCII  ;%SUPPLY +0.01990V WITH _;
 5022  025050  020131  030053  030056
 5023  025056  034461  030071  020126
 5024  025064  044527  044124  057440
 5025  025072  051445  050125  046120  MES25:  .ASCII  ;%SUPPLY +0.000V.@;
 5026  025100  020131  030053  030056
 5027  025106  030060  027126     100
 5028
 5029  025113     045  047111  047503  MES26:  .ASCII  ;%INCORRECT GAIN!@;
 5030  025120  051122  041505  020124
 5031  025126  040507  047111  040041
 5032
 5033  025134  020045  046040  053517  MES27:  .ASCII  ;%  LOW    AVG   HIGH@;
 5034  025142  020040  020040  053101
 5035  025150  020107  020040  044510
 5036  025156  044107     100
 5037  025161     045  042522  047503  MES28:  .ASCII  ;%RECOVERED FROM POWER FAILURE - BY GOLLY!@;
 5038  025166  042526  042522  020104
 5039  025174  051106  046517  050040
 5040  025202  053517  051105  043040
 5041  025210  044501  052514  042522
 5042  025216  026440  041040  020131
 5043  025224  047507  046114  020531
 5044  025232     100
 5045
 5046  025233     102  042103  044440  MES29:  .ASCII  ;BCD INPUT ADDRESS TEST.@;
 5047  025240  050116  052125  040440
 5048  025246  042104  042522  051523
 5049  025254  052040  051505  027124
 5050  025262     100
 5051
 5052  025263     045  047515  052504  MES30:  .ASCII  ;%MODULE ADDR.? @;
 5053  025270  042514  040440  042104
 5054  025276  027122  020077     100
 5055  025303     123  052105  041440  MES31:  .ASCII  ;SET CUST. SW.'S _;
 5056  025310  051525  027124  051440
 5057  025316  027127  051447  057440
 5058  025324  046101  020114  047117  MES31A: .ASCII  ;ALL ON WITH INPUTS HI.@;
 5059  025332  053440  052111  020110
 5060  025340  047111  052520  051524
 5061  025346  044040  027111     100
 5062  025353     101  046114  047440  MES31B: .ASCII  ;ALL OFF WITH INPUTS HI.@;
 5063  025360  043106  053440  052111
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 5064  025366  020110  047111  052520
 5065  025374  051524  044040  027111
 5066  025402     100
 5067  025403     124  020117  046101  MES31C: .ASCII  ;TO ALTERNATE ON & OFF'S.@;
 5068  025410  042524  047122  052101
 5069  025416  020105  047117  023040
 5070  025424  047440  043106  051447
 5071  025432  040056
 5072  025434  046101  020114  047117  MES31D: .ASCII  ;ALL ON WITH INPUTS LO.@;
 5073  025442  053440  052111  020110
 5074  025450  047111  052520  051524
 5075  025456  046040  027117     100
 5076  025463     101  046114  047440  MES31E: .ASCII  ;ALL OFF.@;
 5077  025470  043106  040056
 5078  025474  041502  020104  047111  MES32:  .ASCII  ;BCD INPUT EXERCISER TEST.@;
 5079  025502  052520  020124  054105
 5080  025510  051105  044503  042523
 5081  025516  020122  042524  052123
 5082  025524  040056
 5083  025526  041502  020104  052517  MES33:  .ASCII  ;BCD OUTPUT ADDRESS TEST.@;
 5084  025534  050124  052125  040440
 5085  025542  042104  042522  051523
 5086  025550  052040  051505  027124
 5087  025556     100
 5088  025557     045  054105  046501  MES34:  .ASCII  ;%EXAMINE OUTPUT LINES FOR _;
 5089  025564  047111  020105  052517
 5090  025572  050124  052125  046040
 5091  025600  047111  051505  043040
 5092  025606  051117  057440
 5093  025612  046101  020114  047514  MES35:  .ASCII  ;ALL LOGIC 1'S.@;
 5094  025620  044507  020103  023461
 5095  025626  027123     100
 5096  025631     122  053105  051105  MES37:  .ASCII  ;REVERSED _;
 5097  025636  042523  020104     137
 5098  025643     045  041523  050117  MES38:  .ASCII  ;%SCOPE FOR 'OUTPUT DONE H&L' (TYPE ^R TO RESTART).@;
 5099  025650  020105  047506  020122
 5100  025656  047447  052125  052520
 5101  025664  020124  047504  042516
 5102  025672  044040  046046  020047
 5103  025700  052050  050131  020105
 5104  025706  051136  052040  020117
 5105  025714  042522  052123  051101
 5106  025722  024524  040056
 5107  025726  045445  054505  047502  MES39:  .ASCII  ;%KEYBOARD/DISPLAY MODULE ADDRESS TEST.@;
 5108  025734  051101  027504  044504
 5109  025742  050123  040514  020131
 5110  025750  047515  052504  042514
 5111  025756  040440  042104  042522
 5112  025764  051523  052040  051505
 5113  025772  027124     100
 5114  025775     061  051447  040440  MES40:  .ASCII  ;1'S AND LEAVE THE INPUTS OPEN.@;
 5115  026002  042116  046040  040505
 5116  026010  042526  052040  042510
 5117  026016  044440  050116  052125
 5118  026024  020123  050117  047105
 5119  026032  040056
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 5120  026034  023461  020123  047101  MES40A: .ASCII  ;1'S AND GND ALL INPUTS.@;
 5121  026042  020104  047107  020104
 5122  026050  046101  020114  047111
 5123  026056  052520  051524  040056
 5124  026064  046101  042524  047122  MES40B: .ASCII  ;ALTERNATE 1'S & 0'S.@;
 5125  026072  052101  020105  023461
 5126  026100  020123  020046  023460
 5127  026106  027123     100
 5128  026111     060  051447  040056  MES41:  .ASCII  ;0'S.@;
 5129  026116  047111  027124  047440  MES42:  .ASCII  ;INT. OR EXT. SYNC.? @;
 5130  026124  020122  054105  027124
 5131  026132  051440  047131  027103
 5132  026140  020077     100
 5133  026143     102  042103  044440  MES43:  .ASCII  ;BCD I/O TEST.@;
 5134  026150  047457  052040  051505
 5135  026156  027124     100
 5136  026161     103  040510  040522  MES44:  .ASCII  ;CHARACTER I/O ADDRESS TEST_ ;
 5137  026166  052103  051105  044440
 5138  026174  047457  040440  042104
 5139  026202  042522  051523  052040
 5140  026210  051505  057524     040
 5141  026215     104  040457  040440  MES45:  .ASCII  ;D/A ADDRESSING TEST.@;
 5142  026222  042104  042522  051523
 5143  026230  047111  020107  042524
 5144  026236  052123  040056
 5145  026242  051445  047503  042520  MES46:  .ASCII  ;%SCOPE FOR 'PROG L' & 'FLOP L' LO.@;
 5146  026250  043040  051117  023440
 5147  026256  051120  043517  046040
 5148  026264  020047  020046  043047
 5149  026272  047514  020120  023514
 5150  026300  046040  027117     100
 5151  026305     123  047503  042520  MES47:  .ASCII  ;SCOPE FOR 'PROG L' HI & 'FLOP L' LO.@;
 5152  026312  043040  051117  023440
 5153  026320  051120  043517  046040
 5154  026326  020047  044510  023040
 5155  026334  023440  046106  050117
 5156  026342  046040  020047  047514
 5157  026350  040056
 5158  026352  041523  050117  020105  MES48:  .ASCII  ;SCOPE FOR 'FLOP L' HI.@;
 5159  026360  047506  020122  043047
 5160  026366  047514  020120  023514
 5161  026374  044040  027111     100
 5162  026401     123  047503  042520  MES49:  .ASCII  ;SCOPE FOR 'FLOP L' LO.@;
 5163  026406  043040  051117  023440
 5164  026414  046106  050117  046040
 5165  026422  020047  047514  040056
 5166  026430  044103  041505  020113  MES50:  .ASCII  ;CHECK CH. '0' OUTPUT FOR _;
 5167  026436  044103  020056  030047
 5168  026444  020047  052517  050124
 5169  026452  052125  043040  051117
 5170  026460  057440
 5171  026462  044103  041505  020113  MES51:  .ASCII  ;CHECK CH. '1' OUTPUT FOR _;
 5172  026470  044103  020056  030447
 5173  026476  020047  052517  050124
 5174  026504  052125  043040  051117
 5175  026512  057440
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 5176  026514  027060  030060  040126  MES52:  .ASCII  ;0.00V@;
 5177  026522  027061  030461  040126  MES53:  .ASCII  ;1.11V@;
 5178  026530  027062  031062  040126  MES54:  .ASCII  ;2.22V@;
 5179  026536  027064  032064  040126  MES55:  .ASCII  ;4.44V@;
 5180  026544  027070  034070  040126  MES56:  .ASCII  ;8.88V@;
 5181  026552  027504  020101  054105  MES57:  .ASCII  ;D/A EXERCISER TEST.@;
 5182  026560  051105  044503  042523
 5183  026566  020122  042524  052123
 5184  026574  040056
 5185  026576  027504  020101  040526  MES58:  .ASCII  ;D/A VALUES(X,Y)? @;
 5186  026604  052514  051505  054050
 5187  026612  054454  037451  040040
 5188  026620  051445  052105  040440  MES59:  .ASCII  ;%SET ALL DATA SW.'S TO '0'.@;
 5189  026626  046114  042040  052101
 5190  026634  020101  053523  023456
 5191  026642  020123  047524  023440
 5192  026650  023460  040056
 5193  026654  052523  050120  054514  MES60:  .ASCII  ;SUPPLY AN EXTERNAL SYNC.@;
 5194  026662  040440  020116  054105
 5195  026670  042524  047122  046101
 5196  026676  051440  047131  027103
 5197  026704     100
 5198  026705     123  047503  042520  MES61:  .ASCII  ;SCOPE FOR THE SIGNAL 'DATA READY, AND CHECK %;
 5199  026712  043040  051117  052040
 5200  026720  042510  051440  043511
 5201  026726  040516  020114  042047
 5202  026734  052101  020101  042522
 5203  026742  042101  026131  040440
 5204  026750  042116  041440  042510
 5205  026756  045503  022440
 5206  026762  044103  023456  020123          .ASCII  ;CH.'S '0 & 1' OUTPUTS FOR 5 USEC RISE TIMES.@;
 5207  026770  030047  023040  030440
 5208  026776  020047  052517  050124
 5209  027004  052125  020123  047506
 5210  027012  020122  020065  051525
 5211  027020  041505  051040  051511
 5212  027026  020105  044524  042515
 5213  027034  027123     100
 5214  027037     124  046124  044440  MES62:  .ASCII  ;TTL I/O TEST%@;
 5215  027044  047457  052040  051505
 5216  027052  022524     100
 5217  027055     104  030514  020061  MES63:  .ASCII  ;DL11 ADRS., VEC.? @;
 5218  027062  042101  051522  026056
 5219  027070  053040  041505  037456
 5220  027076  040040
 5221  027100  047111  042523  052122  MES64:  .ASCII  ;INSERT THE M7387 READ-IN MODULE & INITIALIZE SYSTEM.%@;
 5222  027106  052040  042510  046440
 5223  027114  031467  033470  051040
 5224  027122  040505  026504  047111
 5225  027130  046440  042117  046125
 5226  027136  020105  020046  047111
 5227  027144  052111  040511  044514
 5228  027152  042532  051440  051531
 5229  027160  042524  027115  040045
 5230  027166  050042  047522  020115  MES65:  .ASCII  ;''PROM OK'' REMOVE THE M7387.%@;
 5231  027174  045517  020042  042522
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 5232  027202  047515  042526  052040
 5233  027210  042510  046440  031467
 5234  027216  033470  022456     100
 5235  027223     123  051105  040511  MES66:  .ASCII  ;SERIAL I/O INTERFACE TEST%@;
 5236  027230  020114  027511  020117
 5237  027236  047111  042524  043122
 5238  027244  041501  020105  042524
 5239  027252  052123  040045
 5240  027256  042522  047515  042524  MES67:  .ASCII  ;REMOTE DST.? @;
 5241  027264  042040  052123  037456
 5242  027272  040040
 5243
 5244  027274  046111  042514  040507  MES68:  .ASCII  ;ILLEGAL DECIMAL NO. ??@;
 5245  027302  020114  042504  044503
 5246  027310  040515  020114  047516
 5247  027316  020056  037477     100
 5248
 5249  027323     050  047111  044055  MES69:  .ASCII  ;(IN-HOUSE).@;
 5250  027330  052517  042523  027051
 5251  027336     100
 5252
 5253  027337     050  044506  046105  MES70:  .ASCII  ;(FIELD).@;
 5254  027344  024504  040056
 5255
 5256  027350  047111  052520  020124  MES71:  .ASCII  ;INPUT DATA, TERMINATE TEST W/EOT.%@;
 5257  027356  040504  040524  020054
 5258  027364  042524  046522  047111
 5259  027372  052101  020105  042524
 5260  027400  052123  053440  042457
 5261  027406  052117  022456     100
 5262
 5263  027413     105  040530  044515  MES72:  .ASCII  ;EXAMINE 'FIFO' DATA.@;
 5264  027420  042516  023440  044506
 5265  027426  047506  020047  040504
 5266  027434  040524  040056
 5267  027440  047105  042524  044522  MES73:  .ASCII  ;ENTERING THE DISPLAY TEST, ;
 5268  027446  043516  052040  042510
 5269  027454  042040  051511  046120
 5270  027462  054501  052040  051505
 5271  027470  026124     040
 5272  027473     122  026505  047111  MES73A: .ASCII  ;RE-INITIALIZE PDM70.@;
 5273  027500  052111  040511  044514
 5274  027506  042532  050040  046504
 5275  027514  030067  040056
 5276  027520  041505  047510  052040  MES74:  .ASCII  ;ECHO TEST, _;
 5277  027526  051505  026124  057440
 5278  027534  052123  051117  043501  MES75:  .ASCII  ;STORAGE TEST _;
 5279  027542  020105  042524  052123
 5280  027550  057440
 5281  027552  042522  042523  020124  MES76:  .ASCII  ;RESET ADDRESS %@;
 5282  027560  042101  051104  051505
 5283  027566  020123  040045
 5284  027572  033515  033463  040470  MES77:  .ASCII  ;M7378A  FOUNDATION MODULE TEST. %@;
 5285  027600  020040  047506  047125
 5286  027606  040504  044524  047117
 5287  027614  046440  042117  046125
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 5288  027622  020105  042524  052123
 5289  027630  020056  040045
 5290  027634  052520  020124  041523  MES78:  .ASCII  ;PUT SCOPE PROBE ON PIN 78 ._;
 5291  027642  050117  020105  051120
 5292  027650  041117  020105  047117
 5293  027656  050040  047111  033440
 5294  027664  020070  057456
 5295  027670  051525  020105  042536  MES79:  .ASCII  ;USE ^E TO EXIT FROM SUBTEST. @;
 5296  027676  052040  020117  054105
 5297  027704  052111  043040  047522
 5298  027712  020115  052523  052102
 5299  027720  051505  027124  040040
 5300  027726  033515  033463  040467  MES80:  .ASCII  ;M7377A REMOTE SERIAL I/O TEST. %@;
 5301  027734  051040  046505  052117
 5302  027742  020105  042523  044522
 5303  027750  046101  044440  047457
 5304  027756  052040  051505  027124
 5305  027764  022440     100
 5306  027767     040  042523  042514  MES81:  .ASCII  ; SELECT 012 (LINEFEED) SWITCH 'V'(VARIABLE TERMINATOR).<CR>@;
 5307  027774  052103  030040  031061
 5308  030002  024040  044514  042516
 5309  030010  042506  042105  020051
 5310  030016  053523  052111  044103
 5311  030024  023440  023526  053050
 5312  030032  051101  040511  046102
 5313  030040  020105  042524  046522
 5314  030046  047111  052101  051117
 5315  030054  027051  041474  037122
 5316  030062     100
 5317  030063     110  052111  041440  MES82:  .ASCII  ;HIT CARRIAGE RETURN TO CONTINUE.%%@;
 5318  030070  051101  044522  043501
 5319  030076  020105  042522  052524
 5320  030104  047122  052040  020117
 5321  030112  047503  052116  047111
 5322  030120  042525  022456  040045
 5323  030126  042522  042523  020124  MES83:  .ASCII  ;RESET MODE SWITCH.%@;
 5324  030134  047515  042504  051440
 5325  030142  044527  041524  027110
 5326  030150  040045
 5327  030152  042523  020124  046103  MES84:  .ASCII  ;SET CLOCK 3 ON CLOCK MODULE TO 100 MILLI SECONDS.%%_;
 5328  030160  041517  020113  020063
 5329  030166  047117  041440  047514
 5330  030174  045503  046440  042117
 5331  030202  046125  020105  047524
 5332  030210  030440  030060  046440
 5333  030216  046111  044514  051440
 5334  030224  041505  047117  051504
 5335  030232  022456  057445
 5336  030236  022445  051440  052105  MES85:  .ASCII  ;%% SET SWITCH  1 OF SWITCH P TO ON. %@;
 5337  030244  051440  044527  041524
 5338  030252  020110  030440  047440
 5339  030260  020106  053523  052111
 5340  030266  044103  050040  052040
 5341  030274  020117  047117  020056
 5342  030302  040045
 5343  030304  022445  051440  051124  MES86:  .ASCII  ;%% STRAP OUT EOT<CR>%@;
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 5344  030312  050101  047440  052125
 5345  030320  042440  052117  041474
 5346  030326  037122  040045
 5347  030332  022445  042522  047515  MES87:  .ASCII  ;%%REMOVE EOT JUMPER<CR>@;
 5348  030340  042526  042440  052117
 5349  030346  045040  046525  042520
 5350  030354  036122  051103  040076
 5351  030362  042522  042523  020124  MES88:  .ASCII  ;RESET MODULE ADDRESS <CR>%@;
 5352  030370  047515  052504  042514
 5353  030376  040440  042104  042522
 5354  030404  051523  036040  051103
 5355  030412  022476     100
 5356  030415     015  051412  051127  MES89:  .ASCIZ<15><12>/SWR=/
 5357  030422  000075
 5358  030424  005015  047012  053505  MES90:  .ASCIZ<15><12><12>/NEW SWR=/
 5359  030432  051440  051127  000075
 5360  030440  023440  052123  023530  ERR1:   .ASCII  ; 'STX' WASN'T RETURNED.%@;
 5361  030446  053440  051501  023516
 5362  030454  020124  042522  052524
 5363  030462  047122  042105  022456
 5364  030470     100
 5365
 5366  030471     040  044504  047104  ERR2:   .ASCII  ; DIDN'T ENTER ADDRESS MODE.%@;
 5367  030476  052047  042440  052116
 5368  030504  051105  040440  042104
 5369  030512  042522  051523  046440
 5370  030520  042117  027105  040045
 5371
 5372  030526  042040  052101  020101  ERR3:   .ASCII  ; DATA ERROR.%@;
 5373  030534  051105  047522  027122
 5374  030542  040045
 5375  030544  040440  042104  042522  ERR4:   .ASCII  ; ADDRESS ERROR IN 2ND PROGRAM%@;
 5376  030552  051523  042440  051122
 5377  030560  051117  044440  020116
 5378  030566  047062  020104  051120
 5379  030574  043517  040522  022515
 5380  030602     100
 5381
 5382  030603     040  042447  052117  ERR5:   .ASCII  ; 'EOT' WASN'T RETURNED.%@;
 5383  030610  020047  040527  047123
 5384  030616  052047  051040  052105
 5385  030624  051125  042516  027104
 5386  030632  040045
 5387
 5388  030634  030440  052123  050040  ERR6:   .ASCII  ; 1ST PROGRAM WASN'T RECIRCULATED.%@;
 5389  030642  047522  051107  046501
 5390  030650  053440  051501  023516
 5391  030656  020124  042522  044503
 5392  030664  041522  046125  052101
 5393  030672  042105  022456     100
 5394
 5395  030677     040  040504  040524  ERR7:   .ASCII  ; DATA PARITY ERROR.%@;
 5396  030704  050040  051101  052111
 5397  030712  020131  051105  047522
 5398  030720  027122  040045
 5399
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 5400  030724  044440  046114  043505  ERR8:   .ASCII  ; ILLEGAL DATA XFER%@;
 5401  030732  046101  042040  052101
 5402  030740  020101  043130  051105
 5403  030746  040045
 5404  030750  023440  054523  023516  ERR9:   .ASCII  ; 'SYN' DELAY 'X' TOO SHORT.%@;
 5405  030756  042040  046105  054501
 5406  030764  023440  023530  052040
 5407  030772  047517  051440  047510
 5408  031000  052122  022456     100
 5409
 5410  031005     040  051447  047131  ERR10:  .ASCII  ; 'SYN' DELAY 'X' TOO LONG.%@;
 5411  031012  020047  042504  040514
 5412  031020  020131  054047  020047
 5413  031026  047524  020117  047514
 5414  031034  043516  022456     100
 5415
 5416  031041     040  044504  047104  ERR11:  .ASCII  ; DIDN'T ENTER DATA MODE.%@;
 5417  031046  052047  042440  052116
 5418  031054  051105  042040  052101
 5419  031062  020101  047515  042504
 5420  031070  022456     100
 5421  031073     040  051447  054124  ERR12:  .ASCII  ; 'STX' DIDN'T CLR DEST.%@;
 5422  031100  020047  044504  047104
 5423  031106  052047  041440  051114
 5424  031114  042040  051505  027124
 5425  031122  040045
 5426  031124  040440  046440  042117  ERR13:  .ASCII  ; A MODULE WAS ENABLED WITH ADDR. ';
 5427  031132  046125  020105  040527
 5428  031140  020123  047105  041101
 5429  031146  042514  020104  044527
 5430  031154  044124  040440  042104
 5431  031162  027122  023440
 5432  031166  023440     100          ERR13A: .ASCII  ; '@;
 5433  031171     040  052105  020130  ERR14:  .ASCII  ; ETX DIDN'T CLR SOURCE, %@;
 5434  031176  044504  047104  052047
 5435  031204  041440  051114  051440
 5436  031212  052517  041522  026105
 5437  031220  022440     100
 5438  031223     040  047505  020124  ERR15:  .ASCII  ; EOT WASN'T STRAPPED OUT. %@;
 5439  031230  040527  047123  052047
 5440  031236  051440  051124  050101
 5441  031244  042520  020104  052517
 5442  031252  027124  022440     100
 5443  031257     040  052105  020130  ERR16:  .ASCII  ; ETX WASN'T RETURNED.@;
 5444  031264  040527  047123  052047
 5445  031272  051040  052105  051125
 5446  031300  042516  027104     100
 5447
 5448  031305     040  042523  044522  ERR17:  .ASCII  ; SERIAL I/O_;
 5449  031312  046101  044440  047457
 5450  031320     137
 5451
 5452  031321     040  047062  020104  ERR18:  .ASCII  ; 2ND PROGRAM DIDN'T ENTER DATA MODE@;
 5453  031326  051120  043517  040522
 5454  031334  020115  044504  047104
 5455  031342  052047  042440  052116
```

