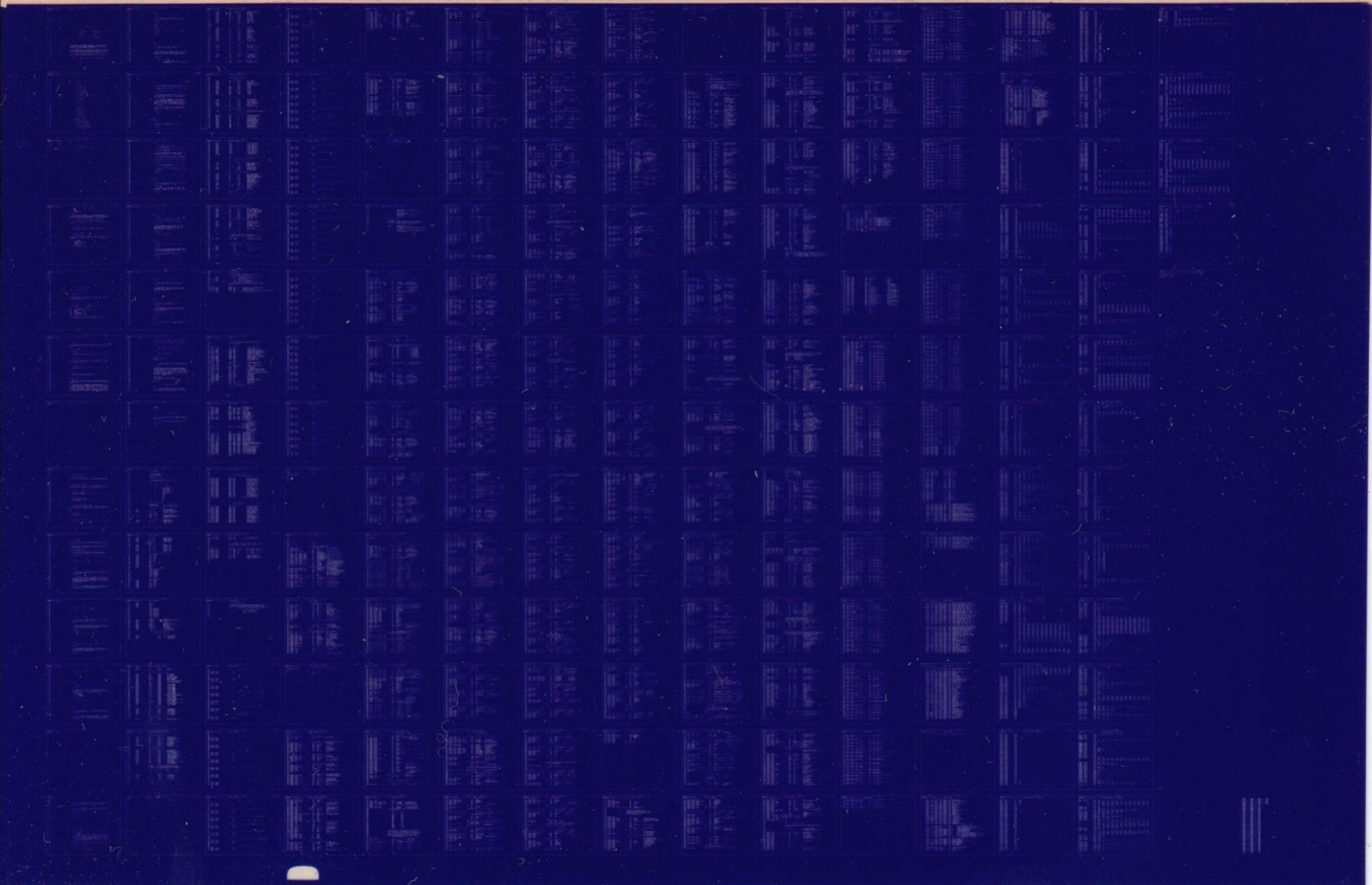


RM03/2

DISKLESS 2
CZRMKB0

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IDENTIFICATION

PRODUCT CODE:	AC-E376B-MC
PRODUCT NAME:	CZRMKB0 RM03/RM02 DISKLESS DIAGNOSTIC, PART II
DATE CREATED:	1-MARCH-78
MAINTAINER:	DIAGNOSTIC GROUP
AUTHOR:	DOUG RIIKONEN

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6. XXDP COMPATIBILITY

7. OPERATING SYSTEM COMPATIBILITY

6. TEST DESCRIPTION

1.0 INTRODUCTION

1.1 ABSTRACT

THE RM03 DISKLESS DIAGNOSTIC IS A STAND ALONE PROGRAM WHICH USES FUNCTIONAL AND DIAGNOSTIC MEANS TO VERIFY THE OPERABILITY OF THE RM03 DISK SUBSYSTEM EXCLUDING AND INDEPENDENTLY OF THE STORAGE MODULE DRIVE. IN PARTICULAR, THE PROGRAM SERVES THE FOLLOWING PURPOSES:

TO DETECT ERRORS AND FAULTS IN THE RM03 MASSBUS ADAPTER;

TO RESOLVE HARDWARE FAILURES IN RM03 TO A FIELD REPLACEABLE MODULE OR MODULES.

1.2 UNIT UNDER TEST

THE UNIT UNDER TEST (UUT) IS THE RM03 DISK SUBSYSTEM, EXCLUDING THE STORAGE MODULE DISK DRIVE AND THE MASSBUS CONTROLLER.

2.0 OPERATING REQUIREMENTS

2.1 HARDWARE REQUIREMENTS

THE FOLLOWING MINIMUM HARDWARE CONFIGURATION, ASSUMED TO BE OPERATIONAL, IS REQUIRED TO LOAD AND EXECUTE THE RM03 DISKLESS DIAGNOSTIC:

PDP-11 PROCESSOR

16 K MEMORY

KW11-L OR LW11-P CLOCK

PROGRAM LOADING DEVICE

TERMINAL

RH CONTROLLER

UNIT UNDER TEST,

WHERE THE UNIT UNDER TEST CONSISTS OF ONE TO EIGHT RM03 ADAPTERS.

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2.2 MEDIA REQUIREMENTS

NONE

2.3 PREREQUISITE DIAGNOSTIC PROGRAMS

CZRMJ- ,RM03/02 DISKLESS DIAGNOSTIC PART 1

3.0 OPERATING PROCEDURE

3.1 LOADING

THE PROGRAM MAY BE LOADED BY EITHER PAPER TAPE, USING THE STANDARD PAPER TAPE LOADING PROCEDURE, OR XXDP MEDIA, USING THE APPROPRIATE LOADING DEVICE.

3.2 SWITCH OPTIONS

THE FOLLOWING SWITCH OPTIONS ARE INVOKED WHEN THE APPROPRIATE SWITCH IS ON.

SW15	HALT ON ERROR
SW14	LOOP ON TEST (CURRENTLY BEING EXECUTED)
SW13	INHIBIT ERROR TYPEOUTS
SW12	UNUSED
SW11	INHIBIT TEST ITERATIONS
SW10	BELL ON ERROR
SW09	LOOP ON ERROR
SW08	LOOP ON TEST IN SW07-00

THE LOW ORDER 8 SWITCHES ARE USED IN CONJUNCTION WITH SW08 TO SPECIFY THE OCTAL NUMBER OF THE TEST WHICH THE PROGRAM WILL LOOP ON.

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3.3 STARTING

THE PROGRAM STARTS AT LOCATION 200 WHICH USES DEFAULT VALUES OF PARAMETERS AND PROVIDES MAXIMUM TESTING WITH THE SWITCH REGISTER EQUAL TO ZERO.

4.0 OPERATOR INTERFACE

4.1 PROGRAM ID

THE PROGRAM TYPES ITS NAME AND MAINDEC NUMBER THE FIRST TIME IT IS STARTED AFTER BEING LOADED.

4.2 PROGRESS REPORTS

AN END OF PASS REPORT OCCURRS EACH TIME THE PROGRAM IS EXECUTED FOR ALL ADAPTERS IN THE TEST QUE. THE END OF PASS REPORT INCLUDES A MESSAGE AND AN ERROR SUMMARY.

4.3 PERFORMANCE REPORT

NO PERFORMANCE REPORTS ARE GIVEN DURING THE EXECUTION OF THE PROGRAM.

4.4 PROGRAM HALTS

THERE ARE NO SCHEDULED HALTS DURING THE EXECUTION OF THE PROGRAM. PROCESSOR HALTS ARE DUE TO THE TRAP CATCHER.

4.5 ERROR REPORTS

THE RM03 DISKLESS DIAGNOSTIC PROVIDES COMPREHENSIVE ERROR REPORTS INTENDED TO (1) AID IN FAULT RESOLUTION AND (2) MINIMIZE REFERENCES TO PROGRAM LISTINGS.

THE FIRST LINE OF THE ERROR REPORT CONTAINS THE NUMBER OF THE UNIT BEING TESTED, THE TEST NUMBER, THE ERROR NUMBER AND THE VALUE OF THE PROGRAM COUNTER WHERE THE ERROR WAS CALLED. THIS LINE IS FOLLOWED BY THE ERROR MESSAGE: SEVERAL LINES OF TEXT WHICH GIVE A COMPREHENSIVE DESCRIPTION OF THE ERROR, AND A LIST OF FAILING MODULES IN ORDER OF DECREASING PROBABILITY. THE ERROR MESSAGE IS NORMALLY FOLLOWED BY ONE OR MORE PAIRS OF LINES CONTAINING DATA HEADERS AND DATA PERTINENT TO THE ERROR, INCLUDING EXPECTED AND ACTUAL TEST

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RESULTS.

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269 5.0 ENVIRONMENTAL SUPPORT

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271 5.1 PROCESSOR COMPATIBILITY

272 THE RM03 DISKLESS DIAGNOSTIC IS EXECUTABLE ON ANY PDP-11
273 PROCESSOR, PROVIDING PREVIOUSLY MENTIONED HARDWARE REQUIREMENTS ARE
274 MET.
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279 5.2 DUAL PORT CONFIGURATIONS

280 THE RM03 DISKLESS DIAGNOSTIC IS NOT EXECUTABLE ON RM03 SUBSYSTEMS
281 HAVING THE DUAL PORT OPTION UNLESS THE DUAL PORT SWITCH IS SET TO THE
282 APPROPRIATE PORT (A OR B) AND NOT TO THE PROGRAMMABLE POSITION (A/B).
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286 5.3 MEMORY PARITY HARDWARE

287 MEMORY PARITY HARDWARE WILL NOT BE USED DURING THE EXECUTION OF
288 THE RM03 DISKLESS DIAGNOSTIC.
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292 5.4 MEMORY MANAGEMENT HARDWARE

293 MEMORY MANAGEMENT HARDWARE WILL NOT BE USED DURING THE RM03
294 DISKLESS DIAGNOSTIC.
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298 5.5 ACT11, APT11 COMPATIBILITY

299 THE RM03 DISKLESS DIAGNOSTIC PROGRAM IS COMPATIBLE WITH ACT11 AND
300 APT11 IN BOTH DUMP AND AUTOMATIC MODES. FURTHER, THE PROGRAM WILL
301 EXECUTE A QUICK PASS DURING THE FIRST PASS IN SUPPORT OF QUICK VERIFY
302 MODE.
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306 5.6 XXDP COMPATIBILITY

307 THE RM03 DISKLESS DIAGNOSTIC PROGRAM IS COMPATIBLE WITH XXDP IN
308 DUMP AND CHAIN MODES.
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312 5.7 OPERATING SYSTEM COMPATIBILITY

313 THE PROGRAM IS NOT REQUIRED TO BE COMPATIBLE WITH ANY OPERATING
314 SYSTEM.
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6.0 TEST DESCRIPTION

THE PROGRAM IS DESIGNED IN A BOTTOM UP MANNER SUCH THAT EACH TEST GENERALLY USES A MORE COMPLEX SUBSET OF HARDWARE THAN THE PREVIOUS TEST.

MODULE CALLOUT IS PREDICATED ON THE ASSUMPTION THAT EARLIER TESTS HAVE BEEN COMPLETED WITHOUT ERROR AND THAT ERRORS ARE DUE TO SINGLE, NONTRANSIENT HARDWARE FAILURES.

THE 'RM03 DISKLES DIAGNOSTIC' CAN BE EXECUTED USING AN RH70 OR AN RH11 MASSBUS CONTROLLER.

UNLESS SPECIFIED BY THE OPERATOR OR BY THE ENVIRONMENT TABLE THE TEST IS REPEATED FOR EACH POSSIBLE DEVICE STARTING WITH DEVICE 0.

THE MODULES WHICH MAY BE CALLED OUT DURING THE EXECUTION OF THE TEST ARE AS FOLLOWS:

IF
CS
DS
MASSBUS MODULE

THE RADIAL MODULE (RD) IS NOT TESTED BY THIS PROGRAM.

TRANSFER TEST

PURPOSE:

TO VERIFY THAT THE RM03 CAN COMPLETE A REGISTER TRANSFER ON THE MASSBUS, AND, IN PARTICULAR, TO VERIFY THAT 'TRANSFER' IS NOT STUCK IN AN INACTIVE STATE.

PROCEDURE:

THE PROGRAM WRITES AND READS REMOTE REGISTERS FOR THE SELECTED DEVICE. REGISTER CONTENTS AND PARITY ERRORS ARE IGNORED, AND THE TEST FAILS IF A 'NONEXISTENT DEVICE ERROR' OR BUS TIMEOUT OCCURS FOR EVERY REGISTER ACCESS. IF THE TEST FAILS THE PROGRAM JUMPS TO THE END OF PASS HANDLER WHICH SELECTS THE NEXT DEVICE TO BE TESTED.

PROBABLE FAULT:

THE TEST FAILS IF THE SELECTED DEVICE IS NONEXISTENT OR IS SWITCHED TO THE PROGRAMMABLE POSITION OR TO THE ALTERNATE PORT. THE FOLLOWING FAULTS ARE APPLICABLE ONLY WHEN THE DEVICE IS PRESENT AND IS SWITCHED TO THE APPROPRIATE PORT.

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1. IF MODULE
2. ASYNCHRONOUS MASSBUS MODULE
3. CS MODULE

CTOD TEST

PURPOSE :

TO VERIFY THAT DATA CAN BE TRANSFERRED TO AND FROM THE RM03
USING THE CONTROL BUS AND, IN PARTICULAR, TO VERIFY THAT
"CONTROLLER TO DEVICE" HAS NOT FAILED.

PROCEDURE:

THE TEST WRITES ONES IN REMOTE REGISTERS THEN READS EACH REGISTER WHICH WILL WRITE ZEROS IN THE REGISTER IF 'IF3 CTOD HOLD H' IS STUCK AT ONE. THE TEST THEN READS AS MANY REMOTE REGISTERS AS ARE NECESSARY TO OBTAIN ONE OR MORE ONE BITS.

PROBABLE FAULT:

1. IF MODULE
2. ASYNCHRONOUS MASSBUS MODULE

MASSBUS INITIALIZE TEST

PURPOSE :

TO VERIFY THAT THE MASSBUS ADAPTER IS BEING INITIALIZED BY THE MASS BUS.

PROCEDURE:

USING CONTROLLER CLEAR TO INITIALIZE THE SELECTED UNIT, THIS TEST THEN READS MASSBUS ADAPTER REGISTERS TO VERIFY THAT AT LEAST ONE BIT IS CLEARED. MASSBUS ADAPTER REGISTERS ARE PRESET TO A NON ZERO VALUE PRIOR TO CONTROLLER CLEAR.

PROBABLE FAULT:

1. ASYNCHRONOUS MASSBUS MODULE
2. IF MODULE
3. CS MODULE

CLEAR STUCK ACTIVE TEST

PURPOSE:

TO VERIFY THAT 'MBA CLR L' ON THE CS MODULE IS NOT STUCK IN AN ACTIVE STATE.

PROCEDURE:

CONTROLLER CLEAR IS USED TO INITIALIZE THE SELECTED UNIT, AFTER WHICH 1'S ARE WRITTEN IN ERROR REGISTERS 1 AND 2 AND MAINTENANCE REGISTER 1. IF ANY 1 BITS CAN BE READ BACK THE TEST IS OK, ELSE, 'MBA CLR L' IS PROBABLY STUCK ACTIVE.

PROBABLE FAULT:

1. CS MODULE
2. IF MODULE
3. ASYNCHRONOUS MASSBUS MODULE

TRISTATE TRANSFER TEST

PURPOSE:

TO VERIFY THAT THE PATH TO AND FROM THE MASSBUS ADAPTER TRI-STATE REGISTER BUS IS NOT STUCK AT ONE OR ZERO AND THAT EACH BIT POSITION IS INDEPENDENT.

PROCEDURE:

THIS TEST PRESETS MASSBUS ADAPTER REGISTERS TO A NONZERO VALUE, THEN, ASSUMING THE REGISTERS ARE PRESET, IT CLEARS THEM USING A MOVE INSTRUCTION. THE TEST THEN READS AS MANY REGISTERS AS IS NECESSARY TO OBTAIN ONE OR MORE ZEROS FROM EACH BIT POSITION.

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THE TEST CLEARS MASSBUS ADAPTER REGISTERS, THEN, ASSUMING THE REGISTER ARE CLEARED, IT LOADS THEM WITH ONES AND READS AS MANY REGISTERS AS IS NECESSARY TO OBTAIN ONE OR MORE ONE BITS IN EACH BIT POSITION.

FINALLY, THE TEST WRITES A SINGLE ONE BIT PATTERN IN BIT 0 OF SELECTED REMOTE REGISTERS AND VERIFIES THAT THE PATTERN CAN BE READ BACK. THE ONE BIT IS SHIFTED AND THE TEST REPEATED FOR ALL BIT POSITIONS.

PROBABLE FAULT:

1. ASYNCHRONOUS MASSBUS MODULE
2. IF MODULE
3. CS MODULE
4. DS MODULE

REGISTER SELECT TEST

PURPOSE:

TO VERIFY THAT THE REGISTER SELECT LINES ARE NOT IN A STUCK POSITION.

PROCEDURE:

EACH REGISTER SELECT LINE IS TESTED BY WRITING ZEROS IN THOSE DEVICE REGISTERS FOR WHICH THE LINE MUST BE ZERO, THEN WRITING ONES IN THOSE DEVICE REGISTERS FOR WHICH THE LINE MUST BE ONE. THE ZERO REGISTER IS READ BACK AND IF THE SELECT LINE IS STUCK AT ZERO, THE ZERO REGISTER WILL CONTAIN ONES. THE PROCESS IS REPEATED TO DETECT A STUCK AT ONE FAULT, EXCEPT IN THIS CASE, THE ONES REGISTER IS WRITTEN FIRST.

REGISTER SELECT LINES 1, 2, 4 AND 8 ARE TESTED IN THIS MANNER; SELECT LINE 16 IS EXPLICITLY TESTED IN THE 'ILR TEST'.

PROBABLE FAULT:

1. IF MODULE
2. ASYNCHRONOUS MASSBUS MODULE

DRIVE TYPE TEST

PURPOSE:

TO TEST THE 'DRIVE TYPE' REGISTER, RMDT.