```
 5456  031350  051105  042040  052101
 5457  031356  020101  047515  042504
 5458  031364     100
 5459
 5460  031365     040  047103  051124  ERR19:  .ASCII  ; CNTRL MODULE DIDN'T ENTER DATA MODE.@;
 5461  031372  020114  047515  052504
 5462  031400  042514  042040  042111
 5463  031406  023516  020124  047105
 5464  031414  042524  020122  040504
 5465  031422  040524  046440  042117
 5466  031430  027105     100
 5467  031433     040  047516  042040  ERR20:  .ASCII  ; NO DATA RETURNED WITH EXT. SYNC.@;
 5468  031440  052101  020101  042522
 5469  031446  052524  047122  042105
 5470  031454  053440  052111  020110
 5471  031462  054105  027124  051440
 5472  031470  047131  027103     100
 5473  031475     045  046111  042514  ERR21:  .ASCII  ;%ILLEGAL EXTERNAL CONVERSION.@;
 5474  031502* 040507  020114  054105
 5475  031510  042524  047122  046101
 5476  031516  041440  047117  042526
 5477  031524  051522  047511  027116
 5478  031532     100
 5479  031533     040  040504  040524  ERR22:  .ASCII  ; DATA FORMAT ERROR.@;
 5480  031540  043040  051117  040515
 5481  031546  020124  051105  047522
 5482  031554  027122     100
 5483  031557     122  046505  052117  ERR23:  .ASCII  ;REMOTE  CLEAR LEFT GARBAGE IN MODULE FIFO%%@;
 5484  031564  020105  041440  042514
 5485  031572  051101  046040  043105
 5486  031600  020124  040507  041122
 5487  031606  043501  020105  047111
 5488  031614  046440  042117  046125
 5489  031622  020105  044506  047506
 5490  031630  022445     100
 5491  031633     103  042514  051101  ERR24:  .ASCII  ;CLEAR LEFT GARBAGE IN MODULE FIFO.%%@;
 5492  031640  046040  043105  020124
 5493  031646  040507  041122  043501
 5494  031654  020105  047111  046440
 5495  031662  042117  046125  020105
 5496  031670  044506  047506  022456
 5497  031676  040045
 5498  031700  040052                  ASTRIC: .ASCII  ;*@;
 5499
 5500  031702  022477  040056          QMARK:  .ASCII  ;?%.@;
 5501
 5502  031706  022445  040056          DOT:    .ASCII  ;%%.@;
 5503
 5504  031712  026445     100          DASH:   .ASCII  ;%-@;
 5505
 5506  031715     045  025440  025453  SCALE:  .ASCII  ;% +++++++++ +++++++++ (SCALE=_;
 5507  031722  025453  025453  025453
 5508  031730  025440  025453  025453
 5509  031736  025453  025453  024040
 5510  031744  041523  046101  036505
 5511  031752     137
```