PROCEDURE:

THE PROGRAM READS RMDT AND VERIFIES THAT THE RESULT
CORRESPONDS TO A SINGLE PROT OR DUAL PROT RM03 DRIVE

PROBABLE FAULT:

1. IF MOULE

DEVICE AVAILABLE TEST

PRUPOSE:

TO VERIFY THAT DEVICE AVAILABLE STATUS IS SET.

PROCEDURE:

THE PROGRAM TESTS 'DVA',BIT 11 OF RMCS1.

PROBABLE FAULT:

1. IF MODULE

SEARCH TIMEOUT TEST

PURPOSE:

TO VERIFY THAT THE SEARCH TIMEOUT ONE SHOT SETS 'OPI',
EXCEPT WHEN 'SEARCH TO DISABLE' IS ACTIVE.

PROCEDURE:

WITH SEARCH TIMEOUT DISABLED, THE TEST EXECUTES A DATA
COMMAND TO THE POINT WHERE 'P ENABLE SEARCH' IS ASSERTED.
AFTER WAITING A SUFFICIENT PERIOD AND VERIFYING THAT OPI
IS NOT SET, THE TEST ENABLES SEARCH TIMEOUT AND VERIFIES
THAT OPI SETS.

PROBABLE FAULT:

1. CS MODULE

NOTE: IT IS ASSUMED THAT THE 'SET OPI TEST' HAS
ALREADY PASSED, THUS MAKING THE IF MODULE
AN IMPROBABLE FAULT.

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SET DTE TEST

PURPOSE:

IN ADDITION TO VERIFYING THAT 'DRIVE TIMING ERROR' CAN BE SET BY THE CS MODULE, THIS TEST ALSO VERIFIES

- * THAT 'MAINTENANCE SECTOR COMPARE' IS NOT STUCK AT ONE OR ZERO.
- * THAT 'ENABLE SEARCH' IS NOT STUCK AT ONE OR ZERO.

PROCEDURE:

(1) INITIALIZE AND VERIFY THAT 'DTE' IS RESET, THEN SET MAINTENANCE INDEX PULSE AND VERIFY THAT DTE IS STILL RESET. THIS TEST WILL INSURE THAT THE SECTOR COMPARE FLOP IS NOT STUCK AT ONE.

(2) EXECUTE A DATA COMMAND IN MAINTENANCE MODE TO THE POINT WHERE SEARCH IS ENABLED, I.E., P EN SEARCH H IS ACTIVE. SET AND RESET THE SECTOR PULSE TO SET 'CS3 EN SEARCH' FLOP, AND CLOCK 'CSS SECTOR COMPARE' FLOP WHICH SHOULD NOT SET. SET SECTOR PULSE AND VERIFY THAT DTE IS RESET. THIS TEST FAILS IF J INPUT TO SECTOR COMPARE FLOP IS STUCK AT ONE.

REPEAT, BUT SET MAINTENANCE SECTOR COMPARE AND VERIFY THAT DTE SETS. THIS TEST FAILS IF MAINTENANCE SECTOR COMPARE IS STUCK AT ZERO.

PROBABLE FAULT:

1. CS MODULE
2. DS MODULE

FORMAT CHANGE TEST

PURPOSE:

TO VERIFY THAT A CHANGE IN FORMAT INHIBITS SEARCH ENABLE UNTIL THE NEXT INDEX PULSE.

PROCEDURE:

THE TEST WILL USE 'DTE' FOR VISIBILITY OF 'CS3 EN

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SEARCH H'.

THE FOLLOWING STEPS ARE EXECUTED:

(1) INITIALIZE AND SET THE FORMAT TO 18 BIT MODE
TO SET 'CS3 FMT CHANGE' FLOP.

(2) EXECUTE A DATA COMMAND TO THE POINT WHERE SEARCH
IS ENABLED BY THE SEQUENCER.

(3) SET 'MAINTENANCE SECTOR COMPARE', THEN SET
'MAINTENANCE SECTOR PULSE' TO CLOCK 'CS3 EN SEARCH' FLOP
WHICH SHOULD NOT SET BECAUSE OF THE FORMAT CHANGE.

(4) RESET SECTOR PULSE TO CLOCK 'CS5 SECTOR COMPARE'
FLOP WHICH WILL NOT SET IF 'CS3 EN SEARCH H' IS INACTIVE.

(5) SET SECTOR PULSE AND VERIFY THAT DRIVE TIMING
ERROR IS RESET.

(6) SET AND RESET INDEX PULSE TO CLEAR THE FORMAT
CHANGE FLOP.

(7) SET AND RESET SECTOR PULSE TO SET 'CS3 EN SEARCH'
FLOP AND 'CS5 SECTOR COMPARE' FLOP.

(8) SET SECTOR COMPARE AND VERIFY THAT DTE IS SET.

REPEAT THE TEST WITH A FORMAT CHANGE FROM 18 BIT MODE
TO 16 BIT MODE.

PROBABLE FAULT:

1. CS MODULE

PROM STROBE TEST

PURPOSE:

TO VERIFY THAT WORD CLOCK AND PROM STROBE CAN BE MAN-
IPULATED IN MAINTENANCE MODE.

PROCEDURE:

INITIALIZE AND SET 16 BIT MODE, THEN SEQUENCE THE
MAINTENANCE CLOCK UNTIL PROM STROBE SETS. ISSUE -- MORE
MAINTENANCE CLOCK PULSES AND VERIFY THAT PROM STROBE RESETS.

PROBABLE FAULT:

1. CS MODULE

2. DS MODULE

SYNC WORD COUNT INHIBIT TEST

PURPOSE:

TO VERIFY THE FOLLOWING DURING READ COMMAND:

- * THAT 'CS4 P LFS' (LOOKING FOR SYNC) GOES ACTIVE.
- * THAT 'LOOKING FOR SYNC' INHIBITS THE WORD COUNT

PROCEDURE:

A READ COMMAND IS SETUP AND EXECUTED TO THE POINT WHERE 'LOOKING FOR SYNC' SHOULD BE ACTIVE, WITH THE PROGRAM VERIFYING THE TRANSITION OF THE SIGNAL. THE PROGRAM THEN SUPPLIES A SERIES OF BIT CLOCKS AND VERIFIES THAT 'PROM STROBE' NEVER GOES ACTIVE.

PROBABLE FAULT:

1. CS MODULE IF LFS FAILT,
2. DS MODULE IF PROM STROBE FAILS.

SYNC DETECTION TEST

PURPOSE:

TO VERIFY THAT THE APPROPRIATE SYNC PATTERN IS RECOGNIZED.

PROCEDURE:

THE TEST EXECUTES A READ COMMAND IN MAINTENANCE MODE, USING BIT 10 OF THE MAINTENANCE REGISTER (RMMR1) TO SIMULATE THE SYNC BIT STREAM, AND USING PROM STROBE TO DETERMINE IF THE SYNC PATTERN HAS BEEN DETECTED.

THE SYNC PATTERN IS 00011001, WITH THE LEFT MOST BIT REPRESENTING THE LAST BIT OF THE STREAM.

PROBABLE FAULT:

1. DS MODULE
2. CS MODULE

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ABORT SYNC DETECTION TEST

PURPOSE:

TO VERIFY THAT 'WORD COUNT INHIBIT' IS RESET IF A
'DRIVE TIMING ERROR' OCCURS DURING SYNC DETECTION.

PROCEDURE:

A READ COMMAND IS INITIATED IN MAINTENANCE MODE. WHEN
'LOOKING FOR SYNC' GOES ACTIVE, THE TEST FORCES A DRIVE
TIMING ERROR AND USES PROM STROBE TO VERIFY THAT 'WORD
COUNT INHIBIT' HAS BEEN RESET.

PROBABLE FAULT:

1. DS MODULE

SYNC GENERATION TEST

PURPOSE:

TO VERIFY THAT THE APPROPRIATE SYNC PATTERN IS
GENERATED DURING A FORMAT OPERATION.

PROCEDURE:

THE TEST EXECUTES A WRITE HEADER AND DATA COMMAND
IN MAINTENANCE MODE, AND VERIFIES THAT THE CORRECT SYNC
PATTERN IS GENERATED BY MONITORING WRITE DATA AT THE MAIN-
TENANCE REGISTER (RMMR1).

PROBABLE FAULT:

1. DS MODULE

WRITE HEADER TEST

PRUPOSE:

TO TEST THE OPERATION OF (1) THE DATA BUFFER AND SHIFT
REGISTER AS WELL AS (2) THE ECC GENERATION DURING WRITE.

PROCEDURE:

A WRITE HEADER AND DATA COMMAND IS EXECUTED IN MAINTENANCE
MODE. THE TEST VERIFIES HEADER WORDS ONE AND TWO AND THE
CRC CHARACTER USING THE WRITE DATA BIT OF THE MAINTENANCE
REGISTER.

THE TEST USES CYLINDER 822, TRACK 4, SECTOR 31 AND
16 BIT FORMAT, WHICH CORRESPONS TO THE FOLLOWING

HEADER:

WORD 1 - 1101001100110110

WORD 2 - 0000010000011111

PROBABLE FAULT:

DS MODULE OR MASSBUS MODULE
HEADER COMPARE TEST

PURPOSE:

TO CHECK THE OPERATION OF (1) THE SHIFT REGISTER AND
DATA BUFFER AS WELL AS THE (2) CRC GENERATOR DURING
READ.

PROCEDURE:

THE TEST EXECUTES A READ HEADER AND DATA COMMAND IN
MAINTENANCE MODE USING BIT 10 OF THE MAINTENANCE REGISTER
(RMMR1) TO SIMULATE THE DATA BITS FOR THE FIRST AND SECOND
HEADER WORDS AS WELL AS THE CRC CHARACTER. THE CRC CHARACTER IS
IS FAULTED, AND THE TEST VERIFIES THAT A CRC ERROR IS DETECTED.
ADDITIONALLY, THE TEST VERIFIES THAT HEADER WORDS ONE AND TWO
ARE CORRECTLY TRANSFERD TO MEMORY.
THE TEST USES THE SAME HEADER AS IN THE PREVIOUS TEST EXCEPT
THAT BIT 15 IS INVERTED.

PROBABLE FAULT:

DS OR IF MODULE IF CRC ERROR NOT DETECTED;
DS OR MASSBUS MODULE IF DATA INCORRECT

ECC GENERATION TEST

PURPOSE:

TO CHECK ECC OPERATION DURING WRITE.

PROCEDURE:

A WRITE DATA COMMAND IS EXECUTED IN MAINTENANCE
MODE. ALL ONES DATA FIELD IS USED, AND THE TEST VERIFIES
THE ECC CHARACTER VIA THE WRITE DATA BIT OF THE MAINTENANCE
REGISTER. THE DATA FIELD IS NOT VERIFIED.

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ECC DETECTION TEST

PURPOSE :

TO CHECK THE ECC GENERATION DURING READ.

PROCEDURE :

THE TEST EXECUTES A READ DATA COMMAND IN MAINTENANCE MODE, AN ALL ONES DATA FIELD IS USED, HOWEVER THE LAST DATA WORD IS FAULTED.

THE TEST VERIFIES (1) THAT AN ECC ERROR IS DETECTED AND THAT (2) THE POSITION AND PATTERN REGISTERS ARE VALID.

PROBABLE FAULT:

DS MODULE

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904      ;PROGRAM REVISION #001
905
906      .TITLE CZRMKB0 RM03/2 DSKLS PRT 2
907      ;*COPYRIGHT (C) 1978
908      ;*DIGITAL EQUIPMENT CORP.
909      ;*MAYNARD, MASS. 01754
910      ;*
911      ;*PROGRAM BY DOUG RIIKONEN
912      ;*
913      ;*THIS PROGRAM WAS ASSEMBLED USING THE PDP-11 MAINDEC SYSMAC
914      ;*PACKAGE (MAINDEC-11-DZQAC-C3), JAN 19, 1977.
915      ;*
916      000001 $TN=1
917      .SBTTL OPERATIONAL SWITCH SETTINGS
918      ;*
919      ;*      SWITCH      USE
920      ;*      -----
921      ;*      15      HALT ON ERROR
922      ;*      14      LOOP ON TEST
923      ;*      13      INHIBIT ERROR TYPEOUTS
924      ;*      11      INHIBIT ITERATIONS
925      ;*      10      BELL ON ERROR
926      ;*      9      LOOP ON ERROR
927      ;*      8      LOOP ON TEST IN SWR<7:0>
928      ;*      7      TN128
929      ;*      6      TN64
930      ;*      5      TN32
931      ;*      4      TN16
932      ;*      3      TN8
933      ;*      2      TN4
934      ;*      1      TN2
935      ;*      0      TN1
936      .SBTTL BASIC DEFINITIONS
937
938      ;*INITIAL ADDRESS OF THE STACK POINTER *** 1100 ***
939      001100 STACK= 1100
940      .EQUIV EMT,ERROR      ;;BASIC DEFINITION OF ERROR CALL
941      .EQUIV IOT,SCOPE      ;;BASIC DEFINITION OF SCOPE CALL
942
943      ;*MISCELLANEOUS DEFINITIONS
944      000011 HT= 11      ;;CODE FOR HORIZONTAL TAB
945      000012 LF= 12      ;;CODE FOR LINE FEED
946      000015 CR= 15      ;;CODE FOR CARRIAGE RETURN
947      000200 CRLF= 200    ;;CODE FOR CARRIAGE RETURN-LINE FEED
948      177776 PS= 177776  ;;PROCESSOR STATUS WORD
949      .EQUIV PS,PSW
950      177774 STKLM= 177774 ;;STACK LIMIT REGISTER
951      177772 PIRQ= 177772 ;;PROGRAM INTERRUPT REQUEST REGISTER
952      177570 DSWR= 177570 ;;HARDWARE SWITCH REGISTER
953      177570 DDISP= 177570 ;;HARDWARE DISPLAY REGISTER
954
955      ;*GENERAL PURPOSE REGISTER DEFINITIONS
956      000000 R0= %0      ;;GENERAL REGISTER
957      000001 R1= %1      ;;GENERAL REGISTER
958      000002 R2= %2      ;;GENERAL REGISTER
959      000003 R3= %3      ;;GENERAL REGISTER
```

```
960      000004      R4=      %4      ; GENERAL REGISTER
961      000005      R5=      %5      ;:GENERAL REGISTER
962      000006      R6=      %6      ;:GENERAL REGISTER
963      000007      R7=      %7      ;:GENERAL REGISTER
964      000006      SP=      %6      ;:STACK POINTER
965      000007      PC=      %7      ;:PROGRAM COUNTER
966
967      ;*PRIORITY LEVEL DEFINITIONS
968      000000      PR0=      0      ;:PRIORITY LEVEL 0
969      000040      PR1=      40     ;:PRIORITY LEVEL 1
970      000100      PR2=      100    ;:PRIORITY LEVEL 2
971      000140      PR3=      140    ;:PRIORITY LEVEL 3
972      000200      PR4=      200    ;:PRIORITY LEVEL 4
973      000240      PR5=      240    ;:PRIORITY LEVEL 5
974      000300      PR6=      300    ;:PRIORITY LEVEL 6
975      000340      PR7=      340    ;:PRIORITY LEVEL 7
976
977      ;*'SWITCH REGISTER' SWITCH DEFINITIONS
978      100000      SW15=     100000
979      040000      SW14=     40000
980      020000      SW13=     20000
981      010000      SW12=     10000
982      004000      SW11=     4000
983      002000      SW10=     2000
984      001000      SW09=     1000
985      000400      SW08=     400
986      000200      SW07=     200
987      000100      SW06=     100
988      000040      SW05=     40
989      000020      SW04=     20
990      000010      SW03=     10
991      000004      SW02=     4
992      000002      SW01=     2
993      000001      SW00=     1
994      .EQUIV      SW09,SW9
995      .EQUIV      SW08,SW8
996      .EQUIV      SW07,SW7
997      .EQUIV      SW06,SW6
998      .EQUIV      SW05,SW5
999      .EQUIV      SW04,SW4
1000     .EQUIV      SW03,SW3
1001     .EQUIV      SW02,SW2
1002     .EQUIV      SW01,SW1
1003     .EQUIV      SW00,SW0
1004
1005     ;*DATA BIT DEFINITIONS (BIT00 TO BIT15)
1006     100000      BIT15=     100000
1007     040000      BIT14=     40000
1008     020000      BIT13=     20000
1009     010000      BIT12=     10000
1010     004000      BIT11=     4000
1011     002000      BIT10=     2000
1012     001000      BIT09=     1000
1013     000400      BIT08=     400
1014     000200      BIT07=     200
1015     000100      BIT06=     100
```

1050					
1051	004000	DVA	=	BIT11	;DEVICE AVAILABLE-READ ONLY
1052	000040	F4	-	BIT05	;FUNCTION CODE
1053	000020	F3	=	BIT04	;FUNCTION CODE
1054	000010	F2	-	BIT03	;FUNCTION CODE
1055	000004	F1	=	BIT02	;FUNCTION CODE

[illegible]

1056	0C0002	FO	=	BIT01	;FUNCTION CODE
1057	000001	GO	=	BIT00	;GO BIT
1058	000077	FNCMSK	=	000077	;FUNCTION CODE MASK
1059					
1060					;FUNCTION CODES (BITS 01-05 OF RMCS1)
1061					
1062	000000	NOP	=	000000	;NOP COMMAND
1063	000002	ILF02	=	000002	;ILLEGAL COMMAND
1064	000004	SEEK	=	000004	;SEEK COMMAND
1065	000006	RECAL	=	000006	;RECALIBRATE COMMAND
1066	000010	DRVCLR	=	000010	;DRIVE CLEAR COMMAND
1067	000012	RELEASE	=	000012	;RELEASE COMMAND
1068	000014	OFFSET	=	000014	;OFFSET COMMAND
1069	000016	RTC	=	000016	;RETURN TO CENTERLINE COMMAND
1070	000020	RIP	=	000020	;READ IN PRESET COMMAND
1071	000022	PAKACK	=	000022	;PACK ACKNOWLEDGE COMMAND
1072	000022	PACACK	=	PAKACK	
1073	000024	ILF24	=	000024	;ILLEGAL COMMAND
1074	000026	ILF26	=	000026	;ILLEGAL COMMAND
1075	000030	SEARCH	=	000030	;SEARCH COMMAND
1076	000030	ILF30	=	000030	;ILLEGAL COMMAND
1077	000032	ILF32	=	000032	;ILLEGAL COMMAND
1078	000034	ILF34	=	000034	;ILLEGAL COMMAND
1079	000036	ILF36	=	000036	;ILLEGAL COMMAND
1080	000040	ILF40	=	000040	;ILLEGAL COMMAND
1081	000042	ILF42	=	000042	;ILLEGAL COMMAND
1082	000044	ILF44	=	000044	;ILLEGAL COMMAND
1083	000046	ILF46	=	000046	;ILLEGAL COMMAND
1084	000050	WCD	=	000050	;WRITE CHECK DATA COMMAND
1085	000052	WCH	=	000052	;WRITE CHECK HEADER AND DATA
1086	000054	ILF54	=	000054	;ILLEGAL COMMAND
1087	000056	ILF56	=	000056	;ILLEGAL COMMAND
1088	000060	WD	=	000060	;WRITE DATA COMMAND
1089	000062	WH	=	000062	;WRITE HEADER AND DATA COMMAND
1090	000064	ILF64	=	000064	;ILLEGAL COMMAND
1091	000066	ILF66	=	000066	;ILLEGAL COMMAND
1092	000070	RD	=	000070	;READ DATA COMMAND
1093	000072	RH	=	000072	;READ HEADER AND DATA COMMAND
1094	000074	ILF74	=	000074	;ILLEGAL COMMAND
1095	000076	ILF76	=	000076	;ILLEGAL COMMAND
1096					
1097					;RMDA DISK ADDRESS REGISTER
1098					
1099	002000	TA4	=	BIT10	;TRACK ADDRESS 4
1100	001000	TA2	=	BIT09	;TRACK ADDRESS 2
1101	000400	TA1	=	BIT08	;TRACK ADDRESS 1
1102	000020	SA16	=	BIT04	;SECTOR ADDRESS 16
1103	000010	SA8	=	BIT03	;SECTOR ADDRESS 8
1104	000004	SA4	=	BIT02	;SECTOR ADDRESS 4
1105	000002	SA2	=	BIT01	;SECTOR ADDRESS 2
1106	000001	SA1	=	BIT00	;SECTOR ADDRESS 1
1107					
1108					;TRACK,SECTOR MASKS
1109					
1110	003400	TADMSK	=	003400	;TRACK ADDRESS MASK
1111	000037	SADMSK	=	000037	;SECTOR ADDRESS MASK

```
1112
1113      ;RMD5  DRIVE STATUS REGISTER
1114
1115      100000      ATA      =      BIT15      ;ATTENTION ACTIVE
1116      040000      ERR      =      BIT14      ;COMPOSITE ERROR
1117      020000      PIP      =      BIT13      ;POSITIONING IN PROGRESS
1118      010000      MOL      -      BIT12      ;MEDIUM ON LINE
1119      004000      WRL      =      BIT11      ;WRITE LOCK
1120      002000      LBT      =      BIT10      ;LAST BLOCK TRANSFERRED
1121      001000      PGM      =      BIT09      ;PROGRAMMABLE
1122      000400      DPR      =      BIT08      ;DRIVE PRESENT
1123      000200      DRY      =      BIT07      ;DRIVE READY
1124      000100      VV      -      BIT06      ;VOLUME VALID
1125      000001      OM      =      BIT00      ;OFFSET MODE ACTIVE
1126
1127      ;RMR1  ERROR REGISTER #1
1128
1129      100000      DCK      =      BIT15      ;DATA CHECK ERROR
1130      040000      UNS      =      BIT14      ;DRIVE UNSAFE
1131      020000      OPI      -      BIT13      ;OPERATION INCOMPLETE
1132      010000      DTE      -      BIT12      ;DRIVE TIMING ERROR
1133      004000      WLE      =      BIT11      ;WRITE LOCK ERROR
1134      002000      IAE      -      BIT10      ;INVALID ADDRESS ERROR
1135      001000      AOE      -      BIT09      ;ADDRESS OVERFLOW ERROR
1136      000400      HCRC     =      BIT08      ;HEADER CRC ERROR
1137      000200      HCE      =      BIT07      ;HEADER COMPARE ERROR
1138      000100      ECH      -      BIT06      ;ECC 'HARD' ERROR
1139      000040      WCF      =      BIT05      ;WRITE CLOCK FAILURE
1140      000020      FER      =      BIT04      ;FORMAT ERROR
1141      000010      PAR      =      BIT03      ;PARITY ERROR
1142      000004      RMR      =      BIT02      ;REGISTER MODIFICATION REFUSED
1143      000002      ILR      =      BIT01      ;ILLEGAL REGISTER
1144      000001      ILF      -      BIT00      ;ILLEGAL FUNCTION
1145
1146      115760      NDTMSK   =      DCK!DTE!WLE!AOE!HCRC!HCE!ECH!WCF!FER
1147      ;'NDTMSK' IS USED TO MASK ERROR REGISTER 1 DURING NON - DATA
1148      ;COMMANDS, I.E., HOUSEKEEPING AND POSITIONING COMMANDS
1149
1150      ;RMAS  ATTENTION SUMMARY REGISTER
1151
1152      000377      ATNMSK   -      377      ;MASK FOR ATTENTION BITS
1153
1154      ;RMLA  LOOK AHEAD REGISTER
1155
1156      002000      SC4      =      BIT10      ;SECTOR COUNT = 16
1157      001000      SC3      =      BIT09      ;SECTOR COUNT = 8
1158      000400      SC2      =      BIT08      ;SECTOR COUNT = 4
1159      000200      SC1      =      BIT07      ;SECTOR COUNT = 2
1160      000100      SC0      =      BIT06      ;SECTOR COUNT = 1
1161
1162      003700      SCTMSK   =      003700      ;SECTOR COUNT MASK
1163
1164      ;RMMR  MAINTENANCE REGISTER
1165
1166      ;      WRITE ONLY BITS
1167
```

SEQ 0026

```

1168      100000      DBCK      -      BIT15      ;DEBUG CLOCK
1169      040000      DBEN      -      BIT14      ;DEBUG CLOCK ENABLE

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[illegible]

1170	020000	DEBL	=	BIT13	:DIAGNOSTIC END OF BLOCK
1171	010000	DT0	=	BIT12	:DIAGNOSTIC TIMEOUT
1172	004000	MCLK	=	BIT11	:MAINTENANCE CLOCK
1173	002000	MRD	=	BIT10	:READ DATA
1174	001000	MUR	=	BIT09	:UNIT READY
1175	000400	MOC	=	BIT08	:ON CYLINDER
1176	000200	MSER	=	BIT07	:SEEK ERROR
1177	000100	MDF	=	BIT06	:DRIVE FAULT
1178	000040	MS	=	BIT05	:SECTOR PULSE
1179	000010	MWP	=	BIT03	:WRITE PROTECT
1180	000004	MI	=	BIT02	:INDEX PULSE
1181	000002	MSC	=	BIT01	:SECTOR COMPARE
1182	000001	DMD	=	BIT00	:DIAGNOSTIC MODE
1183	051401	MR1AAA	=	DMD!MUR!DBEN!MOC!DT0	
1184					
1185		:		READ ONLY BITS	
1186					
1187	100000	OCC	=	BIT15	:OCCUPIED
1188	040000	RG	=	BIT14	:RUN AND GO
1189	020000	EBL	=	BIT13	:END OF BLOCK
1190	010000	REX	=	BIT12	:EXCEPTION
1191	004000	ESRC	=	BIT11	:ENABLE SEARCH
1192	002000	PLFS	=	BIT10	:LOOKING FOR SYNC
1193	001000	ECRC	=	BIT09	:ENABLE CRC OUT
1194	000400	PDA	=	BIT08	:DATA AREA
1195	000200	PHA	=	BIT07	:HEADER AREA
1196	000100	CONT	=	BIT06	:CONTINUE
1197	000040	WC	=	BIT05	:WORD CLOCK
1198	000020	EECC	=	BIT04	:ENABLE ECC OUT
1199	000010	MWD	=	BIT03	:WRITE DATA BIT
1200	000004	LS	=	BIT02	:LAST SECTOR
1201	000002	LST	=	BIT01	:LAST SECTOR AND TRACK
1202	000001	DMD	=	BIT00	:DIAGNOSTIC MODE
1203					
1204		:RMDT		DRIVE TYPE REGISTER	
1205					
1206	100000	NSA	=	BIT15	:NOT SECTOR ADDRESSED=0
1207	040000	TAP	=	BIT14	:TAPE DRIVE = 0
1208	020000	MOH	=	BIT13	:MOVING HEAD = 1
1209	004000	DRQ	=	BIT11	:DRIVE REQUEST REQUIRED
1210					
1211	020024	SNGPRT	=	020024	:SINGLE PORT DRIVE TYPE
1212	024024	DULPRT	=	024024	:DUAL PORT DRIVE TYPE
1213					
1214		:RMOF		OFFSET REGISTER	
1215					
1216	010000	FMT16	=	BIT12	:16 BIT WORD FORMAT
1217	004000	ECI	=	BIT11	:ECC INHIBIT
1218	002000	HCI	=	BIT10	:HEADER COMPARE INHIBIT
1219	000200	OFD	=	BIT07	:OFFSET FORWARD
1220	161577	XNUOF	=	161577	:UNUSED BITS OF RMOF
1221					
1222					
1223		:RMDC		DESIRED CYLINDER ADDRESS REGISTER	
1224	001777	CYLMSK	=	1777	:MASK FOR CYLINDER ADDRESS
1225	176000	XNUDC	=	176000	:UNUSED BITS OF RMDC

```
1226
1227      ;RMMR2 MAINTENANCE REGISTER #2
1228
1229      ; READ ONLY BITS
1230      RQA = BIT15 ;PORT A REQUEST
1231      RQB = BIT14 ;PORT B REQUEST
1232      TAG = BIT13 ;TAG CONTROL
1233      TST = BIT12 ;COMMAND SEQUENCE TEST BIT
1234      CC = BIT11 ;CONTROL OR CYLINDER TAG
1235      CH = BIT10 ;CONTROL OR HEAD TAG
1236      BB09 = BIT09 ;TAG BUS
1237      BB08 = BIT08 ;TAG BUS
1238      BB07 = BIT07 ;TAG BUS
1239      BB06 = BIT06 ;TAG BUS
1240      BB05 = BIT05 ;TAG BUS
1241      BB04 = BIT04 ;TAG BUS
1242      BB03 = BIT03 ;TAG BUS
1243      BB02 = BIT02 ;TAG BUS
1244      BB01 = BIT01 ;TAG BUS
1245      BB00 = BIT00 ;TAG BUS
1246
1247
1248      ;RMER2 ERROR REGISTER 2
1249
1250      BSE = BIT15 ;BAD SECTOR ERROR
1251      SKI = BIT14 ;SEEK INCOMPLETE
1252      OPE = BIT13 ;OPERATOR PLUG ERROR
1253      IVC = BIT12 ;INVALID COMMAND ERROR
1254      LSC = BIT11 ;LOSS OF SYSTEM CLOCK
1255      LBC = BIT10 ;LOSS OF BIT CLOCK
1256      DVC = BIT07 ;DEVICE CHECK
1257      DPE = BIT03 ;DATA PARITY ERROR
1258      XNUER2 = 001567 ;UNUSED BITS OF RMER2
1259
1260      .SBTTL PROGRAM MNEMONICS
1261
1262      MSE = BIT15 ;MANUFACTURING DETECTED SECTOR ERROR
1263      USE = BIT14 ;USER DETECTED SECTOR ERROR
1264
1265      .SBTTL RM03 REGISTER INDEX VALUES
1266
1267      RMCS1 = 00 ;CONTROL STATUS REGISTER
1268      RMDA = 06 ;DISK ADDRESS REGISTER
1269      RMDS = 12 ;DRIVE STATUS REGISTER
1270      RMER1 = 14 ;ERROR REGISTER 1
1271      RMAS = 16 ;ATTENTION SUMMARY REGISTER
1272      RMLA = 20 ;LOOK AHEAD REGISTER
1273      RMMR1 = 24 ;MAINTENANCE REGISTER
1274      RMDT = 26 ;DRIVE TYPE REGISTER
1275      RMSN = 30 ;SERIAL NUMBER REGISTER
1276      RMOF = 32 ;OFFSET REGISTER
1277      RMDC = 34 ;DESIRED CYLINDER REGISTER
1278      RMHR = 36 ;HOLDING REGISTER
1279      RMMR2 = 40 ;MAINTENANCE REGISTER 2
1280      RMER2 = 42 ;ERROR REGISTER 2
1281      RMEC1 = 44 ;ECC POSITION REGISTER
```

```
1282      000046      RMEC2  =      46      ;ECC PATTERN REGISTER
1283      000050      ILRG50 =      50      ;ILLEGAL REGISTER 50
1284      000052      ILRG52 =      52      ;ILLEGAL REGISTER 52
1285      000054      ILRG54 =      54      ;ILLEGAL REGISTER 54
1286      000056      ILRG56 =      56      ;ILLEGAL REGISTER 56
1287      000060      ILRG60 =      60      ;ILLEGAL REGISTER 60
1288      000062      ILRG62 =      62      ;ILLEGAL REGISTER 62
1289      000064      ILRG64 =      64      ;ILLEGAL REGISTER 64
1290      000066      ILRG66 =      66      ;ILLEGAL REGISTER 66
1291      000070      ILRG70 =      70      ;ILLEGAL REGISTER 70
1292      000072      ILRG72 =      72      ;ILLEGAL REGISTER 72
1293      000074      ILRG74 =      74      ;ILLEGAL REGISTER 74
1294      000076      ILRG76 =      76      ;ILLEGAL REGISTER 76
1295
1296
1297      000077      IDXMSK =      77      ;MASK FOR REGISTER INDEX NUMBER
1298
1299      .SBTTL RH CONTROLLER REGISTER BIT DEFINITIONS
1300
1301      ;RMCS1 CONTROL STATUS REGISTER #1
1302
1303      100000      SC      =      BIT15      ;SPECIAL CONDITION-READ ONLY
1304      040000      TRE      =      BIT14      ;TRANSFER ERROR
1305      020000      MCPE      =      BIT13      ;MASSBUS CONTROL BUS PARITY
1306                                     ;ERROR-READ ONLY
1307      002000      PSEL      =      BIT10      ;PORT B SELECT
1308      001000      A17      =      BIT09      ;ADDRESS EXTENSION
1309      000400      A16      =      BIT08      ;ADDRESS EXTENSION
1310      000200      RDY      =      BIT07      ;READY-READ ONLY
1311      000100      IE      =      BIT06      ;INTERRUPT ENABLE
1312
1313      ;RMCS2 RH CONTROL STATUS REGISTER #2
1314
1315      100000      DLT      =      BIT15      ;DATA LATE-READ ONLY
1316      040000      WCE      =      BIT14      ;WRITE CHECK ERROR-READ ONLY
1317      020000      UPE      =      BIT13      ;UNIBUS PARITY ERROR
1318      010000      NED      =      BIT12      ;NONEXISTANT DRIVE-READ ONLY
1319      004000      NEM      =      BIT11      ;NONEXISTANT MEMORY-READ ONLY
1320      002000      PGE      =      BIT10      ;PROGRAM ERROR-READ ONLY
1321      001000      MXF      =      BIT09      ;MISSED TRANSFER
1322      000400      MDPE      =      BIT08      ;MASSBUS DATA BUS PARITY
1323                                     ;ERROR-READ ONLY
1324      000200      OR      =      BIT07      ;OUTPUT READY-READ ONLY
1325      000100      IR      =      BIT06      ;INPUT READY-READ ONLY
1326      000040      CLR      =      BIT05      ;CONTROLLER CLEAR
1327      000020      PAT      =      BIT04      ;PARITY TEST
1328      000010      BAI      =      BIT03      ;UNIBUS ADDRESS INCREMENT
1329                                     ;INHIBIT
1330      000004      U2      =      BIT02      ;UNIT SELECT
1331      000002      U1      =      BIT01      ;UNIT SELECT
1332      000001      U0      =      BIT00      ;UNIT SELECT
1333
1334      ;UNIT SELECT MASK
1335      000007      UNTMSK =      7      ;UNIT SELECT MASK
1336
1337      ;RMCS3 RH70 CONTROL STATUS REGISTER #3
```

```
1338      100000      APE      =      BIT15      ;ADDRESS PARITY ERROR
1339      040000      DPEHI    =      BIT14      ;DATA PARITY ERROR HIGH WORD
1340      020000      DPELO    =      BIT13      ;DATA PARITY ERROR LOW WORD
1341      010000      WCEHI    =      BIT12      ;WRITE CHECK ERROR HIGH WORD
1342      004000      WCELO    =      BIT11      ;WRITE CHECK ERROR LOW WORD
1343      002000      DBL      =      BIT10      ;DOUBLE WORD TRANSFER
1344      000100      IE       =      BIT06      ;INTERRUPT ENABLE
1345      000010      IPCK3     =      BIT03      ;INVERT PARITY CHECK
1346      000004      IPCK2     =      BIT02      ;INVERT PARITY CHECK
1347      000002      IPCK1     =      BIT01      ;INVERT PARITY CHECK
1348      000001      IPCK0     =      BIT00      ;INVERT PARITY CHECK
1349      .SBTTL      RH CONTROLLER REGISTER INDEX VALUES
1350
1351      000000      RMCS1      =      00      ;CONTROL, STATUS REGISTER
1352      000002      RMWC      =      02      ;WORD COUNT REGISTER
1353      000004      RMBA      =      04      ;BUS ADDRESS REGISTER
1354      000010      RMCS2     =      10      ;CONTROLLER STATUS REGISTER
1355      000022      RMDB      =      22      ;DATA BUFFER
1356      000050      RMBAE     =      50      ;BUS ADDRESS EXTENSION
1357      000052      RMCS3     =      52      ;CONTROL STATUS REGISTER #3
1358
1359      176700      ABASE      =      176700    ;UNIBUS ADDRESS
1360      120254      AVECT1    =      120254    ;UNIBUS VECTOR ADDRESS AND PRIORITY
1361
1362
1363      .SBTTL      TRAP CATCHER
1364
1365      000000      . = 0
1366      ;*ALL UNUSED LOCATIONS FROM 4 - 776 CONTAIN A '.+2,HALT'
1367      ;*SEQUENCE TO CATCH ILLEGAL TRAPS AND INTERRUPTS
1368      ;*LOCATION 0 CONTAINS 0 TO CATCH IMPROPERLY LOADED VECTORS
1369      000174      . = 174
1370      000174      000000      DISPREG: .WORD 0      ;;SOFTWARE DISPLAY REGISTER
1371      000176      000000      SWREG:   .WORD 0      ;;SOFTWARE SWITCH REGISTER
1372
1373
1374      .SBTTL      ACT11 HOOKS
1375
1376      ;*****
1377      ;HOOKS REQUIRED BY ACT11
1378      000200      $SVPC-.      ;SAVE PC
1379      000046      . = 46
1380      000046      021666      $ENDAD      ;;1)SET LOC.46 TO ADDRESS OF $ENDAD IN .SEOP
1381      000052      . = 52
1382      000052      000000      .WORD 0      ;;2)SET LOC.52 TO ZERO
1383      000200      . = $SVPC      ;; RESTORE PC
1384
1385      .SBTTL      STARTING ADDRESS
1386
1387      ;THE PROGRAM STARTS AT LOCATION 200
1388      000200      = 200
1389      000200      000137      002632      JMP      START      ;JUMP TO START OF PROGRAM
1390
1391      001100      . = 1100
1392      .SBTTL      APT PARAMETER BLOCK
1393
```