```
 5512  031753     061  053115     137  X1MV:   .ASCII  ;1MV_;
 5513  031757     061  030060  053125  X100UV: .ASCII  ;100UV_;
 5514  031764     137
 5515  031765     061  052460  057526  X10UV:  .ASCII  ;10UV_;
 5516  031772  042057  053111  022451  XDIV:   .ASCII  ;/DIV]%% @;
 5517  032000  020045     100
 5518
 5519  032003     045  051117  047514  XLOW:   .ASCII  ;%ORLOW  @;
 5520  032010  020127  040040
 5521  032014  047445  044122  043511  XHIGH:  .ASCII  ;%ORHIGH @;
 5522  032022  020110     100
 5523  032025     100          END:    .ASCII  ;@;
 5524
 5525  032026  040134          SLASH:  .ASCII  ;\@;
 5526
 5527  032030  040136          UPAROW: .ASCII  ;^@;
 5528
 5529  032032  040045          CRLF:   .ASCII  ;%@;
 5530
 5531  032034  022445     100  CRLF2:  .ASCII  ;%%@;
 5532
 5533  032037     104  030503  040045  MESDC1: .ASCII  ;DC1%@;
 5534
 5535  032044  041504  022462     100  MESDC2: .ASCII  ;DC2%@;
 5536
 5537  032051     104  031503  040045  MESDC3: .ASCII  ;DC3%@;
 5538
 5539  032056  041504  022464     100  MESDC4: .ASCII  ;DC4%@;
 5540
 5541  032063     123  054124  040045  MESSTX: .ASCII  ;STX%@;
 5542
 5543  032070  054523  022516     100  MESSYN: .ASCII  ;SYN%@;
 5544
 5545  032075     123  044117  040045  MESSOH: .ASCII  ;SOH%@;
 5546
 5547  032102  044523  040045          MESSI:  .ASCII  ;SI%@;
 5548
 5549  032106  047505  022524     100  MESEOT: .ASCII  ;EOT%@;
 5550
 5551  032113     105  054124  040045  MESETX: .ASCII  ;ETX%@;
```