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APT PARAMETER BLOCK

SEQ 0031

```
1394
1395
1396
1397      001100
1398      000024
1399 000024 000200
1400      000044
1401 000044 001100
1402      001100
1403
1404
1405
1406
1407 001100
1408 001100 000000
1409 001102 001222
1410 001104 000001
1411 001106 000002
1412 001110 000002
1413 001112 000042
1414      001114

*****
;SET LOCATIONS 24 AND 44 AS REQUIRED FOR APT
*****
      .SX=.      ;;SAVE CURRENT LOCATION
      .=24      ;;SET POWER FAIL TO POINT TO START OF PROGRAM
      200      ;;FOR APT START UP
      .=44      ;;POINT TO APT INDIRECT ADDRESS PNTR.
      $APTHDR   ;;POINT TO APT HEADER BLOCK
      .=.SX     ;;RESET LOCATION COUNTER
*****
;SETUP APT PARAMETER BLOCK AS DEFINED IN THE APT-PDP11 DIAGNOSTIC
;INTERFACE SPEC.

$APTHD:
$HIBTS: .WORD 0      ;;TWO HIGH BITS OF 18 BIT MAILBOX ADDR.
$MBADR: .WORD $MAIL  ;;ADDRESS OF APT MAILBOX (BITS 0-15)
$STSM:  .WORD 1      ;;RUN TIM OF LONGEST TEST
$PASTM: .WORD 2      ;;RUN TIME IN SECS. OF 1ST PASS ON 1 UNIT (QUICK VERIFY)
$UNITM: .WORD 2      ;;ADDITIONAL RUN TIME (SECS) OF A PASS FOR EACH ADDITIONAL UNIT
      .WORD $ETEND-$MAIL/2 ;;LENGTH MAILBOX-ETABLE(WORDS)
TAGADR =
```

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001114

000377

```
.SBTTL COMMON TAGS

*****
*THIS TABLE CONTAINS VARIOUS COMMON STORAGE LOCATIONS
*USED IN THE PROGRAM.

      . =TAGADR
$CMTAG:                               ;;START OF COMMON TAGS
      .WORD 0
$TSTNM: .BYTE 0                       ;;CONTAINS THE TEST NUMBER
$ERFLG: .BYTE 0                       ;;CONTAINS ERROR FLAG
$ICNT: .WORD 0                        ;;CONTAINS SUBTEST ITERATION COUNT
$LPADR: .WORD 0                       ;;CONTAINS SCOPE LOOP ADDRESS
$LPERR: .WORD 0                       ;;CONTAINS SCOPE RETURN FOR ERRORS
$ERTTL: .WORD 0                       ;;CONTAINS TOTAL ERRORS DETECTED
$ITEMB: .BYTE 0                      ;;CONTAINS ITEM CONTROL BYTE
$ERMAX: .BYTE 1                      ;;CONTAINS MAX. ERRORS PER TEST
$ERRPC: .WORD 0                      ;;CONTAINS PC OF LAST ERROR INSTRUCTION
$GDADR: .WORD 0                      ;;CONTAINS ADDRESS OF 'GOOD' DATA
$BDADR: .WORD 0                      ;;CONTAINS ADDRESS OF 'BAD' DATA
$GDDAT: .WORD 0                      ;;CONTAINS 'GOOD' DATA
$BDDAT: .WORD 0                      ;;CONTAINS 'BAD' DATA
      .WORD 0                        ;;RESERVED--NOT TO BE USED
      .WORD 0
$AUTOB: .BYTE 0                      ;;AUTOMATIC MODE INDICATOR
$INTAG: .BYTE 0                      ;;INTERRUPT MODE INDICATOR
      .WORD 0
$SWR: .WORD DSWR                     ;;ADDRESS OF SWITCH REGISTER
$DISPLAY: .WORD DDISP                ;;ADDRESS OF DISPLAY REGISTER
$TKS: 177560                         ;;TTY KBD STATUS
$TKB: 177562                         ;;TTY KBD BUFFER
$TPS: 177564                         ;;TTY PRINTER STATUS REG. ADDRESS
$TPB: 177566                         ;;TTY PRINTER BUFFER REG. ADDRESS
$NULL. .BYTE 0                      ;;CONTAINS NULL CHARACTER FOR FILLS
$FILLS: .BYTE 2                      ;;CONTAINS # OF FILLER CHARACTERS REQUIRED
$FILLC: .BYTE 12                     ;;INSERT FILL CHARS. AFTER A 'LINE FEED'
$TPFLG: .BYTE 0                      ;;'TERMINAL AVAILABLE' FLAG (BIT<07>=0=YES)
$TMP0: .WORD 0                      ;;USER DEFINED
$TMP1: .WORD 0                      ;;USER DEFINED
$TMP2: .WORD 0                      ;;USER DEFINED
$TMP3: .WORD 0                      ;;USER DEFINED
$TMP4: .WORD 0                      ;;USER DEFINED
$TIMES: 0                           ;;MAX. NUMBER OF ITERATIONS
$ESCAPE: 0                          ;;ESCAPE ON ERROR ADDRESS
$BELL: .ASCIIZ <207><377><377>      ;;CODE FOR BELL
$QUES: .ASCII /?/                   ;;QUESTION MARK
$CRLF: .ASCII <15>                  ;;CARRIAGE RETURN
$LF: .ASCIIZ <12>                   ;;LINE FEED
*****
.SBTTL APT MAILBOX-ETABLE

*****
.NLIST ME
:
:
```

1471			.EVEN			
1472	001222		\$MAIL:		;; APT MAILBOX	
1473	001222	000000	\$MSGTY: .WORD	AMSGTY	;; MESSAGE TYPE CODE	
1474	001224	000000	\$FATAL: .WORD	AFATAL	;; FATAL ERROR NUMBER	
1475	001226	000000	\$TESTN: .WORD	ATESTN	;; TEST NUMBER	
1476	001230	000000	\$PASS: .WORD	APASS	;; PASS COUNT	
1477	001232	000000	\$DEVCT: .WORD	ADEVCT	;; DEVICE COUNT	
1478	001234	000000	\$UNIT: .WORD	AUNIT	;; I/O UNIT NUMBER	
1479	001236	000000	\$MSGAD: .WORD	AMSGAD	;; MESSAGE ADDRESS	
1480	001240	000000	\$MSGLG: .WORD	AMSGLG	;; MESSAGE LENGTH	
1481	001242		\$ETABLE:		;; APT ENVIRONMENT TABLE	
1482	001242	000	\$ENV: .BYTE	AENV	;; ENVIRONMENT BYTE	
1483	001243	000	\$ENVM: .BYTE	AENVM	;; ENVIRONMENT MODE BITS	
1484	001244	000000	\$SWREG: .WORD	ASWREG	;; APT SWITCH REGISTER	
1485	001246	000000	\$USWR: .WORD	AUSWR	;; USER SWITCHES	
1486	001250	000000	\$CPUOP: .WORD	ACPUOP	;; CPU TYPE, OPTIONS	
1487			;		BITS 15-11=CPU TYPE	
1488			;		11/04=01, 11/05=02, 11/20=03, 11/40=04, 11/45=05	
1489			;		11/70=06, PDQ=07, Q=10	
1490			;		BIT 10=REAL TIME CLOCK	
1491			;		BIT 9=FLOATING POINT PROCESSOR	
1492			;		BIT 8=MEMORY MANAGEMENT	
1493	001252	000	\$MAMS1: .BYTE	AMAMS1	;; HIGH ADDRESS, M.S. BYTE	
1494	001253	000	\$MTYP1: .BYTE	AMTYP1	;; MEM. TYPE, BLK#1	
1495			;		MEM. TYPE BYTE -- (HIGH BYTE)	
1496			;		900 NSEC CORE=001	
1497			;		300 NSEC BIPOLAR=002	
1498			;		500 NSEC MOS=003	
1499	001254	000000	\$MADR1: .WORD	AMADR1	;; HIGH ADDRESS, BLK#1	
1500			;		MEM. LAST ADDR.=3 BYTES, THIS WORD AND LOW OF 'TYPE' ABOVE	
1501	001256	000	\$MAMS2: .BYTE	AMAMS2	;; HIGH ADDRESS, M.S. BYTE	
1502	001257	000	\$MTYP2: .BYTE	AMTYP2	;; MEM. TYPE, BLK#2	
1503	001260	000000	\$MADR2: .WORD	AMADR2	;; MEM. LAST ADDRESS, BLK#2	
1504	001262	000	\$MAMS3: .BYTE	AMAMS3	;; HIGH ADDRESS, M.S. BYTE	
1505	001263	000	\$MTYP3: .BYTE	AMTYP3	;; MEM. TYPE, BLK#3	
1506	001264	000000	\$MADR3: .WORD	AMADR3	;; MEM. LAST ADDRESS, BLK#3	
1507	001266	000	\$MAMS4: .BYTE	AMAMS4	;; HIGH ADDRESS, M.S. BYTE	
1508	001267	000	\$MTYP4: .BYTE	AMTYP4	;; MEM. TYPE, BLK#4	
1509	001270	000000	\$MADR4: .WORD	AMADR4	;; MEM. LAST ADDRESS, BLK#4	
1510	001272	120254	\$VECT1: .WORD	AVECT1	;; INTERRUPT VECTOR#1, BUS PRIORITY#1	
1511	001274	000000	\$VECT2: .WORD	AVECT2	;; INTERRUPT VECTOR#2, BUS PRIORITY#2	
1512	001276	176700	\$BASE: .WORD	ABASE	;; BASE ADDRESS OF EQUIPMENT UNDER TEST	
1513	001300	000000	\$DEVN: .WORD	ADEVN	;; DEVICE MAP	
1514	001302	000000	\$CDW1: .WORD	ACDW1	;; CONTROLLER DESCRIPTION WORD#1	
1515	001304	000000	\$CDW2: .WORD	ACDW2	;; CONTROLLER DESCRIPTION WORD#2	
1516	001306	000000	\$DDW0: .WORD	ADDW0	;; DEVICE DESCRIPTOR WORD#0	
1517	001310	000000	\$DDW1: .WORD	ADDW1	;; DEVICE DESCRIPTOR WORD#1	
1518	001312	000000	\$DDW2: .WORD	ADDW2	;; DEVICE DESCRIPTOR WORD#2	
1519	001314	000000	\$DDW3: .WORD	ADDW3	;; DEVICE DESCRIPTOR WORD#3	
1520	001316	000000	\$DDW4: .WORD	ADDW4	;; DEVICE DESCRIPTOR WORD#4	
1521	001320	000000	\$DDW5: .WORD	ADDW5	;; DEVICE DESCRIPTOR WORD#5	
1522	001322	000000	\$DDW6: .WORD	ADDW6	;; DEVICE DESCRIPTOR WORD#6	
1523	001324	000000	\$DDW7: .WORD	ADDW7	;; DEVICE DESCRIPTOR WORD#7	
1524	001326		\$ETEND:			
1525			.MEXIT			
1526						

```
1527
1528
1529      .SBTTL REGISTER INPUT BUFFER
1530
1531      ;      THE REGISTER INPUT BUFFER IS USED FOR STORING REGISTER
1532      ;CONTENTS AS THEY ARE READ FROM THE DEVICE.
1533
1534 001326 000000  RMCS1I: .WORD      ;CONTROL,STATUS REGISTER #1
1535 001330 000000  RMWCI: .WORD      ;WORD COUNT REGISTER
1536 001332 000000  RMBAI: .WORD      ;BUS ADDRESS REGISTER
1537 001334 000000  RMDAI: .WORD      ;DISK ADDRESS REGISTER
1538 001336 000000  RMCS2I: .WORD      ;CONTROL, STATUS REGISTER #2
1539 001340 000000  RMDSI: .WORD      ;DRIVE STATUS REGISTER
1540 001342 000000  RMER1I: .WORD      ;ERROR REGISTER 1
1541 001344 000000  RMAI: .WORD      ;ATTENTION SUMMARY REGISTER
1542 001346 000000  RMLAI: .WORD      ;LOOK AHEAD REGISTER
1543 001350 000000  RMDBI: .WORD      ;DATA BUFFER
1544 001352 000000  RMMR1I: .WORD      ;MAINTENANCE REGISTER #1
1545 001354 000000  RMDTI: .WORD      ;DRIVE TYPE REGISTER
1546 001356 000000  RMSNI: .WORD      ;SERIAL NUMBER REGISTER
1547 001360 000000  RMOFI: .WORD      ;OFFSET REGISTER
1548 001362 000000  RMDCI: .WORD      ;DESIRED CYLINDER REGISTER
1549 001364 000000  RMHRI: .WORD      ;HOLDING REGISTER
1550 001366 000000  RMMR2I: .WORD      ;MAINTENANCE REGISTER #2
1551 001370 000000  RMER2I: .WORD      ;ERROR REGISTER 2
1552 001372 000000  RMECI: .WORD      ;ECC POSITION REGISTER
1553 001374 000000  RMEC2I: .WORD      ;ECC PATTERN REGISTER
1554 001376 000000  RMBAEI: .WORD      ;BUS ADDRESS EXTENSION REGISTER
1555 001400 000000  RMCS3I: .WORD      ;CONTROL, STATUS REGISTER #3
1556
1557
1558      .SBTTL REGISTER OUTPUT BUFFER
1559
1560      ;      THE REGISTER OUTPUT BUFFER IS USED FOR ASSEMBLING DATA TO
1561      ;BE WRITTEN TO THE DEVICE.
1562
1563
1564 001402 000000  RMCS1O: .WORD      ;CONTROL,STATUS REGISTER #1
1565 001404 000000  RMWCO: .WORD      ;WORD COUNT REGISTER
1566 001406 000000  RMBAO: .WORD      ;BUS ADDRESS REGISTER
1567 001410 000000  RMDAO: .WORD      ;DISK ADDRESS REGISTER
1568 001412 000000  RMCS2O: .WORD      ;CONTROL, STATUS REGISTER #2
1569 001414 000000  RMDSO: .WORD      ;DRIVE STATUS REGISTER
1570 001416 000000  RMER1O: .WORD      ;ERROR REGISTER 1
1571 001420 000000  RMAO: .WORD      ;ATTENTION SUMMARY REGISTER
1572 001422 000000  RMLAO: .WORD      ;LOOK AHEAD REGISTER
1573 001424 000000  RMDBO: .WORD      ;DATA BUFFER
1574 001426 000000  RMMR1O: .WORD      ;MAINTENANCE REGISTER #1
1575 001430 000000  RMDTO: .WORD      ;DRIVE TYPE REGISTER
1576 001432 000000  RMSNO: .WORD      ;SERIAL NUMBER REGISTER
1577 001434 000000  RMOFO: .WORD      ;OFFSET REGISTER
1578 001436 000000  RMDCO: .WORD      ;DESIRED CYLINDER REGISTER
1579 001440 000000  RMHRO: .WORD      ;HOLDING REGISTER
1580 001442 000000  RMMR2O: .WORD      ;MAINTENANCE REGISTER #2
1581 001444 000000  RMER2O: .WORD      ;ERROR REGISTER 2
1582 001446 000000  RMEC1O: .WORD      ;ECC POSITION REGISTER
```

CZRMKB0 RM03/2 DSKLS PRT 2
CZRMKB.P11 14-AUG-78 15:53

J 3
MACY11 30A(1052) 18-AUG-78 12:59 PAGE 35
REGISTER OUTPUT BUFFER

SEQ 0035

1583 001450 000000
1584 001452 000000
1585 001454 000000

RMEC20: .WORD ;ECC PATTERN REGISTER
RMB AEO: .WORD ;BUS ADDRESS EXTENSION REGISTER
RMCS30: .WORD ;CONTROL, STATUS REGISTER #3

1586
1587

.SBTTL TEST QUE

1588
1589

; EACH WORD OF THE TEST QUE CONTAINS THE DEVICE NUMBER IN
;THE LOW BYTE AND THE ATTENTION BIT IN THE HIGH BYTE. A ZERO
;WORD IS A BLANK AND REPRESENTS THE END OF THE QUE.

1590
1591

1592
1593

001456 000012

TSTQUE: .BLKW 10. ;TEST QUE

1594
1595

001502 172540

\$LPCSR: .WORD 172540 ;KW11-P CONTROL + STATUS REGISTER

1596
1597

001504 172542

\$LPCSB: .WORD 172542 ;KW11-P COUNT SET BUFFER

1598
1599

001506 000104

\$LPVEC: .WORD 104 ;KW11-P INTERRUPT VECTOR

1600
1601

001510 000106

.WORD 106 ;KW11-L CONTROL + STATUS REGISTER

1602
1603

001512 177546

\$LLCSR: .WORD 177546 ;KW11-L INTERRUPT VECTOR

1604
1605

001514 000100

\$LLVEC: .WORD 100

1606
1607

001516 000102

.WORD 102

1608
1609

001520 000000

\$PSW: .WORD ;STORAGE FOR PRIORITY

001522 000000

TIME: .WORD ;STORAGE FOR ELAPSED TIME

001524 000000

WATCH: .WORD ;STORAGE FOR REMAINING TIME

001526 000000

CLOCK: .WORD ;ADDRESS OF START CLOCK SUB

001530 000000

STOP: .WORD ;ADDRESS OF STOP CLOCK SUB

;PUT TAGS HERE

```

1610      .SBTTL  ERROR POINTER TABLE
1611
1612      ;*THIS TABLE CONTAINS THE INFORMATION FOR EACH ERROR THAT CAN OCCUR.
1613      ;*THE INFORMATION IS OBTAINED BY USING THE INDEX NUMBER FOUND IN
1614      ;*LOCATION $ITEMB. THIS NUMBER INDICATES WHICH ITEM IN THE TABLE IS PERTINENT.
1615      ;*NOTE1:      IF $ITEMB IS 0 THE ONLY PERTINENT DATA IS ($ERRPC).
1616      ;*NOTE2:      EACH ITEM IN THE TABLE CONTAINS 4 POINTERS EXPLAINED AS FOLLOWS:
1617
1618      ;*      EM      ;;POINTS TO THE ERROR MESSAGE
1619      ;*      DH      ;;POINTS TO THE DATA HEADER
1620      ;*      DT      ;;POINTS TO THE DATA
1621      ;*      DF      ;;POINTS TO THE DATA FORMAT
1622
1623
1624      001532      $ERRTB:
1625
1626

```

~~~~~

|      |        |        |          |                                                         |
|------|--------|--------|----------|---------------------------------------------------------|
| 1627 |        |        |          |                                                         |
| 1628 |        |        | :ERROR 1 | CANNOT CLEAR NED STATUS                                 |
| 1629 |        |        |          |                                                         |
| 1630 | 001532 | 031744 | EMT1     |                                                         |
| 1631 | 001534 | 037650 | EHT1     |                                                         |
| 1632 | 001536 | 037760 | EDT1     |                                                         |
| 1633 | 001540 | 040014 | EFT1     |                                                         |
| 1634 |        |        |          |                                                         |
| 1635 |        |        |          |                                                         |
| 1636 |        |        | :ERROR 2 | CANNOT READ OR WRITE ANY DEVICE REG WITHOUT NED         |
| 1637 |        |        |          |                                                         |
| 1638 | 001542 | 031752 | EMT2     |                                                         |
| 1639 | 001544 | 037654 | EHT2     |                                                         |
| 1640 | 001546 | 037762 | EDT2     |                                                         |
| 1641 | 001550 | 040016 | EFT2     |                                                         |
| 1642 |        |        |          |                                                         |
| 1643 |        |        |          |                                                         |
| 1644 |        |        | :ERROR 3 | CANNOT WRITE/READ ONES TO ANY DEVICE REGISTER           |
| 1645 |        |        |          |                                                         |
| 1646 | 001552 | 032000 | EMT3     |                                                         |
| 1647 | 001554 | 000000 | 0        |                                                         |
| 1648 | 001556 | 000000 | 0        |                                                         |
| 1649 | 001560 | 000000 | 0        |                                                         |
| 1650 |        |        |          |                                                         |
| 1651 |        |        |          |                                                         |
| 1652 |        |        | :ERROR 4 | CANNOT CLEAR ANY DEVICE REGISTER BITS W/MASSBUS INIT    |
| 1653 |        |        |          |                                                         |
| 1654 | 001562 | 032020 | EMT4     |                                                         |
| 1655 | 001564 | 000000 | 0        |                                                         |
| 1656 | 001566 | 000000 | 0        |                                                         |
| 1657 | 001570 | 000000 | 0        |                                                         |
| 1658 |        |        |          |                                                         |
| 1659 |        |        |          |                                                         |
| 1660 |        |        | :ERROR 5 | CANNOT WRITE/READ ZEROS TO ALL BIT POSITIONS            |
| 1661 |        |        |          |                                                         |
| 1662 | 001572 | 032042 | EMT5     |                                                         |
| 1663 | 001574 | 037660 | EHT5     |                                                         |
| 1664 | 001576 | 037764 | EDT5     |                                                         |
| 1665 | 001600 | 040020 | EFT5     |                                                         |
| 1666 |        |        |          |                                                         |
| 1667 |        |        |          |                                                         |
| 1668 |        |        | :ERROR 6 | CANNOT WRITE/READ ONES TO ALL BIT POSITIONS             |
| 1669 |        |        |          |                                                         |
| 1670 | 001602 | 032066 | EMT6     |                                                         |
| 1671 | 001604 | 037660 | EHT5     |                                                         |
| 1672 | 001606 | 037764 | EDT5     |                                                         |
| 1673 | 001610 | 040020 | EFT5     |                                                         |
| 1674 |        |        |          |                                                         |
| 1675 |        |        |          |                                                         |
| 1676 |        |        | :ERROR 7 | CANNOT WRITE/READ SHIFTING ONE BIT TO ALL BIT POSITIONS |
| 1677 |        |        | :        | OF DEVICE REGISTERS                                     |
| 1678 |        |        |          |                                                         |
| 1679 | 001612 | 032110 | EMT7     |                                                         |
| 1680 | 001614 | 037664 | EHT7     |                                                         |
| 1681 | 001616 | 037764 | EDT5     |                                                         |
| 1682 | 001620 | 040020 | EFT5     |                                                         |

|      |        |        |        |                                    |
|------|--------|--------|--------|------------------------------------|
| 1683 |        |        |        |                                    |
| 1684 |        |        |        |                                    |
| 1685 |        |        | ;ERROR | 10 REGISTER SELECT 1 APPEARS S-A-0 |
| 1686 |        |        |        |                                    |
| 1687 | 001622 | 032132 | EMT10  |                                    |
| 1688 | 001624 | 000000 | 0      |                                    |
| 1689 | 001626 | 000000 | 0      |                                    |
| 1690 | 001630 | 000000 | 0      |                                    |
| 1691 |        |        |        |                                    |
| 1692 |        |        |        |                                    |
| 1693 |        |        | ;ERROR | 11 REGISTER SELECT 1 APPEARS S-A-1 |
| 1694 |        |        |        |                                    |
| 1695 | 001632 | 032150 | EMT11  |                                    |
| 1696 | 001634 | 000000 | 0      |                                    |
| 1697 | 001636 | 000000 | 0      |                                    |
| 1698 | 001640 | 000000 | 0      |                                    |
| 1699 |        |        |        |                                    |
| 1700 |        |        |        |                                    |
| 1701 |        |        | ;ERROR | 12 REGISTER SELECT 2 APPEARS S-A-0 |
| 1702 |        |        |        |                                    |
| 1703 | 001642 | 032166 | EMT12  |                                    |
| 1704 | 001644 | 000000 | 0      |                                    |
| 1705 | 001646 | 000000 | 0      |                                    |
| 1706 | 001650 | 000000 | 0      |                                    |
| 1707 |        |        |        |                                    |
| 1708 |        |        |        |                                    |
| 1709 |        |        | ;ERROR | 13 REGISTER SELECT 2 APPEARS S-A-1 |
| 1710 |        |        |        |                                    |
| 1711 | 001652 | 032204 | EMT13  |                                    |
| 1712 | 001654 | 000000 | 0      |                                    |
| 1713 | 001656 | 000000 | 0      |                                    |
| 1714 | 001660 | 000000 | 0      |                                    |
| 1715 |        |        |        |                                    |
| 1716 |        |        |        |                                    |
| 1717 |        |        | ;ERROR | 14 REGISTER SELECT 4 APPEARS S-A-0 |
| 1718 |        |        |        |                                    |
| 1719 | 001662 | 032222 | EMT14  |                                    |
| 1720 | 001664 | 000000 | 0      |                                    |
| 1721 | 001666 | 000000 | 0      |                                    |
| 1722 | 001670 | 000000 | 0      |                                    |
| 1723 |        |        |        |                                    |
| 1724 |        |        |        |                                    |
| 1725 |        |        | ;ERROR | 15 REGISTER SELECT 4 APPEARS S-A-1 |
| 1726 |        |        |        |                                    |
| 1727 | 001672 | 032240 | EMT15  |                                    |
| 1728 | 001674 | 000000 | 0      |                                    |
| 1729 | 001676 | 000000 | 0      |                                    |
| 1730 | 001700 | 000000 | 0      |                                    |
| 1731 |        |        |        |                                    |
| 1732 |        |        |        |                                    |
| 1733 |        |        | ;ERROR | 16 REGISTER SELECT 8 APPEARS S-A-0 |
| 1734 |        |        |        |                                    |
| 1735 | 001702 | 032256 | EMT16  |                                    |
| 1736 | 001704 | 000000 | 0      |                                    |
| 1737 | 001706 | 000000 | 0      |                                    |
| 1738 | 001710 | 000000 | 0      |                                    |

|      |        |        |           |                                                          |
|------|--------|--------|-----------|----------------------------------------------------------|
| 1739 |        |        |           |                                                          |
| 1740 |        |        |           |                                                          |
| 1741 |        |        | ;ERROR 17 | REGISTER SELECT 8 APPEARS S-A-1                          |
| 1742 |        |        |           |                                                          |
| 1743 | 001712 | 032274 | EMT17     |                                                          |
| 1744 | 001714 | 000000 | 0         |                                                          |
| 1745 | 001716 | 000000 | 0         |                                                          |
| 1746 | 001720 | 000000 | 0         |                                                          |
| 1747 |        |        |           |                                                          |
| 1748 |        |        |           |                                                          |
| 1749 |        |        | ;ERROR 20 | OPI SET WITH SEACH TIMOUT DISABLED                       |
| 1750 |        |        |           |                                                          |
| 1751 | 001722 | 032312 | EMT20     |                                                          |
| 1752 | 001724 | 037650 | EHT1      |                                                          |
| 1753 | 001726 | 037760 | EDT1      |                                                          |
| 1754 | 001730 | 040014 | EFT1      |                                                          |
| 1755 |        |        |           |                                                          |
| 1756 |        |        |           |                                                          |
| 1757 |        |        | ;ERROR 21 | OPI SET WITH SECTOR PULSE,SECTOR COMPARE WAS RESET       |
| 1758 |        |        |           |                                                          |
| 1759 | 001732 | 032334 | EMT21     |                                                          |
| 1760 | 001734 | 037650 | EHT1      |                                                          |
| 1761 | 001736 | 037760 | EDT1      |                                                          |
| 1762 | 001740 | 040014 | EFT1      |                                                          |
| 1763 |        |        |           |                                                          |
| 1764 |        |        |           |                                                          |
| 1765 |        |        | ;ERROR 22 | DTE SET WITH INDEX PULSE,SEARCH WAS NOT ENABLED          |
| 1766 |        |        |           |                                                          |
| 1767 | 001742 | 032356 | EMT22     |                                                          |
| 1768 | 001744 | 037650 | EHT1      |                                                          |
| 1769 | 001746 | 037760 | EDT1      |                                                          |
| 1770 | 001750 | 040014 | EFT1      |                                                          |
| 1771 |        |        |           |                                                          |
| 1772 |        |        |           |                                                          |
| 1773 |        |        | ;ERROR 23 | DTE SET WITH SECTOR PULSE,SECTOR COMPARE WAS RESET       |
| 1774 |        |        |           |                                                          |
| 1775 | 001752 | 032402 | EMT23     |                                                          |
| 1776 | 001754 | 037650 | EHT1      |                                                          |
| 1777 | 001756 | 037760 | EDT1      |                                                          |
| 1778 | 001760 | 040014 | EFT1      |                                                          |
| 1779 |        |        |           |                                                          |
| 1780 |        |        |           |                                                          |
| 1781 |        |        | ;ERROR 24 | DTE DID NOT SET WITH SECTOR PULSE,SECTOR COMPARE WAS SET |
| 1782 |        |        |           |                                                          |
| 1783 | 001762 | 032426 | EMT24     |                                                          |
| 1784 | 001764 | 037650 | EHT1      |                                                          |
| 1785 | 001766 | 037760 | EDT1      |                                                          |
| 1786 | 001770 | 040014 | EFT1      |                                                          |
| 1787 |        |        |           |                                                          |
| 1788 |        |        |           |                                                          |
| 1789 |        |        | ;ERROR 25 | DTE SET WITH SECTOR PULSE DURING FORMAT CHANGE           |
| 1790 |        |        |           |                                                          |
| 1791 | 001772 | 032452 | EMT25     |                                                          |
| 1792 | 001774 | 037650 | EHT1      |                                                          |
| 1793 | 001776 | 037760 | EDT1      |                                                          |
| 1794 | 002000 | 040014 | EFT1      |                                                          |

|      |        |        |                                                 |
|------|--------|--------|-------------------------------------------------|
| 1795 |        |        |                                                 |
| 1796 |        |        |                                                 |
| 1797 |        |        | ;ERROR 26 MBA CLR L IS STUCK ACTIVE             |
| 1798 |        |        |                                                 |
| 1799 | 002002 | 032472 | EMT26                                           |
| 1800 | 002004 | 000000 | 0                                               |
| 1801 | 002006 | 000000 | 0                                               |
| 1802 | 002010 | 000000 | 0                                               |
| 1803 |        |        |                                                 |
| 1804 |        |        |                                                 |
| 1805 |        |        | ;ERROR 27 COULD NOT SET DTE AFTER FORMAT CHANGE |
| 1806 |        |        |                                                 |
| 1807 | 002012 | 032524 | EMT27                                           |
| 1808 | 002014 | 037650 | EHT1                                            |
| 1809 | 002016 | 037760 | EDT1                                            |
| 1810 | 002020 | 040014 | EFT1                                            |
| 1811 |        |        |                                                 |
| 1812 |        |        |                                                 |
| 1813 |        |        | ;ERROR 30 CANNOT SET PROM STROBE WITH BIT CLOCK |
| 1814 |        |        |                                                 |
| 1815 | 002022 | 032544 | EMT30                                           |
| 1816 | 002024 | 037650 | EHT1                                            |
| 1817 | 002026 | 037760 | EDT1                                            |
| 1818 | 002030 | 040014 | EFT1                                            |
| 1819 |        |        |                                                 |
| 1820 |        |        |                                                 |
| 1821 |        |        | ;ERROR 31 CANNOT CLEAR RMER1,DTE                |
| 1822 |        |        |                                                 |
| 1823 | 002032 | 032564 | EMT31                                           |
| 1824 | 002034 | 037650 | EHT1                                            |
| 1825 | 002036 | 037760 | EDT1                                            |
| 1826 | 002040 | 040014 | EFT1                                            |
| 1827 |        |        |                                                 |
| 1828 |        |        |                                                 |
| 1829 |        |        | ;ERROR 32 PROM STROBE RESET EARLY               |
| 1830 |        |        |                                                 |
| 1831 | 002042 | 032600 | EMT32                                           |
| 1832 | 002044 | 037650 | EHT1                                            |
| 1833 | 002046 | 037760 | EDT1                                            |
| 1834 | 002050 | 040014 | EFT1                                            |
| 1835 |        |        |                                                 |
| 1836 |        |        |                                                 |
| 1837 |        |        | ;ERROR 33 PROM STROBE SET EARLY                 |
| 1838 |        |        |                                                 |
| 1839 | 002052 | 032612 | EMT33                                           |
| 1840 | 002054 | 037650 | EHT1                                            |
| 1841 | 002056 | 037760 | EDT1                                            |
| 1842 | 002060 | 040014 | EFT1                                            |
| 1843 |        |        |                                                 |
| 1844 |        |        |                                                 |
| 1845 |        |        | ;ERROR 34 LOOKING FOR SYNC SET EARLY            |
| 1846 |        |        |                                                 |
| 1847 | 002062 | 032624 | EMT34                                           |
| 1848 | 002064 | 037650 | EHT1                                            |
| 1849 | 002066 | 037760 | EDT1                                            |
| 1850 | 002070 | 040014 | EFT1                                            |

|      |        |        |                                                                  |
|------|--------|--------|------------------------------------------------------------------|
| 1851 |        |        |                                                                  |
| 1852 |        |        |                                                                  |
| 1853 |        |        | :ERROR 35      LOOKING FOR SYNC DID NOT SET                      |
| 1854 |        |        |                                                                  |
| 1855 | 002072 | 032636 | EMT35                                                            |
| 1856 | 002074 | 037650 | EHT1                                                             |
| 1857 | 002076 | 037760 | EDT1                                                             |
| 1858 | 002100 | 040014 | EFT1                                                             |
| 1859 |        |        |                                                                  |
| 1860 |        |        |                                                                  |
| 1861 |        |        | :ERROR 36      PROM STROBE   SET WHILE LOOKING FOR SYNC          |
| 1862 |        |        |                                                                  |
| 1863 | 002102 | 032650 | EMT36                                                            |
| 1864 | 002104 | 037650 | EHT1                                                             |
| 1865 | 002106 | 037760 | EDT1                                                             |
| 1866 | 002110 | 040014 | EFT1                                                             |
| 1867 |        |        |                                                                  |
| 1868 |        |        |                                                                  |
| 1869 |        |        | :ERROR 37      SYNC DETECTED WITH WRONG PATTERN                  |
| 1870 |        |        |                                                                  |
| 1871 | 002112 | 032670 | EMT37                                                            |
| 1872 | 002114 | 037724 | EHT115                                                           |
| 1873 | 002116 | 040004 | EDT115                                                           |
| 1874 | 002120 | 040032 | EFT115                                                           |
| 1875 |        |        |                                                                  |
| 1876 |        |        |                                                                  |
| 1877 |        |        | :ERROR 40      SYNC NOT DETECTED                                 |
| 1878 |        |        |                                                                  |
| 1879 | 002122 | 032720 | EMT40                                                            |
| 1880 | 002124 | 037650 | EHT1                                                             |
| 1881 | 002126 | 037760 | EDT1                                                             |
| 1882 | 002130 | 040014 | EFT1                                                             |
| 1883 |        |        |                                                                  |
| 1884 |        |        |                                                                  |
| 1885 |        |        | :ERROR 41      DRIVE TIMING ERROR DID NOT CLEAR LOOKING FOR SYNC |
| 1886 |        |        |                                                                  |
| 1887 | 002132 | 032742 | EMT41                                                            |
| 1888 | 002134 | 037650 | EHT1                                                             |
| 1889 | 002136 | 037760 | EDT1                                                             |
| 1890 | 002140 | 040014 | EFT1                                                             |
| 1891 |        |        |                                                                  |
| 1892 |        |        |                                                                  |
| 1893 |        |        | :ERROR 42      WRITE GATE DID NOT COME ON OR RESET EARLY         |
| 1894 |        |        |                                                                  |
| 1895 | 002142 | 032770 | EMT42                                                            |
| 1896 | 002144 | 037650 | EHT1                                                             |
| 1897 | 002146 | 037760 | EDT1                                                             |
| 1898 | 002150 | 040014 | EFT1                                                             |
| 1899 |        |        |                                                                  |
| 1900 |        |        |                                                                  |
| 1901 |        |        | :ERROR 43      INCORRECT SYNC PATTERN DURING HEADER              |
| 1902 |        |        |                                                                  |
| 1903 | 002152 | 033006 | EMT43                                                            |
| 1904 | 002154 | 000000 | 0                                                                |
| 1905 | 002156 | 000000 | 0                                                                |
| 1906 | 002160 | 000000 | 0                                                                |

|      |        |        |           |                                                |
|------|--------|--------|-----------|------------------------------------------------|
| 1907 |        |        |           |                                                |
| 1908 |        |        |           |                                                |
| 1909 |        |        | ;ERROR 44 | INCORRECT SYNC PATTERN DURING HEADER           |
| 1910 |        |        |           |                                                |
| 1911 | 002162 | 033006 | EMT43     |                                                |
| 1912 | 002164 | 037664 | EHT7      |                                                |
| 1913 | 002166 | 037764 | EDT5      |                                                |
| 1914 | 002170 | 040020 | EFT5      |                                                |
| 1915 |        |        |           |                                                |
| 1916 |        |        |           |                                                |
| 1917 |        |        | ;ERROR 45 | HEADER AREA DID NOT COME ON OR RESET EARLY     |
| 1918 |        |        |           |                                                |
| 1919 | 002172 | 033040 | EMT45     |                                                |
| 1920 | 002174 | 037650 | EHT1      |                                                |
| 1921 | 002176 | 037760 | EDT1      |                                                |
| 1922 | 002200 | 040014 | EFT1      |                                                |
| 1923 |        |        |           |                                                |
| 1924 |        |        |           |                                                |
| 1925 |        |        | ;ERROR 46 | CRC ENABLE DID NOT SET                         |
| 1926 |        |        |           |                                                |
| 1927 | 002202 | 033054 | EMT46     |                                                |
| 1928 | 002204 | 037650 | EHT1      |                                                |
| 1929 | 002206 | 037760 | EDT1      |                                                |
| 1930 | 002210 | 040014 | EFT1      |                                                |
| 1931 |        |        |           |                                                |
| 1932 |        |        |           |                                                |
| 1933 |        |        | ;ERROR 47 | INCORRECT HEADER GENERATED DURING WRITE        |
| 1934 |        |        |           |                                                |
| 1935 | 002212 | 033070 | EMT47     |                                                |
| 1936 | 002214 | 037670 | EHT47     |                                                |
| 1937 | 002216 | 037766 | EDT47     |                                                |
| 1938 | 002220 | 040014 | EFT1      |                                                |
| 1939 |        |        |           |                                                |
| 1940 |        |        |           |                                                |
| 1941 |        |        | ;ERROR 50 | READ GATE INCORRECT DURING HEADER AREA         |
| 1942 |        |        |           |                                                |
| 1943 | 002222 | 033106 | EMT50     |                                                |
| 1944 | 002224 | 037650 | EHT1      |                                                |
| 1945 | 002226 | 037760 | EDT1      |                                                |
| 1946 | 002230 | 040014 | EFT1      |                                                |
| 1947 |        |        |           |                                                |
| 1948 |        |        |           |                                                |
| 1949 |        |        | ;ERROR 51 | UNEXPECTED HEADER ERROR DURING DIAGNOSTIC MODE |
| 1950 |        |        |           |                                                |
| 1951 | 002232 | 033210 | EMT55     |                                                |
| 1952 | 002234 | 037650 | EHT1      |                                                |
| 1953 | 002236 | 037760 | EDT1      |                                                |
| 1954 | 002240 | 040014 | EFT1      |                                                |
| 1955 |        |        |           |                                                |
| 1956 |        |        |           |                                                |
| 1957 |        |        | ;ERROR 52 | INCORRECT HEADER READ IN DIAGNOSTIC MODE       |
| 1958 |        |        |           |                                                |
| 1959 | 002242 | 033140 | EMT52     |                                                |
| 1960 | 002244 | 037674 | EHT52     |                                                |
| 1961 | 002246 | 037770 | EDT52     |                                                |
| 1962 | 002250 | 040022 | EFT57     |                                                |

|      |        |        |                                                                        |
|------|--------|--------|------------------------------------------------------------------------|
| 1963 |        |        |                                                                        |
| 1964 |        |        |                                                                        |
| 1965 |        |        | ;ERROR 53 INCORRECT TAG BUS DURING DATA COMMAND                        |
| 1966 |        |        |                                                                        |
| 1967 | 002252 | 037544 | EMT276                                                                 |
| 1968 | 002254 | 037650 | EHT1                                                                   |
| 1969 | 002256 | 037760 | EDT1                                                                   |
| 1970 | 002260 | 040014 | EFT1                                                                   |
| 1971 |        |        |                                                                        |
| 1972 |        |        |                                                                        |
| 1973 |        |        | ;ERROR 54 DATA TIMING SEQUENCER CONTROLS INCORRECT DURING DATA COMMAND |
| 1974 |        |        |                                                                        |
| 1975 | 002262 | 033172 | EMT54                                                                  |
| 1976 | 002264 | 037650 | EHT1                                                                   |
| 1977 | 002266 | 037760 | EDT1                                                                   |
| 1978 | 002270 | 040014 | EFT1                                                                   |
| 1979 |        |        |                                                                        |
| 1980 |        |        |                                                                        |
| 1981 |        |        | ;ERROR 55 DATA AREA DID NOT COME ON OR RESET EARLY                     |
| 1982 |        |        |                                                                        |
| 1983 | 002272 | 033210 | EMT55                                                                  |
| 1984 | 002274 | 037650 | EHT1                                                                   |
| 1985 | 002276 | 037760 | EDT1                                                                   |
| 1986 | 002300 | 040014 | EFT1                                                                   |
| 1987 |        |        |                                                                        |
| 1988 |        |        |                                                                        |
| 1989 |        |        | ;ERROR 56 ECC ENABLE DID NOT SET                                       |
| 1990 |        |        |                                                                        |
| 1991 | 002302 | 033226 | EMT56                                                                  |
| 1992 | 002304 | 037650 | EHT1                                                                   |
| 1993 | 002306 | 037760 | EDT1                                                                   |
| 1994 | 002310 | 040014 | EFT1                                                                   |
| 1995 |        |        |                                                                        |
| 1996 |        |        |                                                                        |
| 1997 |        |        | ;ERROR 57 DEVICE IS NOT AN RM03                                        |
| 1998 |        |        |                                                                        |
| 1999 | 002312 | 033242 | EMT57                                                                  |
| 2000 | 002314 | 037700 | EHT57                                                                  |
| 2001 | 002316 | 037772 | EDT57                                                                  |
| 2002 | 002320 | 040022 | EFT57                                                                  |
| 2003 |        |        |                                                                        |
| 2004 |        |        |                                                                        |
| 2005 |        |        | ;ERROR 60 DEVICE AVAILABLE IS NOT SET                                  |
| 2006 |        |        |                                                                        |
| 2007 | 002322 | 033256 | EMT60                                                                  |
| 2008 | 002324 | 037650 | EHT1                                                                   |
| 2009 | 002326 | 037760 | EDT1                                                                   |
| 2010 | 002330 | 040014 | EFT1                                                                   |
| 2011 |        |        |                                                                        |
| 2012 |        |        |                                                                        |
| 2013 |        |        | ;ERROR 61 INCORRECT ECC PATTERN GENERATED DURING WRITE                 |
| 2014 |        |        |                                                                        |
| 2015 | 002332 | 033272 | EMT61                                                                  |
| 2016 | 002334 | 037704 | EHT61                                                                  |
| 2017 | 002336 | 037774 | EDT61                                                                  |
| 2018 | 002340 | 040022 | EFT57                                                                  |

|      |        |        |                                                   |
|------|--------|--------|---------------------------------------------------|
| 2019 |        |        |                                                   |
| 2020 |        |        |                                                   |
| 2021 |        |        | ;ERROR 62 CANNOT CLEAR PROM STROBE WITH BIT CLOCK |
| 2022 |        |        |                                                   |
| 2023 | 002342 | 033310 | EMT62                                             |
| 2024 | 002344 | 037650 | EHT1                                              |
| 2025 | 002346 | 037760 | EDT1                                              |
| 2026 | 002350 | 040014 | EFT1                                              |
| 2027 |        |        |                                                   |
| 2028 |        |        |                                                   |
| 2029 |        |        | ;ERROR 63 DATA AREA DID NOT RESET                 |
| 2030 |        |        |                                                   |
| 2031 | 002352 | 033326 | EMT63                                             |
| 2032 | 002354 | 037650 | EHT1                                              |
| 2033 | 002356 | 037760 | EDT1                                              |
| 2034 | 002360 | 040014 | EFT1                                              |
| 2035 |        |        |                                                   |
| 2036 |        |        |                                                   |
| 2037 |        |        | ;ERROR 64 UNEXPECTED ECC ERROR IN DIAGNOSTIC MODE |
| 2038 |        |        |                                                   |
| 2039 | 002362 | 033340 | EMT64                                             |
| 2040 | 002364 | 037650 | EHT1                                              |
| 2041 | 002366 | 037760 | EDT1                                              |
| 2042 | 002370 | 040014 | EFT1                                              |
| 2043 |        |        |                                                   |
| 2044 |        |        |                                                   |
| 2045 |        |        | ;ERROR 65 INCORRECT DATA TRANSFERRED TO MEMORY    |
| 2046 |        |        |                                                   |
| 2047 | 002372 | 033354 | EMT65                                             |
| 2048 | 002374 | 037650 | EHT1                                              |
| 2049 | 002376 | 037760 | EDT1                                              |
| 2050 | 002400 | 040014 | EFT1                                              |
| 2051 |        |        |                                                   |
| 2052 |        |        | ;ERROR 66                                         |
| 2053 |        |        |                                                   |
| 2054 | 002402 | 033366 | EMT66                                             |
| 2055 | 002404 | 000000 | 0                                                 |
| 2056 | 002406 | 000000 | 0                                                 |
| 2057 | 002410 | 000000 | 0                                                 |
| 2058 |        |        |                                                   |
| 2059 |        |        | ;ERROR 67                                         |
| 2060 |        |        |                                                   |
| 2061 | 002412 | 033402 | EMT67                                             |
| 2062 | 002414 | 000000 | 0                                                 |
| 2063 | 002416 | 000000 | 0                                                 |
| 2064 | 002420 | 000000 | 0                                                 |
| 2065 |        |        |                                                   |
| 2066 |        |        | ;ERROR 70                                         |
| 2067 |        |        |                                                   |
| 2068 | 002422 | 033420 | EMT70                                             |
| 2069 | 002424 | 000000 | 0                                                 |
| 2070 | 002426 | 000000 | 0                                                 |
| 2071 | 002430 | 000000 | 0                                                 |
| 2072 |        |        |                                                   |
| 2073 |        |        | ;ERROR 71                                         |
| 2074 |        |        |                                                   |

|      |        |        |            |                       |
|------|--------|--------|------------|-----------------------|
| 2075 | 002432 | 033440 | EMT71      |                       |
| 2076 | 002434 | 000000 | 0          |                       |
| 2077 | 002436 | 000000 | 0          |                       |
| 2078 | 002440 | 000000 | 0          |                       |
| 2079 |        |        |            |                       |
| 2080 |        |        | ;ERROR 72  |                       |
| 2081 |        |        |            |                       |
| 2082 | 002442 | 033464 | EMT72      |                       |
| 2083 | 002444 | 000000 | 0          |                       |
| 2084 | 002446 | 000000 | 0          |                       |
| 2085 | 002450 | 000000 | 0          |                       |
| 2086 |        |        |            |                       |
| 2087 |        |        | ;ERROR 73  |                       |
| 2088 |        |        |            |                       |
| 2089 | 002452 | 033510 | EMT73      |                       |
| 2090 | 002454 | 000000 | 0          |                       |
| 2091 | 002456 | 000000 | 0          |                       |
| 2092 | 002460 | 000000 | 0          |                       |
| 2093 |        |        |            |                       |
| 2094 |        |        | ;ERROR 74  |                       |
| 2095 |        |        |            |                       |
| 2096 | 002462 | 033530 | EMT74      |                       |
| 2097 | 002464 | 000000 | 0          |                       |
| 2098 | 002466 | 000000 | 0          |                       |
| 2099 | 002470 | 000000 | 0          |                       |
| 2100 |        |        |            |                       |
| 2101 |        |        | ;ERROR 75  |                       |
| 2102 |        |        |            |                       |
| 2103 | 002472 | 033540 | EMT75      |                       |
| 2104 | 002474 | 000000 | 0          |                       |
| 2105 | 002476 | 000000 | 0          |                       |
| 2106 | 002500 | 000000 | 0          |                       |
| 2107 |        |        |            |                       |
| 2108 |        |        | ;ERROR 76  |                       |
| 2109 |        |        |            |                       |
| 2110 | 002502 | 033552 | EMT76      |                       |
| 2111 | 002504 | 000000 | 0          |                       |
| 2112 | 002506 | 000000 | 0          |                       |
| 2113 | 002510 | 000000 | 0          |                       |
| 2114 |        |        |            |                       |
| 2115 |        |        | ;ERROR 77  |                       |
| 2116 |        |        |            |                       |
| 2117 | 002512 | 033566 | EMT77      |                       |
| 2118 | 002514 | 000000 | 0          |                       |
| 2119 | 002516 | 000000 | 0          |                       |
| 2120 | 002520 | 000000 | 0          |                       |
| 2121 |        |        |            |                       |
| 2122 |        |        |            |                       |
| 2123 |        |        | ;ERROR 100 | CANT SET VOLUME VALID |
| 2124 |        |        |            |                       |
| 2125 | 002522 | 035374 | EMT170     |                       |
| 2126 | 002524 | 037744 | EHT150     |                       |
| 2127 | 002526 | 040004 | EDT115     |                       |
| 2128 | 002530 | 040032 | EFT115     |                       |
| 2129 |        |        |            |                       |
| 2130 |        |        |            |                       |

| Line | Address | Hex    | Hex    | Label      | Text                                          |
|------|---------|--------|--------|------------|-----------------------------------------------|
| 2131 |         |        |        | ;ERROR 101 | RUN AND GO WONT SET                           |
| 2132 |         |        |        |            |                                               |
| 2133 | 002532  | 037524 | EMT275 |            |                                               |
| 2134 | 002534  | 037650 | EHT1   |            |                                               |
| 2135 | 002536  | 037760 | EDT1   |            |                                               |
| 2136 | 002540  | 040014 | EFT1   |            |                                               |
| 2137 |         |        |        |            |                                               |
| 2138 |         |        |        |            |                                               |
| 2139 |         |        |        | ;ERROR 102 | SEARCH ENABLE WONT SET                        |
| 2140 |         |        |        |            |                                               |
| 2141 | 002542  | 035422 | EMT172 |            |                                               |
| 2142 | 002544  | 037650 | EHT1   |            |                                               |
| 2143 | 002546  | 037760 | EDT1   |            |                                               |
| 2144 | 002550  | 040014 | EFT1   |            |                                               |
| 2145 |         |        |        |            |                                               |
| 2146 |         |        |        |            |                                               |
| 2147 |         |        |        | ;ERROR 103 | OCCUPIED IS INCORRECT FOR FUNCTION CODE       |
| 2148 |         |        |        |            |                                               |
| 2149 | 002552  | 035440 | EMT173 |            |                                               |
| 2150 | 002554  | 037744 | EHT150 |            |                                               |
| 2151 | 002556  | 040004 | EDT115 |            |                                               |
| 2152 | 002560  | 040032 | EFT115 |            |                                               |
| 2153 |         |        |        |            |                                               |
| 2154 |         |        |        |            |                                               |
| 2155 |         |        |        | ;ERROR 104 | READ IN PRESET DIDNT CLEAR RMDA, RMDC OR RMOF |
| 2156 |         |        |        |            |                                               |
| 2157 | 002562  | 035462 | EMT174 |            |                                               |
| 2158 | 002564  | 000000 | 0      |            |                                               |
| 2159 | 002566  | 000000 | 0      |            |                                               |
| 2160 | 002570  | 000000 | 0      |            |                                               |
| 2161 |         |        |        |            |                                               |
| 2162 |         |        |        |            |                                               |
| 2163 |         |        |        | ;ERROR 105 | READ IN PRESET DIDNT CLEAR RMOF               |
| 2164 |         |        |        |            |                                               |
| 2165 | 002572  | 035510 | EMT175 |            |                                               |
| 2166 | 002574  | 037650 | EHT1   |            |                                               |
| 2167 | 002576  | 037760 | EDT1   |            |                                               |
| 2168 | 002600  | 040014 | EFT1   |            |                                               |
| 2169 |         |        |        |            |                                               |
| 2170 |         |        |        |            |                                               |
| 2171 |         |        |        | ;ERROR 106 | READ IN PRESET DIDNT CLEAR RMDA               |
| 2172 |         |        |        |            |                                               |
| 2173 | 002602  | 035526 | EMT176 |            |                                               |
| 2174 | 002604  | 037650 | EHT1   |            |                                               |
| 2175 | 002606  | 037760 | EDT1   |            |                                               |
| 2176 | 002610  | 040014 | EFT1   |            |                                               |
| 2177 |         |        |        |            |                                               |
| 2178 |         |        |        |            |                                               |
| 2179 |         |        |        | ;ERROR 107 | READ IN PRESET DIDNT CLEAR RMDC               |
| 2180 |         |        |        |            |                                               |
| 2181 | 002612  | 035544 | EMT177 |            |                                               |
| 2182 | 002614  | 037650 | EHT1   |            |                                               |
| 2183 | 002616  | 037760 | EDT1   |            |                                               |
| 2184 | 002620  | 040014 | EFT1   |            |                                               |
| 2185 |         |        |        |            |                                               |
| 2186 |         |        |        |            |                                               |

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ERROR POINTER TABLE

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```

2187                                     ;ERROR   110          CANT SET OFFSET MODE BY OFFSET COMMAND
2188
2189                                002622    035562                               EMT200
2190                                002624    037650                               EHT1
2191                                002626    037760                               EDT1
2192                                002630    040014                               EFT1
2193
2194
2195
2196
2197                                ;PUT ERROR TABLE HERE
2198
```