```
5552
5553                            ;*********************************************************************
5554                            .SBTTL SOFTWARE 'SWITCH' ADDRESSES
5555                            ;*********************************************************************
5556                                    .EVEN
5557  032120  000000            MTRSWH: 0
5558  032122  000000            PRTSWH: 0
5559  032124  001506            RVECTR: MONTR1                  ;CONTAINS THE 'CNTRL R' RESTART ADDRESS
5560  032126  001506            AVECTR: MONTR1                  ;CONTAINS THE 'CNTRL A' RESTART ADDRESS
5561  032130  003717            OFFSET: 1999.                   ;A/D OFFSET
5562  032132  000000            SIOSWH: 0                       ;SERIAL I/O SWITCH, SET IF SERIAL INPUT USED
5563  032134  000000            MODADR: 0                       ;STORAGE OF CURRENT MODULE ADDRESS
5564  032136  000000            REPTSW: 0
5565  032140  000000            KSTOR0: 0
5566  032142  000000            FORMT1: 0
5567  032144  000000            DLYSWH: 0
5568  032146  000000            DSTSWH: 0
5569  032150  000000            SENDSW: 0
5570  032152  000000            OPRTSW: 0
5571  032154  000000            TERMSW: 0
5572  032156  000000            TOPC:   0
5573  032160  000000            COUNT:  .WORD   0               ;TEMPORARY COUNTER(REMOTE SER I/O).
5574  032162  000000            FROMPC: 0
5575  032164  000000            SAVEPC: 0
5576  032166  000000            SAVPSW: 0
5577  032170  000000            SAV2PC: 0
5578  032172  000000            SAV2SW: 0
5579  032174  000000            KSTOR1: 0
5580  032176  000000            KSTOR2: 0
5581  032200  000000            KSTOR3: 0
5582  032202  000000            KSTOR4: 0
5583  032204  000000            KSTOR5: 0
5584  032206  000000            TSTNUM: 0
5585  032210  000000            TEMP1:  0
5586  032212  000000            TEMP2:  0
5587  032214  000000            CHRCNT: 0
5588  032216  000000            RUBSWH: 0
5589  032220  000000            PRGSWH: 0
5590  032222  000000            LOPSWH: 0
5591  032224  000000            RESTRT: 0
5592  032226  000000            ORLOW:  0
5593  032230  000000            MINUS9: 0
5594          032300                    .=.+46
5595  032300  000000            ORHIGH: 0
5596
5597  032302  000000            AVGTAB: 0
5598          032614                    .=.+200.
5599          001376                    .END    MONITR
```

```
A       023346  4824  4838#
ADCHX1  005211  1293*  1294  1302#  1310  1314*  1315
ADCNVT= 104027  137#  1392  1434  1636  1644
ADCT0   006710  1685  1687#  1713
ADCT1   006716  1690#
ADCT2   006736  1695#  1711
ADCT3   007030  1705  1708  1712#
ADDRES= 104026  136#  270  800  1027  1052  1166  1237  1380  1410  1568  1738  1993  2029
                2317  2425  2482  2623  2749  3210  3249  4401
ADRDST  017234  1062  1089  1115  1144  1192  1749  1769  1780  1966  2075  2155  2287  2571
                2708  2810  2912  3075  4018#  4409
ADRSIT  005154  892  1288  1291#  2193  2722  2961  3433
ADRSRC  017220  815  851  865  878  913  942  967  984  1003  1039  1208  1248  1274
                1335  1688  2045  2061  2161  2298  2495  2634  2650  2685  2769  2819  2917
                3086  3118  3138  3166  4003#
ADSER1  014644  3625  3633#
ADSLOP  014512  3581#  3631
ADSLP1  014552  3587  3593#
ADSLP2  014572  3592  3598  3606#
ADSNXT  014626  3585  3617  3619  3621  3629#  3637
ADT0    005022  1238#  1364
ADT1    005024  1245#
ADT2    005110  1255  1260  1271#
ADT3    005142  1286#
ADT4    005252  1289  1324#
ADT5    005402  1327  1340  1360#
ASEMBL= 104015  127#  285  4153  4303  4833
ASTRIC  031700  1506  4588  4618  5498#
AVECTR  032126  334*  335*  3735  5560#
AVERAG= 104031  139#  1435  1451  1645
AVGDAT  016006  3839#
AVGTAB  032302  1437  1456  1546  5597#
BCDBIN= 104030  138#  1417  1698
BCDBN1  022446  4644#  4669
BCDBN2  022454  4647#  4665
BCDEND  022536  4648  4651  4666#
BCDERR  022554  4653  4655  4672#
BCDIO   004606  357  1164#
BCDIO1  004652  1184#  1228
BCDTAB  022564  1418  1420  1699  4642  4643*  4675#
BCDT0   003456  801#  1016
BCDT1   003472  812#
BCDT10  004132  947  958#
BCDT11  004206  905  978#
BCDT12  004244  986  997#
BCDT13  004302  1005  1012#
BCDT2   003610  820  825  830  835  848#
BCDT3   003640  862#
BCDT4   003672  875#
BCDT5   003722  890#
BCDT6   003732  902#
BCDT7   004024  918  929#
BINDEC= 104033  141#  1535  1539  1729
BYTEA   014430  3519#
BYTEX   014431  3520#
CALBT1  005440  1385#
```

```
CALBT2  005444  1387#  1394   1399
CHANEL= 104032   140#  1431   1571
CHART1  012074  2631#
CHART2  012124  2636   2647#
CHART3  012206  2674#
CHART4  012254  2696#
CHART5  012344  2720#
CHART6  012354  2728#
CHRCNT  032214  1697*  1998   3663*  3691*  3692   3703   3705*  4068*  4070   4647   4649*  4668   4789
                4801*  4810*  4812*  4834   5587#
CLRMOT  021524  1398   1542   4413#
CMPT1A  011254  2372#  2378
CMP1    002264   430#   436
CMP1A   010344  2098#  2104
CMP1B   010522  2166#  2172
CMP1BA  012762  2928#  2936
CMP1C   010516  2165#  2180
CMP1CA  012756  2927#  2944
CMP1DA  012774  2929   2933#
CMP11   003322   725#   732
CMP2    002340   461#   473
CMP2A   003554   831#   837
CMP2B   004002   914#   920
CMP3    002432   492#   498
CMP4    002514   522#   528
CMP5    002610   556#   562
CMP6    002772   602#   608
CNTLOP  014472  3145   3565#  3567
CNTRLA  015222  3730   3732#
CNTRLC  015210  3726   3729#
CNTRLE  015262  3737   3742#
CNTRLG  015172  3700   3724#
CNTRLO  015276  3743   3746#
CNTRLR  015240  3733   3736#
COUNT   032160  3139*  3566*  5573#
CP1B    012576  2827#  2833
CP1C    012572  2826#  2841
CRLF    032032  1032   1386   1665   3716   3739   3798   4540   5529#
CRLF2   032034  1541   5531#
CT10    003034   632#
CT11    003246   709#
CT12    003430   698    729    737    789#
CT2     002322   434    445    456#
CT3     002374   465    481#
CT3A    002366   467    471#
CT4     002470   489    496    506    515#
CT5     002552   526    535    545#
CT6     002646   552    560    576#
CT7     003012   597    606    616#
DAOUT   007746  1799   1813   1827   1841   1855   1869   1883   1897   1910   1923   1945   1951   1963#
                2018
DASH    031712  1499   5504#
DATA1   004712  1186   1190   1196#  1210
DATA2   004722  1188   1204#  1217   1224
DATA3   007776  1797*  1811*  1825*  1839*  1853*  1867*  1881*  1895*  1908*  1921*  1941*  1947*  1963
                1972#  2001   2013
```