[illegible]

```
2199 .SBTTL START OF PROGRAM
2200
2201
2202 002632 START:
2203
2204 ;CLEAR AND SETUP FOR TEST EXECUTION
2205 002632 000240 NOP
2206 002634 000005 RESET ;INITIALIZE THE SYSTEM
2207
2208 .SBTTL INITIALIZE THE COMMON TAGS
2209 ;;CLEAR THE COMMON TAGS ($CMTAG) AREA
2210 002636 012706 001114 MOV $CMTAG,R6 ;;FIRST LOCATION TO BE CLEARED
2211 002642 005026 CLR (R6)+ ;;CLEAR MEMORY LOCATION
2212 002644 022706 001154 CMP $SWR,R6 ;;DONE?
2213 002650 001374 BNE -6 ;;LOOP BACK IF NO
2214 002652 012706 001100 MOV $STACK,SP ;;SETUP THE STACK POINTER
2215 ;;INITIALIZE A FEW VECTORS
2216 002656 012737 026076 000020 MOV $SCOPE,@IOTVEC ;;IOT VECTOR FOR SCOPE ROUTINE
2217 002664 012737 000340 000022 MOV #340,@IOTVEC+2 ;;LEVEL 7
2218 002672 012737 026460 000030 MOV $ERROR,@EMTVEC ;;EMT VECTOR FOR ERROR ROUTINE
2219 002700 012737 000340 000032 MOV #340,@EMTVEC+2 ;;LEVEL 7
2220 002706 012737 030220 000034 MOV $TRAP,@TRAPVEC ;;TRAP VECTOR FOR TRAP CALLS
2221 002714 012737 000340 000036 MOV #340,@TRAPVEC+2 ;;LEVEL 7
2222 002722 012737 030326 000024 MOV $PWRDN,@PWRVEC ;;POWER FAILURE VECTOR
2223 002730 012737 000340 000026 MOV #340,@PWRVEC+2 ;;LEVEL 7
2224 002736 013737 021532 021524 MOV $ENDCT,$EOPCT ;;SETUP END-OF-PROGRAM COUNTER
2225 002744 005037 001206 CLR $TIMES ;;INITIALIZE NUMBER OF ITERATIONS
2226 002750 005037 001210 CLR $ESCAPE ;;CLEAR THE ESCAPE ON ERROR ADDRESS
2227 002754 112737 000001 001131 MOVB #1,$ERMAX ;;ALLOW ONE ERROR PER TEST
2228 002762 012737 002762 001122 MOV #,$LPADR ;;INITIALIZE THE LOOP ADDRESS FOR SCOPE
2229 002770 012737 002770 001124 MOV #,$LPERR ;;SETUP THE ERROR LOOP ADDRESS
2230 ;;SIZE FOR A HARDWARE SWITCH REGISTER. IF NOT FOUND OR IT IS
2231 ;;EQUAL TO A '-1', SETUP FOR A SOFTWARE SWITCH REGISTER.
2232 002776 013746 000004 MOV @ERRVEC,-(SP) ;;SAVE ERROR VECTOR
2233 003002 012737 003036 000004 MOV #64$,@ERRVEC ;;SET UP ERROR VECTOR
2234 003010 012737 177570 001154 MOV #DSWR,$SWR ;;SETUP FOR A HARDWARE SWICH REGISTER
2235 003016 012737 177570 001156 MOV #DDISP,$DISPLAY ;;AND A HARDWARE DISPLAY REGISTER
2236 003024 022777 177777 176122 CMP #-1,$SWR ;;TRY TO REFERENCE HARDWARE SWR
2237 003032 001012 BNE 66$ ;;BRANCH IF NO TIMEOUT TRAP OCCURRED
2238 ;;AND THE HARDWARE SWR IS NOT -1
2239 003034 000403 BR 65$ ;;BRANCH IF NO TIMEOUT
2240 003036 012716 003044 64$: MOV #65$,(SP) ;;SET UP FOR TRAP RETURN
2241 003042 000002 RTI
2242 003044 012737 000176 001154 65$: MOV $SWREG,$SWR ;;POINT TO SOFTWARE SWR
2243 003052 012737 000174 001156 MOV $DISPREG,$DISPLAY
2244 003060 012637 000004 66$: MOV (SP)+,@ERRVEC ;;RESTORE ERROR VECTOR
2245
2246 003064 005037 001230 CLR $PASS ;;CLEAR PASS COUNT
2247 003070 132737 000200 001243 BITB #APTSIZE,$ENVM ;;TEST USER SIZE UNDER APT
2248 003076 001403 BEQ 67$ ;;YES,USE NON-APT SWITCH
2249 003100 012737 001244 001154 MOV #SWREG,$SWR ;;NO,USE APT SWITCH REGISTER
2250 003106 67$:
2251 003106 012746 000140 MOV #PR3,-(SP) ;;PUT NEW PS ON STACK
2252 003112 012746 003120 MOV #68$,-(SP) ;;PUT NEW PC ON STACK
2253 003116 000002 RTI ;;POP NEW PC AND PS
2254 003120 68$:
```

```
2255 .SBTTL TYPE PROGRAM NAME
2256 ;;TYPE THE NAME OF THE PROGRAM IF FIRST PASS
2257 003120 005227 177777 INC #1 ;;FIRST TIME?
2258 003124 001061 BNE 69$ ;;BRANCH IF NO
2259 003126 022737 021666 000042 CMP #SENDAD,@#42 ;;ACT-11?
2260 003134 001455 BEQ 69$ ;;BRANCH IF YES
2261 003136 104401 003204 TYPE ,70$ ;;TYPE ASCII STRING
2262 .SBTTL GET VALUE FOR SOFTWARE SWITCH REGISTER
2263 003142 005737 000042 TST @#42 ;;ARE WE RUNNING UNDER XXDP/ACT?
2264 003146 001012 BNE 71$ ;;BRANCH IF YES
2265 003150 123727 001242 000001 CMPB $ENV,#1 ;;ARE WE RUNNING UNDER APT?
2266 003156 001406 BEQ 71$ ;;BRANCH IF YES
2267 003160 023727 001154 000176 CMP SWR,#SWREG ;;SOFTWARE SWITCH REG SELECTED?
2268 003166 001005 BNE 72$ ;;BRANCH IF NO
2269 003170 104407 GTSWR ;;GET SOFT-SWR SETTINGS
2270 003172 000403 BR 72$
2271 003174 112737 000001 001150 71$: MOVB #1,$AUTOB ;;SET AUTO-MODE INDICATOR
2272 003202 72$:
2273 003202 000432 BR 69$ ;;GET OVER THE ASCII
2274 ;;70$: .ASCIIZ <CRLF>@CZRMKB0, RM03/RM02 DISKLESS DIAGNOSTIC PART II @<CRLF>
2275 69$:
2276
2277
2278 ;FIND OUT IF PROGRAM IS RUNNING IN STANDALONE MODE
2279 003270 005737 000042 TST 42 ;IS LOC 42 ZERO ??
2280 003274 001003 BNE 10$ ;NO - NOT IN STANDALONE
2281 003276 105737 001242 *STB $ENV ;IS APT ENVIRONMENT ZERO ??
2282 003302 001451 BEQ STANDALONE ;YES - PROGRAM IN STANDALONE
2283 003304 10$:
2284
2285 ;PROGRAM NOT RUNNING IN STANDALONE - SEE IF SIZING IS ALLOWED
2286 003304 132737 000200 001243 XSIZ: BITB #BIT7,$ENV ;SIZING ALLOWED ??
2287 003312 001043 BNE 20$ ;NO
2288 ; MOV #377,$DEVM ;YES - SET DEVICE MAP FOR ALL DEVICES
2289 003314 005037 001300 CLR $DEVM ;CLEAR THE BIT MAP
2290 003320 005001 CLR R1 ;START FROM THE DRIVE 0
2291 003322 012704 000001 MOV #BIT0,R4 ;BIT MAP DOR DRIVE 0
2292 003326 013700 001276 MOV $BASE,R0 ;BASE ADDRESS
2293 003332 012760 000040 000010 15$: MOV #CLR,RMCS2(R0) ;LOAD THE DRIVE ADDRESS
2294 003340 010160 000010 MOV R1,RMCS2(R0) ;LOAD THE DRIVE ADDRESS
2295 003344 016003 000010 MOV RMCS2(R0),R3 ;NED BIT SET ?
2296 003350 032703 010000 BIT #NED,R3 ;BRANCH IF SO
2297 003354 001010 BNE 16$ ;TO NEXT DRIVE
2298 003356 016003 000000 MOV RMCS1(R0),R3 ;CHECK THE DVA BIT
2299 003362 032703 004000 BIT #DVA,R3 ;DRIVE AVAILABLE ?
2300 003366 001403 BEQ 16$ ;BRANCH IF DRIVE NOT AVAILABLE
2301 003370 050437 001300 BIS R4,$DEVM ;SET THE BIT MAP FOR ALL AVAILABLE DRIVE
2302 003374 000405 BR 17$ ;DONT TYPE THE NONE EXIST MSG
2303 16$:
2304 003376 104401 031607 TYPE ,NOTEX ;TYPE NOT EXIT MESSAGE
2305 003402 010146 MOV R1,-(SP) ;DRIVE NUMBER
2306 003404 104403 TYP0S
2307 003406 006 .BYTE 6
2308 003407 000 .BYTE 0
2309 003410 005201 17$: INC R1 ;INCREMENT THE DRIVE ADDRESS
2310 003412 006304 ASL R4 ;SET UP THE BIT MAP FOR NEXT DRIVE
```

|      |        |        |        |  |  |
|------|--------|--------|--------|--|--|
| 2311 | 003414 | 022701 | 000007 |  |  |
| 2312 | 003420 | 103344 |        |  |  |
| 2313 | 003422 |        |        |  |  |
| 2314 |        |        |        |  |  |
| 2315 |        |        |        |  |  |
| 2316 | 003422 | 000137 | 004254 |  |  |

20\$:

CMP #7,R1

BHIS 15\$

;ALL DRIVE ARE CHECKED ?

;BRANCH IF NOT

;GO TO COMMON START CODE

JMP CMNSTART

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GET VALUE FOR SOFTWARE SWITCH REGISTER

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SEQ 0050

2311 003414 022701 000007

2312 003420 103344

2313 003422

2314

2315

2316 003422 000137 004254

20\$:

CMP #7,R1

BHIS 15\$

;ALL DRIVE ARE CHECKED ?

;BRANCH IF NOT

;GO TO COMMON START CODE

JMP CMNSTART

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GET VALUE FOR SOFTWARE SWITCH REGISTER

SEQ 0051

```
2317 003426
2318
2319 003426 004737 026670
2320
2321 003432 005327 000001
2322 003436 100024
2323
2324
2325
2326 003440 104401 031116
2327 003444 104411
2328 003446 012637 001176
2329 003452 104401 001176
2330 003456 123727 001176 000131
2331 003464 001002
2332 003466 000137 004414
2333 003472 123727 001176 000116
2334 003500 001420
2335 003502 104401 030761
2336 003506 000754
2337 003510
2338
2339
2340 003510 104401 030763
2341 003514 104411
2342 003516 012637 001176
2343 003522 104401 001176
2344 003526 123727 001176 000131
2345 003534 001002
2346 003536 104401 054116
2347 003542
2348
2349
2350 003542 104401 031017
2351 003546 104411
2352 003550 012637 001176
2353 003554 104401 001176
2354 003560 104411
2355 003562 005726
2356 003564 123727 001176 000131
2357 003572 001137
2358 003574
2359
2360
2361 003574 104401 031155
2362 003600 013746 001276
2363 003604 104402
2364 003606 104401 030752
2365 003612 104413
2366 003614 012637 001176
2367 003620 001412
2368 003622 022737 160000 001176
2369 003630 101403
2370 003632 104401 031202
2371 003636 000756
2372 003640 013737 001176 001276

STANDALONE:

;SEE IF THIS IS THE FIRST START AFTER PROGRAM WAS LOADED
JSR PC,$TKINT
DEC #1 ;FIRST START ??
BPL 10$ ;YES !!

;SEE IF THE USER WANTS TO KEEP SAME DEVICES FOR TESTING
5$: TYPE ,CNSL00 ;MAINTAIN PREVIOUS PARAMETERS??
RDCHR ;GET RESPONSE
MOV (SP)+,$TMP1 ;ECHO RESPONSE
TYPE $TMP1
CMPB $TMP1,#'Y ;YES RESPONSE??
BNE 6$ ;NO!!
JMP READY ;KEEP PREVIOUS PARAMETERS
6$: CMPB $TMP1,#'N ;NO RESPONSE??
BEQ 20$ ;GET NEW PARAMETERS
TYPE ,QSTMRK ;NOT YES OR NO, TYPE '?'
BR 5$ ;RETRY
10$:

;SEE IF OPERATOR WANTS HELP FILE
TYPE ,HELPOST ;WANT HELP ??
RDCHR ;GET RESPONSE
MOV (SP)+,$TMP1 ;SAVE AND ECHO RESPONSE
TYPE $TMP1
CMPB $TMP1,#'Y ;WAS IT A YES RESPONSE ??
BNE 20$ ;NO - DONT TYPE HELP
TYPE ,HELP ;YES - TYPE HELP TEXT
20$:

;SEE IF USER WANTS TO CHANGE RM03 UNIBUS ADDRESS
TYPE ,UBUSQST ;WANT TO CHANGE ADDRESS ??
RDCHR ;GET RESPONSE
MOV (SP)+,$TMP1 ;SAVE AND ECHO RESPONSE
TYPE $TMP1
RDCHR ;READ S CR
TST (SP)+ ;CLEAR THE STACK
CMPB $TMP1,#'Y ;WAS IT A YES RESPONSE ??
BNE 90$ ;NO !!
30$:

;DIALOGUE TO CHANGE THE UNIBUS ADDRESS, AND INTERRUPT VECTOR
TYPE ,CNSL01 ;TYPE CURRENT BUS ADDRESS
MOV $BASE,-(SP) ;;SAVE $BASE FOR TYPEOUT
TYPOC ;GO TYPE--OCTAL ASCII(ALL DIGITS)
TYPE ,CLSPRN
RDOCT ;GET NEW BUS ADDRESS
MOV (SP)+,$TMP1 ;CARRIAGE RETURN??
BEQ 50$ ;YES-SKIP TO NEXT ENTRY
CMP #160000,$TMP1 ;BASE ADDRESS IN I/O PAGE??
BLOS 40$ ;YES
TYPE ,CNSL02 ;TYPE WARNING MESSAGE
BR 30$ ;RETRY
40$: MOV $TMP1,$BASE ;STORE NEW BUS ADDRESS
```

SEQ 0052

CZRM  
CZRM

[illegible]

```

2429 004142 000444          BR      140$      ;SKIP TO NEXT ENTRY
2430 004144 104401 030755    100$:  TYPE     ,PROMP-    ;TYPE PROMPTING CHARACTER
2431 004150 104411          RDCHR          ;GET RESPONSE
2432 004152 012637 001176    MOV     (SP)+,$TMP1    ;ECHO RESPONSE
2433 004156 104401 001176    TYPE     ,TMP1
2434 004162 023727 001176 000015  CMP     $TMP1,#CR      ;CARRIAGE RETURN??
2435 004170 001431          BEQ      140$
2436 004172 023727 001176 000060 110$:  CMP     $TMP1,#'0    ;NUMBER < 0??
2437 004200 002404          BLT      120$      ;YES. !
2438 004202 023727 001176 000067  CMP     $TMP1,#'7    ;NUMBER > 7??
2439 004210 003403          BLE      130$      ;NO!!
2440 004212 104401 030761    120$:  TYPE     ,QSTMRK    ;TYPE '?'
2441 004216 000752          BR      100$      ;RETRY
2442 004220 013701 001176    130$:  MOV     $TMP1,R1      ;R1=DRIVE NUMBER
2443 004224 042701 177770    BIC      #^C7,R1
2444 004230 116102 031734    MOV      ATNTBL(R1),R2      ;DECODE DEVICE NUMBER
2445 004234 042702 177400    BIC      #^C377,R2      ;CLEAR UNUSED BITS
2446 004240 050237 001300    BIS      R2,$DEVM      ;SET DEVICE # IN MAP
2447 004244 122737 000377 001300  CMPB    #377,$DEVM    ;DONE ??
2448 004252 101334          BHI      100$      ;NO
2449 004254          140$:
2450

```

```
2451 004254 CMNSTART:
2452
2453 ;ASSEMBLE TEST QUE FROM DEVICE MAP
2454 004254 013700 001300 MOV $DEVN,R0 ;R0 = DEVICE MAP
2455 004260 012701 001460 MOV #TSTQUE+2,R1 ;R1 = ADDRESS OF FIRST ENTRY IN QUE
2456 004264 010137 001456 MOV R1,TSTQUE ;INITIALIZE ENTRY POINTER
2457 004270 012702 000001 MOV #1,R2 ;R2 = DEVICE POINTER
2458 004274 005003 CLR R3 ;R3 = DEVICE NUMBER
2459 004276 030200 10$: BIT R2,R0 ;IS THIS DEVICE IN MAP ??
2460 004300 001406 BEQ 20$ ;NO !!
2461 004302 010311 MOV R3,(R1) ;YES - ENTER DEVICE NUMBER IN QUE
2462 004304 116361 031734 000001 MOVB ATNTBL(R3),1(R1) ;ENTER ATTENTION BIT IN QUE
2463 004312 062701 000002 ADD #2,R1 ;ADVANCE ENTRY POINTER
2464 004316 006302 20$: ASL R2 ;ADVANCE DEVICE POINTER
2465 004320 105702 TSTB R2 ;DONE ALL DEVICES ??
2466 004322 001402 BEQ 25$ ;YES
2467 004324 005203 INC R3 ;ADVANCE DEVICE NUMBER
2468 004326 000763 BR 10$ ;ENTER NEXT DEVICE
2469 004330 005011 25$: CLR (R1) ;TERMINATE TEST QUE
2470
2471 ;SIZE FOR CLOCK
2472 004332 004737 022510 JSR PC,SIZCLK ;SEE IF CLOCK PRESENT
2473 004336 000403 BR 40$ ;YES - CLOCK IS PRESENT
2474 004340 104000 30$: ERROR ;NO CLOCK
2475 004342 000000 HALT
2476 004344 000775 BR 30$
2477 004346
2478 .SBTTL GET VALUE FOR SOFTWARE SWITCH REGISTER
2479 004346 005737 000042 TST @#42 ;ARE WE RUNNING UNDER XXDP/ACT?
2480 004352 001012 BNE 64$ ;BRANCH IF YES
2481 004354 123727 001242 000001 CMPB $ENV,#1 ;ARE WE RUNNING UNDER APT?
2482 004362 001406 BEQ 64$ ;BRANCH IF YES
2483 004364 023727 001154 000176 CMP SWR,#SWREG ;SOFTWARE SWITCH REG SELECTED?
2484 004372 001005 BNE 65$ ;BRANCH IF NO
2485 004374 104407 GTSWR ;GET SOFT-SWR SETTINGS
2486 004376 000403 BR 65$
2487 004400 112737 000001 001150 64$: MOVB #1,$AUTOB ;SET AUTO-MODE INDICATOR
2488 004406 65$:
2489 004406 012737 000140 000032 MOV #PR3,@#EMTVEC+2 ;DROP PRIORITY DURING ERROR TYPEOUT
2490 004414 000240 READY: NOP ;READY TO START TEST
2491 004416 004737 026670 JSR PC,$TKINT ;INITIALIZE TRY
2492 004422 117737 175030 001234 MOVB @TSTQUE,$UNIT ;LOAD UNIT NUMBER
```

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REGISTER AND STORAGE USAGE

SEQ 0055

2493  
2494  
2495

.SBTTL REGISTER AND STORAGE USAGE  
;REGISTER ASSIGNMENTS

```
2496  
2497      :R0      =      UNIBUS ADDRESS OF RH CONTROLLER  
2498      :R1      =      ADDRESS OF ENTRY IN TEST QUE CORRESPONDING TO THE  
2499      :          UNIT UNDER TEST  
2500      :R2,R3    =      WORKING REGISTERS FOR TEST IN PROGRESS, MUST BE  
2501      :          SAVED BY SUBROUTINES  
2502      :R4,R5    =      GENERAL WORKING REGISTERS, ARE NOT SAVED BY  
2503      :          SUBROUTINES  
2504      :R6      =      STACK POINTER  
2505      :R7      =      LINKAGE REGISTER TO SUBROUTINES  
2506  
2507      :STORAGE ASSIGNMENTS  
2508      :  
2509      :$TMP0-$TMP4  TEMPORARY STORAGE, NOT SAVED BY SUBROUTINES  
2510      :$GDDAT,$BDDAT  EXPECTED AND RRECEIVED STATUS FOR ERROR TYPEOUT  
2511      :$GDADR,$BDADR  ADDRESS OF EXPECTED AND RECEIVED STATUS IF APPLICABLE,  
2512      :                ALSO THE ADDRESS OF A REGISTER ERROR  
2513      :  
2514      :$STN      TEST NUMBER  
2515      :$UNIT     NUMBER OF DEVICE BEING TESTED  
2516      :$GINBF    =      THE REGISTER INPUT BUFFER HAS A STORAGE LOCATION FOR  
2517      :                EACH REGISTER, AND IS USED WHEN READING STATUS AND  
2518      :                CONTROL DATA  
2519      :$GOTBF     =      THE REGISTER OUTPUT BUFFER HAS A STORAGE LOCATION FOR  
2520      :                EACH REGISTER, AND IS USED FOR ASSEMBLING DATA TO BE  
2521      :                WRITTEN IN REGISTERS
```

```
2522      ;*****
2523      ;*TEST 1      TRANSFER TEST
2524
2525      ;*****
2526 004430 000004      TST1:  SCOPE
2527 004432 012737 000001 001226      MOV      #1,$TESTN      ;;SET TEST NUMBER IN APT MAIL BOX
2528
2529      NOP
2530 004442 012737 000024 001120      MOV      #20,$ICNT      ;20 ITERATIONS
2531 004450 112737 000001 001131      MOV      #1,$ERMAX      ;ONE ERROR ALLOWED
2532 004456 012737 004472 001122      MOV      #T1,$LPADR      ;LOAD LOOP ON TEST ADDRESS
2533 004464 012737 004472 001124      MOV      #T1,$LPERR      ;LOAD LOOP ON ERROR ADDRESS
2534 004472
2535 004472 012706 001100      T1:      MOV      #STACK,SP      ;LOAD THE STACK POINTER
2536 004476 013700 001276      MOV      $BASE,R0      ;R0 = UNIBUS ADDRESS OF UUT
2537 004502 013701 001456      MOV      TSTQUE,R1      ;R1 = POINTER TO DEVICE
2538 004506 012702 000000      MOV      #0,R2      ;R2 = REGISTER INDEX
2539 004512
2540      10$:
2541      ;CLEAR THE MASSBUS AND VERIFY THAT NONEXISTANT DEVICE ERROR IS RESET
2542 004512 012760 000040 000010      MOV      #CLR, RMCS2(R0) ;CLEAR THE MASSBUS
2543 004520 111160 000010      MOV      (R1), RMCS2(R0) ;SELECT UNIT
2544
2545 004524 016037 000010 001142      MOV      RMCS2(R0), $BDDAT      ;STORE RMCS2 AT $BDDAT
2546 004532 032737 010000 001142      BIT      #NED, $BDDAT
2547 004540 001417      BEQ      20$
2548 004542 111137 001140      MOV      (R1), $GDDAT
2549 004546 042737 177770 001140      BIC      #^CUNTMSK, $GDDAT
2550 004554 052737 000100 001140      BIS      #IR, $GDDAT
2551 004562 010037 001136      MOV      R0, $BDADR
2552 004566 062737 000010 001136      ADD      #RMCS2, $BDADR
2553 004574 104001      ERROR      1
2554 004576 000500      BR      60$
2555
2556      20$:
2557      ;READ THE REGISTER WHOSE INDEX IS IN R2 AND EXIT TEST IF THE READ
2558      ;DOES NOT SET 'NED' ERROR
2559 004600 010003      MOV      R0,R3      ;R3 - REGISTER ADDRESS
2560 004602 060203      ADD      R2,R3
2561 004604 011304      MOV      (R3), R4      ;READ REGISTER
2562 004606 032760 010000 000010      BIT      #NED, RMCS2(R0)      ;IS 'NED' SET??
2563 004614 001473      BEQ      70$      ;NO. !
2564 004616 012760 000040 000010      MOV      #CLR, RMCS2(R0) ;CLEAR THE MASSBUS
2565 004624 111160 000010      MOV      (R1), RMCS2(R0) ;SELECT UNIT
2566
2567 004630 016037 000010 001142      MOV      RMCS2(R0), $BDDAT      ;STORE RMCS2 AT $BDDAT
2568 004636 032737 010000 001142      BIT      #NED, $BDDAT
2569 004644 001417      BEQ      30$
2570 004646 111137 001140      MOV      (R1), $GDDAT
2571 004652 042737 177770 001140      BIC      #^CUNTMSK, $GDDAT
2572 004660 052737 000100 001140      BIS      #IR, $GDDAT
2573 004666 010037 001136      MOV      R0, $BDADR
2574 004672 062737 000010 001136      ADD      #RMCS2, $BDADR
2575 004700 104001      ERROR      1
2576 004702 000436      BR      60$
2577      30$:
2578      ;WRITE THE REGISTER WHOSE INDEX IS IN R2 AND EXIT TEST IF THE WRITE
2579      ;DOES NOT SET 'NED' ERROR
```