```
DATA4   010000          1798* 1812* 1826* 1840* 1854* 1868* 1882* 1896* 1909* 1922* 1942* 1948* 1973#
DATA5   010002          1943* 1949* 1965* 1974# 2017*
DATA6   010004          1944* 1950* 1975#
DATST3  007206          1795#
DATST4  007242          1809#
DATST5  007276          1823#
DATST6  007332          1837#
DATST7  007366          1851#
DATS10  007422          1865#
DATS11  007456          1879#
DATS12  007512          1893#
DATS13  007546          1906#
DATS14  007602          1919#
DATS15  007636          1936#
DAT1    007102          1747#
DAT15A  007652          1941# 1952
DAT2    007136          1767#
DC1   = 000021           222#  403  411  580  650  660 1301 2204 2244 2452 2521 2986 3010
                        3029 3150 3188 3286 3294 3304 3328 3479 3535 3542 3547 3599 3759
                        3986 4006 4108
DC2   = 000022           223#  407  415  584  654 2208 2248 2344 2456 2523 2972 3013 3122
                        3174 3290 3298 3315 3470 3539 3544 3762 4028 4131
DC3   = 000023           224#  409  419  587  659  664 1305 2210 2250 2458 2525 2974 2988
                        3012 3016 3031 3124 3152 3176 3190 3293 3303 3308 3317 3330 3472
                        3482 3541 3546 3603 3765 3942 4010 4020 4022 4030 4079 4112 4133
DC4   = 000024           225#  410 3768
DECODE  001712           310#  347
DECOD1  001746           313   318#
DECOUT  022650          4693  4698#
DECPNT  022710          4686  4709#
DEC1    022670          4699  4701 4704#
DEC2    022702          4703  4706#
DELAY = 104004           118#  592  720 1209 1350 2581 2582 2771 3087 3339 3608 4099
DELAYL= 104020           130# 2816 2817 2818 3183 3338
DESTIN= 104024           134# 4025
DIVDIT  016042          3854# 3860
DIVIDE  016016          1425  3839 3848#
DLYSWH  032144           251*  390* 1938* 2486* 4097 4420* 5567#
DOT     031706           305  5502#
DSTADR  017277          2285* 3073* 3102* 3579* 3581 3584 3629* 3630 3633 4020 4022* 4024* 4029#
                        4161*
DSTSWH  032146          2448* 2462* 2517* 2529* 3995* 4118 4127* 5568#
ECHO    015064          3694# 3712 3721
EMTOK   001220           157   159#
EMTSRV  001200           102   153#
EMTTAB  001240           161   166#
END     032025          5523#
END2    002234           420#  497
ENQ   = 000005           232# 3179
EOT   = 000004           231#  483  485  517  547  548  838  852  866  879  948  968 1075
                        1101 1128 1147 1204 1261 1276 1756 1774 1785 1965 2011 2047 2113
                        2130 2153 2267 2294 2389 2405 2470 2496 2537 2580 2635 2664 2706
                        2772 2808 2981 3082 3127 3275 3473 3492 3521 3620 3783 3936 4077
                        4090 4369 4416
ERREXT  020620          4208 4218#
ERRMES  017136          3925* 3930* 3960#
```

```
ERR1    030440            622    2256    3038    5360#
ERR10   031005            645*    684    5410#
ERR11   031041            819     946    1254    2090    2303    2364    3091    5416#
ERR12   031073           2262    3050    3057    5421#
ERR13   031124           1312    3635    5426#
ERR13A  031166           1310*   3633*   5432#
ERR14   031171           2225    3002    5433#
ERR15   031223           2308    3097    5438#
ERR16   031257           2219    2996    5443#
ERR17   031305           5448#
ERR18   031321            508    5452#
ERR19   031365            447    5460#
ERR2    030471            433     596    5366#
ERR20   031433            988    1007    1354    5467#
ERR21   031475           1339    5473#
ERR22   031533           5479#
ERR23   031557           3203    5483#
ERR24   031633           3159    5491#
ERR3    030526            464     605     728     824     829     834     841     869     882     917     951     971    1215
                         1264    1279    2101    2169    2375    2830    2931    3355    5372#
ERR4    030544            495    5375#
ERR5    030603            488     551     855    1259    2050    2127    2402    2499    2638    2775    3343    5382#
ERR6    030634            525     537     559     568    5388#
ERR7    030677            469    2095    2369    5395#
ERR8    030724           2066    2079    2133    2353    2408    2654    5400#
ERR9    030750            644*    677    5404#
ERTRAP  020440             97    4169#
ETX   = 000003            226#    420     588     665    2211    2216    2543    2975    2993    3309    3786    3950    4092
                         4113
EVECTO  014404           3451*   3495#   3745
EXTTY   015152           3675    3678    3684    3718#   3728    3749    3751
FDATA   014072           3284    3314    3320#
FLAB1   014042           3270*   3295#   3646*
FLAB17  014565           3600#
FLAB2   014037           3292#   3647*
FLAB3   014067           3316#   3648*
FLAB3A  014066           3315#
FLAB4   014363           3480#   3649*
FLAB5   014113           3329#   3650*
FLAB5A  014112           3328#   3594
FLAB6   014351           3471#   3651*
FLAB7   013660           3239#   3251*   3252    3270    3652*
FLO     013670           3247#   3426    3505
FLOP    013674           3248#
FLOPB   013704           3252#
FLUSH   002050            328     338#    343
FND1B   014140           3352#   3371
FND1C   014134           3341    3351#   3379
FND1D   014152           3353    3370#
FND3A   014302           3425    3432#
FND5    014334           3461#
FND5A   014342           3467#   3478
FND5B   014370           3462    3487#   3493
FND5C   014354           3469    3476#
FNORM   014060           3281    3312#
FORMT1  032142           3794*   3795    3799*   3807*   4547*   5566#
```

```
FOUNDL  014014  3280#  3414
FOUND2  014212  3356   3373   3375   3387#
FOUND3  014270  3390   3424#
FOUND5  014312  3388   3442#
FOUND6  014406  3395   3451   3501#
FOUNSW  013662  3243#  3247*  3387   3413*
FPROG   014030  3285#  3490   3590
FROMPC  032162  4171*  4179*  4181   5574#
FSTUF   014660  3255   3410   3582   3646#
FTST    014116  3323   3327   3338#
GANEXT  006662  1648   1651   1654   1673#
GETDAT  015730  3824#  3838
GETREG= 104003   117#  1670   1714   1730   3718   3840   3869   4100   4140   4332   4478   4516   4577
                4670   4696
HEADER  023415   302   4851#
HIDIVD  016116  1422*  3819*  3836*  3852   3874#
HIDIVR  016112  1421*  3850   3872#
HIGH    016124  3821*  3825   3827   3829*  3877#
IADRS0  002214   271*   404#   581    585   4157
IADRS1  002220   272*   408#
IADRS2  002224   273*   412#
IADRS3  002230   274*   416#
IADRS4  003120   275*   651#
IADRS5  003124   276*   655#
IADRS6  003132   277*   661#
IADRS7  017547   278*  4109#
IADRS8  017643   279*  4124   4132#
IADRS9  017202   280*  3256   3257   3258   3259   3989#
IADR10  011167   281*  2345#
IADR11  014046  3256*  3302#
IADR12  014032  3257*  3287#
IADR13  014036  3259*  3291#
IADR14  014051  3258*  3305#
ICOUNT  020770  4234   4257#  4353*
INBUF   015330   268    310*   312    320   1170   1695*  1696*  2000   3665   3755#  4191   4193   4399
                4596   4641   4792
INPUTA  014740  3666#  3667   3695   3704
INPUTB  015030  3685#  3723
INPUTC  015006  3673   3679#
KEYAD1  011623  2483*  2522#
KEYAD2  011625  2484*  2524#
KEYT0   011524  2485#  2595
KEYT1   011532  2493#
KEYT2   011554  2497   2507#  2538   2552
KEYT3   011734  2544   2562#
KEYT4   012036  2591#
KSTOR0  032140  4395*  4402*  4406   5565#
KSTOR1  032174  1420*  1423   1429   1448   4306   4311*  4312*  4313   4314*  4317   5579#
KSTOR2  032176  1444*  1465   5580#
KSTOR3  032200  1446*  1469   1474   4204*  4212*  4214   5581#
KSTOR4  032202  1428*  1447   1463   5582#
KSTOR5  032204  1429*  1430*  1453   5583#
LDCHR0= 104006   120#   442    482    503    516    532    546    563    617   1146   1750   1755   2112
                2213   2266   2388   2468   2535   2573   2575   2579   3491   3971   4368   4415   4605
LDPGM0= 104007   121#   399    458    590    646   1064   1090   1117   1193   1770   1781   1968   2085
                2114   2157   2201   2229   2240   2289   2341   2359   2390   2709   2812   2914   2969
```

		2977	2983	3007	3025	3077	3119	3147	3170	3185	3282	3312	3320	3325
		3467	3476	3487	3516	3531	3589	3593	3596	3984	4105	4128	4624	
LODIVD	016114	1424*	3820*	3835*	3851	3873#								
LODIVR	016110	1423*	3823*	3849	3871#									
LOPSWH	032222	388*	426	429*	736*	792*	1570*	1659	1661*	2034*	2760*	5590#		
LOW	016120	1436	1668	3822*	3830	3832	3834*	3875#						
MASK	022114	4502*	4508	4513*	4518#									
MATCH	002000	327#	330											
MATD	014504	3579#												
MESADR	020616	4205*	4216#											
MESDC1	032037	3761	5533#											
MESDC2	032044	3764	5535#											
MESDC3	032051	3767	5537#											
MESDC4	032056	3770	5539#											
MESEOT	032106	3785	4470	5549#										
MESETX	032113	3788	5551#											
MESSI	032102	3782	5547#											
MESSOH	032075	3779	5545#											
MESSTX	032063	3773	5541#											
MESSYN	032070	3776	5543#											
MES0	023775	266	4898#											
MES1	024042	386	4907#											
MES10	024316	932	1329	2279	3067	3407	4949#							
MES11	024364	1236	4956#											
MES12	024411	1379	4960#											
MES13	024437	4251	4964#											
MES14	024460	2278	4967#											
MES14A	024527	2316	4974#											
MES15	024574	1409	4981#											
MES16	024624	1415	4985#											
MES17	024633	4189	4987#											
MES18	024641	1567	4990#											
MES19	024666	1576	4995#											
MES2	024070	3925	3960	4913#										
MES20	024714	1578	1595	5000#										
MES21	024730	1586	1603	5003#										
MES22	024761	5009#												
MES23	025000	5013#												
MES24	025014	1594	5016#											
MES24A	025042	5021#												
MES25	025072	1611	5025#											
MES26	025113	1640	5029#											
MES27	025134	1663	5033#											
MES28	025161	4743	5037#											
MES29	025233	799	5046#											
MES3	024127	2028	4920#											
MES30	025263	4152	5052#											
MES31	025303	802	907	934	961	5055#								
MES31A	025324	803	5058#											
MES31B	025353	5062#												
MES31C	025403	962	5067#											
MES31D	025434	908	5072#											
MES31E	025463	935	5076#											
MES32	025474	1026	5078#											
MES33	025526	1051	5083#											
MES34	025557	1079	1105	1131	5088#									

MES35	025612	1080	5093#								
MES37	025631	1132	5096#								
MES38	025643	1143	5098#								
MES39	025726	2481	5107#								
MES4	024161	3930	4925#								
MES40	025775	5114#									
MES40A	026034	5120#									
MES40B	026064	1106	1133	5124#							
MES41	026111	5128#									
MES42	026116	1168	5129#								
MES43	026143	1165	5133#								
MES44	026161	2607	2621	5136#							
MES45	026215	1737	5141#								
MES46	026242	1753	5145#								
MES47	026305	1758	5151#								
MES48	026352	1777	5158#								
MES49	026401	1788	5162#								
MES5	024205	4173	4930#								
MES50	026430	1801	1815	1829	1843	1857	5166#				
MES51	026462	1871	1885	1899	1912	1925	5171#				
MES52	026514	1802	1872	5176#							
MES53	026522	1816	1886	5177#							
MES54	026530	1830	1900	5178#							
MES55	026536	1844	1913	5179#							
MES56	026544	1858	1926	5180#							
MES57	026552	1992	5181#								
MES58	026576	1996	5185#								
MES59	026620	5188#									
MES6	024227	4178	4935#								
MES60	026654	981	1000	1342	5193#						
MES61	026705	1940	5198#								
MES62	027037	2424	5214#								
MES63	027055	284	5217#								
MES64	027100	713	5221#								
MES65	027166	734	5230#								
MES66	027223	2332	5235#								
MES67	027256	4397	5240#								
MES68	027274	4673	5244#								
MES69	027323	2608	5249#								
MES7	024236	791	1015	1227	1363	1619	2319	2417	2594	2731	3213	3504	4938#
MES70	027337	2622	5253#								
MES71	027350	2659	2678	5256#							
MES72	027413	2712	5263#								
MES73	027440	2565	5267#								
MES73A	027473	2550	5272#								
MES74	027520	2658	5276#								
MES75	027534	2677	5278#								
MES76	027552	5281#									
MES77	027572	3245	5284#								
MES78	027634	3444	5290#								
MES79	027670	3448	5295#								
MES8	024257	4302	4942#								
MES80	027726	2748	5300#								
MES81	027767	2896	5306#								
MES82	030063	5317#									
MES83	030126	5323#									

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MES84   030152          3114    5327#
MES85   030236          3115    5336#
MES86   030304          5343#
MES87   030332          5347#
MES88   030362          3099    5351#
MES89   030415          4828    5356#
MES9    024275          4544    4946#
MES90   030424          4832    5358#
MINUS9  032230          1476*   1487    5593#
MODADR  032134           821     937*   1294    2283*   2320    3071*   3100*   3211    3584    4159*   5563#
MODERR= 104022           132#    432     446     463     468     487     494     507     524     536     550     558     567
                         595     604     621     676     683     727     818     823     828     833     840     854     868
                         881     916     945     950     970     987    1006    1214    1253    1258    1263    1278    1311
                        1338    1353    2049    2065    2078    2089    2094    2100    2126    2132    2168    2218    2224
                        2255    2261    2302    2307    2352    2363    2368    2374    2401    2407    2498    2637    2653
                        2774    2829    2930    2995    3001    3037    3049    3056    3090    3096    3158    3202    3342
                        3354    3634
MONITR  001376           110     238#   2418    3731    3961    4182    4567    4600    4674    4744    5599
MONTR1  001506           264#    303    5559    5560
MONTR2  001630           289#    297
MONTR3  001660           287     295     298#
MONTR4  001674           301#
MONTR5  001700           255     303#
MONT1A  001612           269     283#
MOVEIT  022042          4504#   4515
MTRSWH  032120           254     256*   5557#
M377A1  012442          2759#
M381E1  004332          1031#
M381E2  004336          1033#   1043    1045
M385A1  010134          2030#   2321
M7377A  012370           371    2747#
M7377B  012376          2750#   3214
M7378A  013664           372    3244#
M7380A  002160           353     385#    793
M7381A  003450           354     798#
M7381E  004316           355    1025#
M7382A  004412           356    1050#
M7383A  005014           358    1235#
M7383C  005416           359    1378#
M7383G  006356           361    1566#   1620
M7383R  005514           360    1408#
M7384A  007072           362    1736#
M7384E  010006           363    1991#
M7385A  010126           364    2027#   2609
M7385I  011150           365    2331#
M7385T  011360           366    2423#
M7386A  011506           367    2480#
M7387A  003254           368     711#
M7388A  012050           369    2606#
M7388F  012062           370    2620#   2732
NMATCH  002070           315     340     345#
NODLAY= 104036           144#    633    1384    1413    2509    2567    4589    4619
NOP   = 000240            46#
NULL  = 104021           131#    248     250    4741
NULL1 = 104023           133#    668     680    3565
OBCDT1  004422          1060#
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OBCDT2  004462  1087#
OBCDT3  004522  1113#
OBCDT4  004564  1140#
OFFSET  032130  1703  1724  5561#
OPRTSW  032152  3750*  4459*  4477*  4480  5570#
ORHIGH  032300  1461  1467*  1492  1508  1530  1538  5595#
ORLOW   032226  1459  1471*  1529  1534  5592#
PARITY  016220  466  2092  2366  3892*  3902#  3935*
PDMPRT  015650  3760  3763  3766  3769  3772  3775  3778  3781  3784  3787  3803#
PDMSET  015434  2542  2663  3759#  4139  4549  4604
PDMST0  015632  3793  3797#
PDMST1  015644  3790  3801#
PDMST2  015646  3796  3802#
PEXT2   015674  3803  3810#
POP1SP= 005726  43#  332  3808
POP2SP= 022626  45#  246  4170
POSTIT  007040  1548  1722#
PRCNTR= 104000  114#  3724  3801  4599
PRGM1   002213  400  403#  425  521  555
PRGM2   002222  410#  435  484  527  561
PRGSWH  032220  5589#
PRINT = 104012  124#  257  265  283  301  304  345  385  712  733  790  798  801
                906  931  933  960  980  999  1014  1025  1031  1050  1078  1104  1130
                1142  1164  1167  1226  1235  1328  1341  1362  1378  1385  1408  1414  1498
                1505  1524  1532  1536  1540  1566  1575  1577  1585  1593  1602  1610  1618
                1639  1662  1664  1736  1752  1757  1776  1787  1800  1814  1828  1842  1856
                1870  1884  1898  1911  1924  1939  1991  1995  2027  2277  2315  2318  2331
                2416  2423  2480  2549  2564  2593  2606  2620  2657  2676  2711  2730  2747
                2895  3066  3098  3113  3212  3244  3406  3443  3503  3688  3708  3715  3738
                3752  3797  3805  3959  4151  4172  4177  4188  4215  4250  4301  4308  4382
                4396  4469  4539  4543  4587  4617  4672  4742  4827  4831
PROMD   003427  731  780#
PROMS   003360  724  741#
PRTBF1  022162  4539#  4566
PRTBF2  022166  4541#  4576
PRTEXT  021734  4466  4471  4476#
PRTOCT= 104014  126#  4175  4180  4209  4213  4252  4829
PRTRBF= 104037  145#  1044  1397  2686
PRTSWH  032122  252*  3674  3683  3699  3746  4381  4384*  4460*  4476*  5558#
PRT1A   022210  4548#  4551
PRT1B   022222  4545  4552#
PSW     001340  200#
PUSH1S= 005746  42#
PUSH2S= 024646  44#
PWRFAL  022722  99  4720#
PWRUP   022756  4728  4730#
QMARK   031702  346  3753  4309  5500#
QUOENT  016122  1428  1442  1452  1646  3868*  3876#
RANA    021134  4270*  4271*  4272*  4273  4276  4292#
RANB    021136  4270  4273*  4274*  4275*  4277  4293#
RANC    021140  4271  4274  4276*  4277*  4278*  4279  4294#
RANDOM= 104011  123#  457  577  2082  2152  2340  2356  2807  2904  3274
RBUF0   001360  211#  3898  3922
RCSR0   001356  210#  288  3899*  3957*  4203*
RECBF0  016234  836  866  919  948  968  985  1004  1211  1251  1261  1276  1514  1637
                1692  1693  2087  2096  2259  3047  3054  3583*  3887  3890  3894*  3900  3907
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                    3908#  4558   4575
RECBUF  022224       374   4558#
RECDC3  016222      3895*  3903#  3944*
RECEND  016736      3910#  3926
RECEOT  016224       674    681    816   1040   1256   1690   2124   2162   2178   2305   2399   2820   2839
                    2918   2942   3093   3340   3377  3893*  3904#  3938*
RECERR  017124      3927   3932   3957#
RECETX  016230      3897*  3906#  3952*
RECEXT  017112      3939   3941   3945   3949   3953#
RECSTX  016226      2253   3035   3896*  3905#  3948*
RECVER  016740       298   3919#
RECVPT  016232      3888*  3907#  3921   3953*
RECVRO= 104005       119#   638    714    911    940    965   1038   1207   1296   1333   1687   2084   2239
                    2286   2296   2358   2444   2516   2570   2968   3024   3074   3084   3140   3163   3277
                    3607   3744   4229   4355   4591   4623
RECVR1  017026      3929   3936#
RECYCL  001754       320#   326    342
REMAIN  016126      1426   3862*  3878#
REMOTE  021442      1381   1411   4394#
REPTSW  032136      3662*  4120   4365   4406*  4407   4413   4417*  5564#
REPTO   005636      1432#  1543
REPTOA  005532      1414#  1419   1427
REPT1   005646      1434#
REPT10  006236      1517*  1520*  1523*  1526#
REPT11  006246      1529#
REPT12  006304      1531   1540#
REPT13  006320      1528   1545#
REPT14  006330      1547#  1554   1669
REPT2   005736      1451#  1455
REPT3   005762      1450   1458#
REPT4   006010      1465#  1479
REPT5   006054      1468   1472   1477#
REPT6   006066      1487#  1493   1495
REPT6A  006102      1492#
REPT6B  006110      1494#  1509
REPT7   006116      1490   1498#
REPT8   006122      1500#  1511
REPT8A  006144      1508#  1513
REPT9   006162      1496   1514#
RESTRT  032224       314    317    333*  4352*  5591#
RETURN  020774       910*   939*   964*  1331*  2083*  2282*  2357*  2568*  2707*  3070*  4241  4255*  4259#
                    4316*  4349*
RINTO   001366       214#   298*
RLVLO   001370       215#   300*
RPT12A  006314      1543#
RUBSWH  032216      3664*  3685   3687*  3706   3711*  5588#
RUN     022360       377   4617#  4631
RVECTR  032124       303*  3741   4350*  4351*  4352   5559#
SAVEPC  032164      4750*  4762   4768*  4780   5575#
SAVPSW  032166      4751*  4761   4769*  4779   5576#
SAVREG= 104002       116#  1666   1682   1722   3661   3818   3848   4061   4137   4326   4458   4498   4574
                    4640   4684
SAV2PC  032170      4752*  4760   4770*  4778   5577#
SAV2SW  032172      4753*  4759   4771*  4777   5578#
SCALE   031715      1525   5506#
SCOPE = 104001       115#   456    481    515    545    576    616    632    709    789    848    862    875
```

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                        890     902     929     958     978     997    1012    1087    1113    1140    1271    1286    1324
                       1360    1767    1795    1809    1823    1837    1851    1865    1879    1893    1906    1919    1936
                       2059    2074    2111    2148    2187    2200    2274    2314    2386    2414    2507    2562    2591
                       2647    2674    2696    2720    2728    2767    2779    2898    2955    2967    3063    3110    3205
                       3269    3404    3432    3442    3501
SCOPEB  020676         4231    4237#
SCOPEF  020772         4234    4236*   4242*   4258#   4315*
SCOPEG  020714         4233    4235    4242#
SD10    010764         2176    2192    2274#
SD10A   013252         2960    2997    3003    3055    3063#
SD11    011122         2304    2314#
SD11A   013402         3092    3098#
SD2     010220         2059#
SD3     010246         2064    2074#
SD4     010364         2111#
SD4A    012502         2773    2779#
SD5     010434         2052    2148#
SD5A    012662         2844    2895#
SD6     010574         2170    2174    2187#
SD6A    013034         2932    2938    2945#
SD6B    013036         2940    2955#
SD7     010624         2200#
SD7A    013066         2967#
SEND    022264          376    4586#
SENDAX  014422         3516#   3606
SENDPG  014434         3531#
SENDSW  032150          253*   2679*   2683*   3672    3792    3958*   4590*   5569#
SEND1   022312         4594#   4607
SEND2   022354         4602*   4606#
SETRMT  021502         1395    1480    4406#
SETUP =  104035         143#    389     711     805    1028    1053    1175    1238    1382    1412    1569    1739    1994
                       2035    2333    2428    2485    2624    2759    3111    3248    4586
SI      =  000017       230#    586     656    2346    3780    4024
SIOSWH  032132          264*    282*    423     490     519     553     599    1291    2051    2173    2191    2465    2532
                       2547    2834    2843    2937    2959    3280    3322    3372    3394    3424    3461    3586    3940
                       3969    3982    4018    4155    4626    5562#
SLASH   032026         3689    3709    5525#
SNDAX1  014470         3518    3533    3556#
SNGCHR  017664         4038*   4088    4094*   4142#
SOH     =  000001       229#    405     413     582     652     662    1303    2206    2246    2454    3288    3296    3306
                       3481    3537    3549    3601    3777    3990    4008    4110
SOH1    017231          814*    850*    864*    877*    912*    941*    966*    983*   1002*   1036*   1037*   1172*   1174*
                       1247*   1273*   1334*   1391*   1704    2044*   2060*   2160*   2297*   2633*   2649*   2684*   2768*
                       2815*   2899*   3117*   3164*   3279*   4009#   4193*
SOURCE=  104025         135#   1297    2449    2518    4003
SPACE =  104016         128#   1502    1553    4211
SPACEX  021262         1500*   1552*   4329*   4331*   4334#   4426*   4431*   4435*
SPCHR1  015070         3680    3682    3699#
SPCHR3  015140         3702    3713#
SPCHR5  015156         3714    3720#
SRCADR  017227          938*   1332*   2284*   3072*   3101*   3137*   3165*   4007#   4160*   4403*
STADR7  010637         2030*   2205#
STADR8  010643         2031*   2209#
STADR9  010723         2032*   2245#
STAD10  010727         2033*   2249#
STDR10  013170         2753*   3015#
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STDR11  013207          2754*  3030#
STDR12  013467          2755*  3123#
STDR13  013531          2756*  3151#
STDR14  013577          2757*  3175#
STDR15  013617          2758*  3189#
STDR7   013103          2750*  2973#  3100  3101  3102  3165
STDR8   013125          2751*  2987#
STDR9   013165          2752*  3011#
STRIPN  023232          4793   4805#  4817
STX   = 000002           227#   402    579   618   619   649  2232  2545  3017  3285  3534  3771  3946
                        3972   3987
ST7377  012450          2767#
ST7385  010162          2042#
SUBX    021142           373   4301#  4310
SUBX1   021170          4305   4311#
SWR     001352           205#   243    245*  697   904  1034  1042  1326  1388  1393  1655  1657  2014
                        2275   2540   3064  4066  4072  4083  4095  4207  4218  4230  4232  4246  4628
                        4823   4825
SWR0    001354           206#
SWSWR   000176           108#   245    4823  4825  4830  4836*
SW02  = 000004            27#
SW03  = 000010            26#
SW04  = 000020            25#
SW05  = 000040            24#
SW06  = 000100            23#
SW07  = 000200            22#
SW08  = 000400            21#
SW09  = 001000            20#  4095
SW10  = 002000            19#   697   904  1326  2275  3064
SW11  = 004000            18#  4072
SW12  = 010000            17#  4066  4083
SW13  = 020000            16#  1042  1393  1655  1657  2540  4207
SW14  = 040000            15#
SW15  = 100000            14#
SYN   = 000026           228#   657   3774
SYNTIM  003127           643*   658#
S5      012506          2804#
S5B     012650          2831   2835  2837  2843#
TAGB    002236           401    423#
TAGD    003056           638#   693
TAGF    003140           648    668#  673   675
TAGG    003170           671    680#
TAGH    003206           682    687#
TAGI    003222           678    685   689   693#
TAGILA  012744          2917#
TAGOA   002452           491    503#
TAGOB1  002304           424    442#
TAGOC   002534           520    532#
TAGOD   002630           554    563#
TAG1D   010362          2080   2091  2102  2104#
TAG1E   010406          2117   2124#
TAG1F   010432          2128   2133#
TAG1H   010472          2157#
TAG1HA  012740          2914#
TAG1K   010646          2203   2213#
TAG1KA  013130          2985   2993#
```

```
TAG1L   010476          2160#
TAG1P   011134          2276    2318#
TAG1PC  013642          3065    3210#
TAG1PD  013644          2845    3211#
TAG1Q   011010          2282#
TAG1QA  013274          3070#
TAG1R   011046          2289#
TAG1RA  013332          3077#
TAG1S   010712          2231    2239#
TAG1SA  013156          3007#
TAG1SB  013176          3009    3024#
TAG1T   010732          2242    2253#
TAG1TA  013212          3027    3035#
TAG1U   011060          2291    2296#
TAG1UA  013344          3079    3084#
TAG1W   010760          2220    2226    2257    2266#
TAG1WA  013240          3039    3054#
TAG1Z   011074          2300#
TAG1ZA  013354          3088#
TAG2A   005042          1250#
TAG2B   005126          1276#
TAG2C   005170          1294#   1316
TAG2F   005234          1295    1309    1314#
TAG2G   005216          1299    1308#
TAG2H   005250          1292    1317#
TAG3A   004452          1066    1078#
TAG3B   004512          1092    1104#
TAG3C   004552          1119    1130#
TAG3D   004574          1144#   1148
TAG4A   004700          1192#   1222
TAG4B   004724          1195    1207#
TAG4C   004744          1212#   1218
TAG4D   004764          1220#   1225
TAG4E   005004          1216    1225#
TAG4F   010016          1995#   1999    2006
TAG4G   010074          2013#   2019
TAG6A   011630          2520    2529#   2546    2548
TAG6B   011654          2533    2534*   2536#
TAG6C   011702          2541    2543#
TAG6D   012002          2569*   2575#   2578    2583*   2584
TAG6E   011764          2570#   2585
TAG7A   011450          2451    2462#   2472
TAG7B   011474          2466    2467*   2469#
TAG8A   012166          2655    2660#   2665
TAG88A  012270          2700#   2705
TEMP1   032210          4528*   4531*   4727*   4733    5585#
TEMP2   032212          4524*   4526*   4529*   5586#
TERMSW  032154          3973*   3994*   4102    4104*   4115    4117*   5571#
TEST1   011156          2340#
TEST2   011274          2354    2365    2370    2376    2386#
TEST3   011344          2414#
TG1H    012540          2812#
TG1KA   013106          2971    2977#
TG1L    012544          2815#
TG1LA   013116          2979    2983#
TG1PA   013474          3121    3137#
```

```
TG1PB   013534          3149    3154#
TG1PC   013550          3157    3164#
TG1PE   013610          3173    3185#
TG1PF   013622          3187    3194#
TG1PG   013636          3201    3205#
TITLE   023353           258    4844#
TKB     001344           202#   3668
TKS     001342           201#   3666    4340    4443*
TKSFLG  021264           181    4340#
TOPC    032156          4169*   4174*   4176    5572#
TPB     001350           204#   4370*   4434*   4512*
TPS     001346           203#   4363    4432    4510
TRANPT  017666          4039*   4048*   4065    4143#
TRAN0   017350          4066#   4093
TRAN1   017374          4067    4072#
TRAN2   017462          4090#
TRAN3   017426          4081#   4103    4116
TRAN4   017526          4076    4078    4102#
TRAN4A  017540          4105#   4135
TRAN5   017554          4080    4115#
TRAN5A  017602          4122#
TRAN5B  017612          4121    4124#
TRAN5C  017622          4119    4126#
TRAN5D  017630          4123    4125    4127#
TRAN5E  017636          4122*   4124*   4126*   4129#
TRAN5F  017642          4126    4131#
TRAN5G  017644          4122    4133#
TRAN6   017650          4084    4137#
TRAN7   017442          4085#   4141
TRNBF0  017670           459     460     578     587*    588*    591     598     607     1433    1458    1643    1683    2086
                        2097    2153*   2154*   2158    2165    2171    2175    2177*   2360    2371    2699    2710    2808*
                        2809*   2813    2826    2832    2836    2838*   2905*   2906*   2910*   2915    2927    2933    2939
                        2941*   3275*   3276*   3321    3351    3370    3374    3376*   4143    4144#   4269    4565    4592
                        4625
TRNBUF  022232           375    4559    4565#
TRNEND  020372           471    2103    2377    4146#   4288    4290*
TRNEXT  017476          4082    4089    4091    4094#   4107
TRNSMT  017330          4041    4061#
TSTABL  002076           333     334     337     353#
TSTLO   015752          3828    3830#
TSTLST  023475           318    4861#
TSTNUM  032206          4210    4244*   4248    4253    4313*   4354*   5584#
TSTTKS= 104017           129#   1033    1387    4228
TST1A   011172          2343    2350#
TST2A   011316          2392    2399#
TST2B   011342          2403    2408#
TTLAD1  011441          2426*   2453#
TTLAD2  011445          2427*   2457#
TTLTST  011400          2441#   2471
TTYENB  021626          1029    2656    2680    4220    4362    4443#   4461    4497    4527    4546    4593    4683
TTYIN = 104013           125#    267     311     735     982    1001    1081    1107    1134    1169    1330    1416    1634
                        1754    1759    1778    1789    1803    1817    1831    1845    1859    1873    1887    1901    1914
                        1927    1997    2280    2551    2566    2713    2897    3068    3116    3408    3449    4190    4254
                        4342    4398    4787    4838
TYPECL  021770          4483    4486#
TYPEIT= 104010           122#   1728    3694    3791    4328    4386    4484    4487    4488    4490    4706
```

```
TYPEQM  015320          3693    3747    3752#
TYPERA  021676          4464#   4481    4485    4491
TYPER1  021750          4475    4480#
TYPER2  021764          4484#
TYPER3  021666          4462#   4473
TYPT1   022620          4688#   4695
TYPT2   022624          4689#   4691
UPAROW  032030          4383    5527#
UPDATE  023274           804     909     936     963    4823#
UPDAT1  023304           316     336    3727    4825#
WAITGN= 104034           142#   1579    1587    1596    1604    1612
WAITG1  006510          1634#   1641
WAITG2  006540          1643#   1656    1658    1671
WAITG3  006576          1655#
WORD2   023206          4797#   4807
X     = 000013            47#    456     457#    481     482#    515     516#    545     546#    576     577#    616     617#
                         632     633#    709     710#    789     790#
XADCNT  006670           189    1682#
XADRES  020374           188    4151#   4158
XASEMB  023156           179    4787#
XASEM1  023202          4794#   4802
XAVRAG  015702           191    3818#
XBCDBI  022430           190    4640#
XBINDE  022574           193    4683#
XBUF0   001364           213#   4087*
XCHANE  020512           192    4188#   4192
XCSR0   001362           212#   4085
XDELAY  022116          4524#
XDIV    031772          1527    5516#
XDLAYL  022126           170     182    4526#
XDLAY2  022160          4533#
XDLAY3  022144          4529#   4530    4532
XDSTG1  017206          3986    3994#
XDSTIN  017164           186    3982#
XERMES  020540           184    4203#
XGETRG  023102           169    4768#
XHIGH   032014          1537    5521#
XINT0   001372           217#
XLDADD  017320           173    3970    3974    3983    3996    4048#
XLDCHR  017302           172    4038#
XLD1    017312          4040#   4049
XLOOP   021216          4307    4315#   4316
XLOW    032003          1533    5519#
XLVL0   001374           218#    294
XNODLY  021544           196    4420#
XNULL   021554           183    4426#
XNULL1  021564           185    4428#
XNULL2  021604          4427    4432#   4436
XOCTPR  022010           178    4497#
XPDMES  015662          3804*   3806#
XPRCNT  021376           166    4377#
XPRCT1  021432          4378    4380    4386#
XPRINT  021650           176    4458#
XPRTRB  022246           197    4574#
XRANGN  020776           175    4269#   4289
XRECR0  016130           171    3887#
```

```
XSAVRG  023026            168   4750#
XSCOPE  020636            167   4228#
XSETUP  021276            195   4349#
XSOURC  017144            187   3969#
XSPACE  021234            180   4326#  4330
XTTYIN  014716            105    177   3661#  3671  3754
XTYPE1  021366           4367*  4369#
XTYPE2  021370           4366   4370#
XTYPIT  021340            174   4362#
XWATGN  006474            194   1631#
X1MV    031753           1517   5512#
X10UV   031765           1523   5515#
X100UV  031757           1520   5513#
Y       = 000002           48#
ZERO    022706           4687*  4702  4704*  4708#
.       = 032614            91#    96#   101#   104#  107#  109#  152#  293  322  324  421#  427  431
                            462    470   486    493   523   549   557   566  594  600  603   620  647
                            666#   710   719    726   817   822   827   832  839  853  867   880  910
                            915    939   944    949   964   969   1041  1065 1076# 1091 1102# 1118 1129#
                           1171   1173  1189   1194  1205#  1213  1252  1257 1262 1277 1298  1331 1337
                           1352   1441  1457   1462  1466   1470  1501  1516 1519 1522 1550  1638 1660
                           1691   1701  1725   1771  1772   1782  1783  1964 1969 2048 2077  2083 2088
                           2093   2099  2116   2122# 2125   2131  2163  2167 2179 2202 2217  2223 2230
                           2241   2254  2260   2282  2290   2295# 2301  2306 2342 2351 2357  2362 2367
                           2373   2391  2397#  2400  2406   2450  2464  2519 2531 2568 2652  2661 2682
                           2707   2821  2828   2840  2919   2943  2970  2978 2984 2994 3000  3008 3026
                           3036   3048  3070   3078  3083#  3089  3094  3120 3148 3172 3182# 3186 3283
                           3311#  3313  3326   3378  3468   3477  3484# 3517 3532 3555# 3597  3604# 3686
                           3707   3756# 3800   3826  3831   3833  3858  3864 3866 3891 3909#  3934 3937
                           3943   3947  3951   3985  4004   4019  4021  4023 4026 4071 4073  4086 4096
                           4098   4106  4129   4130  4145#  4156  4219  4249 4282 4285 4341  4364 4400
                           4408   4414  4433   4468  4503   4511  4525  4542 4595 4598 4627  4632 4709
                           4790   4811  5594#  5598#
```

```
CTX       112#    456     481     515     545     576     616     632     709     789
SIO       112#
TA        112#
TS        111#    456     481     515     545     576     616     632     709     789


. ABS.  032614     000


 ERRORS DETECTED:  0

 CZPMAC.BIN,CZPMAC.LST/CRF/SOL/NL:TOC=CZPMAC.P11
 RUN-TIME: 5 13 2 SECONDS
 RUN-TIME RATIO: 113/21=5.3
 CORE USED:  13K  (25 PAGES)
```