| Address | Offset | Device | Register | Value  | Operation | Comment                                                             |
|---------|--------|--------|----------|--------|-----------|---------------------------------------------------------------------|
| 2578    | 004704 | 012713 | 000000   |        | MOV       | #0,(R3) ;WRITE REGISTER                                             |
| 2579    | 004710 | 032760 | 010000   | 000010 | BIT       | #NED, RMCS2 (R0) ;IS 'NED' SET??                                    |
| 2580    | 004716 | 001432 |          |        | BEQ       | 70\$ ;NO!!                                                          |
| 2581    |        |        |          |        |           |                                                                     |
| 2582    | 004720 |        |          |        |           | 40\$:                                                               |
| 2583    |        |        |          |        |           | ;COULD NOT READ OR WRITE THE REGISTER WITHOUT SETTING 'NED' ERROR - |
| 2584    |        |        |          |        |           | ;ADVANCE THE REGISTER INDEX AND REPEAT THE TEST FOR THE NEXT        |
| 2585    |        |        |          |        |           | ;AVAILABLE DEVICE REGISTER                                          |
| 2586    | 004720 | 062702 | 000002   |        | ADD       | #2,R2 ;ADVANCE TO NEXT REGISTER                                     |
| 2587    | 004724 | 022702 | 000002   |        | CMP       | #RMWC,R2 ;IS THIS RMWC??                                            |
| 2588    | 004730 | 001773 |          |        | BEQ       | 40\$ ;YES - TRY NEXT REGISTER                                       |
| 2589    | 004732 | 022702 | 000004   |        | CMP       | #RMB A,R2 ;IS THIS RMB A??                                          |
| 2590    | 004736 | 001770 |          |        | BEQ       | 40\$ ;YES - TRY NEXT REGISTER                                       |
| 2591    | 004740 | 022702 | 000010   |        | CMP       | #RMCS2,R2 ;IS THIS RMCS2??                                          |
| 2592    | 004744 | 001765 |          |        | BEQ       | 40\$ ;YES - TRY ANOTHER REGISTER                                    |
| 2593    | 004746 | 022702 | 000016   |        | CMP       | #RMAS,R2 ;IS THIS RMAS ??                                           |
| 2594    | 004752 | 001762 |          |        | BEQ       | 40\$ ;YES - TRY ANOTHER REGISTER                                    |
| 2595    | 004754 | 022702 | 000022   |        | CMP       | #RMD B,R2 ;IS THIS RMD B??                                          |
| 2596    | 004760 | 001757 |          |        | BEQ       | 40\$ ;YES - TRY ANOTHER REGISTER                                    |
| 2597    | 004762 | 022702 | 000046   |        | CMP       | #RMEC2,R2 ;IS THIS A LEGAL REGISTER                                 |
| 2598    | 004766 | 103251 |          |        | BHIS      | 10\$ ;YES - TRY THIS REGISTER                                       |
| 2599    |        |        |          |        |           |                                                                     |
| 2600    | 004770 |        |          |        |           | 50\$:                                                               |
| 2601    |        |        |          |        |           |                                                                     |
| 2602    |        |        |          |        |           | ;GOT 'NONEXISTENT DEVICE' ERROR FOR EVERY REMOTE REGISTER ADDRESS   |
| 2603    | 004770 | 013737 | 001276   | 001136 | MOV       | \$BASE, \$BDADR ;STORE BASE ADDRESS                                 |
| 2604    | 004776 | 104002 |          |        | ERROR     | 2 ;DEMAND OR TRANSFER FAILED                                        |
| 2605    | 005000 | 000137 | 021442   |        | JMP       | \$EOSP ;GO SELECT NEXT DEVICE                                       |
| 2606    |        |        |          |        |           |                                                                     |
| 2607    | 005004 |        |          |        |           | 70\$:                                                               |
| 2608    |        |        |          |        |           |                                                                     |
| 2609    |        |        |          |        |           | ::*****                                                             |
| 2610    |        |        |          |        |           | ;*TEST 2 CTOD TEST                                                  |
| 2611    |        |        |          |        |           |                                                                     |
| 2612    |        |        |          |        |           | ::*****                                                             |
| 2613    | 005004 | 000004 |          |        | TST2:     | SCOPE                                                               |
| 2614    | 005006 | 012737 | 000002   | 001226 | MOV       | #2,\$TESTN ;;SET TEST NUMBER IN APT MAIL BOX                        |
| 2615    | 005014 | 000240 |          |        | NOP       |                                                                     |
| 2616    | 005016 | 012737 | 000024   | 001120 | MOV       | #20, \$ICNT ;20 ITERATIONS                                          |
| 2617    | 005024 | 112737 | 000001   | 001131 | MOVB      | #1, \$ERMAX ;ONE ERROR ALLOWED                                      |
| 2618    | 005032 | 012737 | 005046   | 001122 | MOV       | #T2, \$LPADR ;LOAD LOOP ON TEST ADDRESS                             |
| 2619    | 005040 | 012737 | 005046   | 001124 | MOV       | #T2, \$LPERR ;LOAD LOOP ON ERROR ADDRESS                            |
| 2620    | 005046 |        |          |        |           |                                                                     |
| 2621    | 005046 | 012706 | 001100   |        | MOV       | #STACK, SP ;LOAD THE STACK POINTER                                  |
| 2622    | 005052 | 013700 | 001276   |        | MOV       | \$BASE, R0 ;R0 = UNIBUS ADDRESS OF UUT                              |
| 2623    | 005056 | 013701 | 001456   |        | MOV       | TSTQUE, R1 ;R1 = POINTER TO DEVICE                                  |
| 2624    | 005062 | 012760 | 000040   | 000010 | MOV       | #CLR, RMCS2(R0) ;CLEAR THE MASSBUS                                  |
| 2625    | 005070 | 111160 | 000010   |        | MOVB      | (R1), RMCS2(R0) ;SELECT UNIT                                        |
| 2626    |        |        |          |        |           | ;WRITE ONES IN REMOTE REGISTERS                                     |
| 2627    |        |        |          |        |           |                                                                     |
| 2628    | 005074 | 012760 | 000076   | 000000 | MOV       | #ILF76, RMCS1(R0) ;LOAD RMCS1                                       |
| 2629    |        |        |          |        |           |                                                                     |
| 2630    | 005102 | 012760 | 177777   | 000006 | MOV       | #-1, RMDA(R0) ;LOAD RMDA                                            |
| 2631    |        |        |          |        |           |                                                                     |
| 2632    | 005110 | 012760 | 001777   | 000034 | MOV       | #CYLMSK, RMDC(R0) ;LOAD RMDC                                        |
| 2633    |        |        |          |        |           |                                                                     |

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2634 005116 012760 016200 000032      MOV      #FMT16!ECI!OFD,RMOF(R0)      ;LOAD RMOF
2635      ;READ REMOTE REGISTERS TWICE
2636 005124 012702 000001      MOV      #1,R2
2637 005130      10$:
2638
2639 005130 016037 000000 001326      MOV      RMCS1(R0),RMCS1I      ;STORE RMCS1 IN INPUT BUFFER
2640
2641 005136 016037 000006 001334      MOV      RMDA(R0),RMDAI      ;STORE RMDA IN INPUT BUFFER
2642
2643 005144 016037 000034 001362      MOV      RMDC(R0),RMDCI      ;STORE RMDC IN INPUT BUFFER
2644
2645 005152 016037 000032 001360      MOV      RMOF(R0),RMOFI      ;STORE RMOF IN INPUT BUFFER
2646 005160 005302
2647 005162 100362      DEC      R2
2648      BPL      10$
2649 005164 042737 177701 001326      ;SEE IF ANY ONE BITS CAME BACK
2650 005172 001014      BIC      #^CILF76,RMCS1I      ;IS RMCS1 0??
2651 005174 005737 001334      BNE      20$      ;NO..
2652 005200 001011      TST      RMDAI      ;IS RMDA 0??
2653 005202 042737 176000 001362      BNE      20$      ;NO!!
2654 005210 001005      BIC      #XNUDC,RMDCI      ;IS RMDC 0??
2655 005212 042737 161577 001360      BNE      20$      ;NO!!
2656 005220 001001      BIC      #XNUOF,RMOFI      ;IS RMOF 0 ??
2657      BNE      20$      ;NO..
2658      ;CANNOT READ ANY ONE BITS FROM REMOTE REGISTERS
2659 005222 104003      ERROR    3      ;CTOD MUST BE STUCK
2660      20$:
2661      ;*****
2662      ;*TEST 3      MASSBUS INITIALIZE TEST
2663      ;*****
2664      ;*****
2665 005224 000004      TST3:    SCOPE
2666 005226 012737 000003 001226      MOV      #3,$TESTN      ;;SET TEST NUMBER IN APT MAIL BOX
2667
2668 005234 000240      NOP
2669 005236 012737 000024 001120      MOV      #20,$ICNT      ;20 ITERATIONS
2670 005244 112737 000001 001131      MOV      #1,$ERMAX      ;ONE ERROR ALLOWED
2671 005252 012737 005266 001122      MOV      #T3,$LPADR      ;LOAD LOOP ON TEST ADDRESS
2672 005260 012737 005266 001124      MOV      #T3,$LPERR      ;LOAD LOOP ON ERROR ADDRESS
2673 005266
2674 005266 012706 001100      T3:      MOV      #STACK,SP      ;LOAD THE STACK POINTER
2675 005272 013700 001276      MOV      $BASE,R0      ;R0 = UNIBUS ADDRESS OF UUT
2676 005276 013701 001456      MOV      TSTQUE,R1      ;R1 = POINTER TO DEVICE
2677 005302 012760 000040 000010      MOV      #CLR,RMCS2(R0)      ;CLEAR THE MASSBUS
2678 005310 111160 000010      MOV      (R1),RMCS2(R0)      ;SELECT UNIT
2679      ;WRITE ONES IN SELECTED REGISTERS
2680
2681 005314 012760 000076 000000      MOV      #ILF76,RMCS1(R0)      ;LOAD RMCS1
2682
2683 005322 012760 177777 000014      MOV      #-1,RMER1(R0)      ;LOAD RMER1
2684
2685 005330 012760 177777 000042      MOV      #-1,RMER2(R0)      ;LOAD RMER2
2686      ;USING CONTROLLER CLEAR, IE., BIT 5 OF RMCS2, INITIALIZE THE MASSBUS
2687 005336 012760 000040 000010      MOV      #CLR,RMCS2(R0)      ;CLEAR THE MASSBUS
2688 005344 111160 000010      MOV      (R1),RMCS2(R0)      ;SELECT UNIT
2689      ;READ THE REGISTERS THAT WERE WRITTEN
  
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2690
2691 005350 016037 000000 001326      MOV      RMCS1(R0),RMCS1I      ;STORE RMCS1 IN INPUT BUFFER
2692
2693 005356 016037 000014 001342      MOV      RMER1(R0),RMER1I      ;STORE RMER1 IN INPUT BUFFER
2694
2695 005364 016037 000042 001370      MOV      RMER2(R0),RMER2I      ;STORE RMER2 IN INPUT BUFFER
2696      ;SEE IF ANY REGISTER BITS WERE CLEARED
2697 005372 052737 177701 001326      BIS      #^CILF76,RMCS1I      ;SET ANY BIT NOT WRITTEN
2698 005400 052737 001567 001370      BIS      #XNUER2,RMER2I
2699 005406 022737 177777 001326      CMP      #-1,RMCS1I      ;ANY ZEROS IN RMCS1??
2700 005414 001011      BNE      10$      ;YES!!
2701 005416 022737 177777 001342      CMP      #-1,RMER1I      ;ANY ZEROS IN RMER1??
2702 005424 001005      BNE      10$      ;YES!!
2703 005426 022737 177777 001370      CMP      #-1,RMER2I      ;ANY ZEROS IN RMER2??
2704 005434 001001      BNE      10$
2705      ;NONE OF THE BITS WERE CLEARED
2706 005436 104004      ERROR      4      ;MASSBUS INIT FAILED
2707 005440      10$:
2708
2709      ;*****
2710      ;*TEST 4      CLEAR STUCK ACTIVE TEST
2711
2712      ;*****
2713 005440 000004      TST4:      SCOPE
2714 005442 012737 000004 001226      MOV      #4,$TESTN      ;;SET TEST NUMBER IN APT MAIL BOX
2715
2716 005450 000240      NOP
2717 005452 012737 000024 001120      MOV      #20,$ICNT      ;20 ITERATIONS
2718 005460 112737 000001 001131      MOVB     #1,$ERMAX      ;ONE ERROR ALLOWED
2719 005466 012737 005502 001122      MOV      #T4,$LPADR      ;LOAD LOOP ON TEST ADDRESS
2720 005474 012737 005502 001124      MOV      #T4,$LPERR      ;LOAD LOOP ON ERROR ADDRESS
2721 005502
2722 005502 012706 001100      T4:      MOV      #STACK,SP      ;LOAD THE STACK POINTER
2723 005506 013700 001276      MOV      $BASE,R0      ;R0 = UNIBUS ADDRESS OF UUT
2724 005512 013701 001456      MOV      TSTQUE,R1      ;R1 = POINTER TO DEVICE
2725 005516 012760 000040 000010      MOV      #CLR,RMCS2(R0)      ;CLEAR THE MASSBUS
2726 005524 111160 000010      MOVB     (R1),RMCS2(R0)      ;SELECT UNIT
2727      ;WRITE ONES IN TEST REGISTERS
2728
2729 005530 012760 177777 000014      MOV      #-1,RMER1(R0)      ;LOAD RMER1
2730
2731 005536 012760 177777 000042      MOV      #-1,RMER2(R0)      ;LOAD RMER2
2732
2733 005544 012760 000001 000024      MOV      #DMD,RMMR1(R0)      ;LOAD RMMR1
2734      ;READ TEST REGISTERS AND SEE IF ANY BITS ARE ON
2735
2736 005552 016037 000014 001342      MOV      RMER1(R0),RMER1I      ;STORE RMER1 IN INPUT BUFFER
2737
2738 005560 016037 000042 001370      MOV      RMER2(R0),RMER2I      ;STORE RMER2 IN INPUT BUFFER
2739
2740 005566 016037 000024 001352      MOV      RMMR1(R0),RMMR1I      ;STORE RMMR1 IN INPUT BUFFER
2741 005574 042737 040000 001342      BIC      #UNS,RMER1I      ;DONT ACCEPT UNSAFE
2742 005602 001011      BNE      10$      ;BRANCH IF ANY OTHER BITS ON
2743 005604 042737 040200 001370      BIC      #SKI!DVC,RMER2I      ;DONT ACCEPT SKI OR DVC
2744 005612 001005      BNE      10$      ;BRANCH IF ANY OTHER BITS ON
2745 005614 032737 000001 001352      BIT      #DMD,RMMR1I      ;BRANCH IF DMD IS ON
  
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2746 005622 001001      BNE      10$
2747 005624 104026      ERROR    26      ;MBA CLR IS STUCK ACTIVE
2748 005626      10$:
2749
2750
2751      ;*****
2752      ;*TEST 5      TRISTATE TRANSFER TEST
2753      ;*****
2754      TST5:  SCOPE
2755 005626 000004      MOV      #5,$TESTN      ;;SET TEST NUMBER IN APT MAIL BOX
2756 005630 012737 000005 001226      NOP
2757 005636 000240      MOV      #20,$ICNT      ;20 ITERATIONS
2758 005640 012737 000024 001120      MOV      #1,$ERMAX      ;ONE ERROR ALLOWED
2759 005646 112737 000001 001131      MOV      #T5,$LPADR      ;LOAD LOOP ON TEST ADDRESS
2760 005654 012737 005670 001122      MOV      #T5,$LPERR      ;LOAD LOOP ON ERROR ADDRESS
2761 005662 012737 005670 001124      T5:
2762 005670      MOV      #STACK,SP      ;LOAD THE STACK POINTER
2763 005670 012706 001100      MOV      $BASE,R0      ;R0 = UNIBUS ADDRESS OF UUT
2764 005674 013700 001276      MOV      TSTQUE,R1      ;R1 = POINTER TO DEVICE
2765 005700 013701 001456      CLR      R2      ;CLEAR ERROR FLAGS
2766 005704 005002      MOV      #CLR,RMCS2(R0) ;CLEAR THE MASSBUS
2767 005706 012760 000040 000010      MOV      (R1),RMCS2(R0) ;SELECT UNIT
2768 005714 111160 000010      ;WRITE ONES IN SELECTED REGISTERS
2769
2770      MOV      #ILF76,RMCS1(R0)      ;LOAD RMCS1
2771 005720 012760 000076 000000      MOV      #-1,RMDA(R0)      ;LOAD RMDA
2772
2773 005726 012760 177777 000006      MOV      #-1,RMER1(R0)      ;LOAD RMER1
2774
2775 005734 012760 177777 000014      MOV      #-1,RMOF(R0)      ;LOAD RMOF
2776
2777 005742 012760 177777 000032      MOV      #-1,RMER2(R0)      ;LOAD RMER2
2778
2779 005750 012760 177777 000042      ;WRITE ZEROS IN SELECTED REGISTERS
2780
2781      MOV      #0,RMCS1(R0)      ;LOAD RMCS1
2782 005756 012760 000000 000000      MOV      #0,RMDA(R0)      ;LOAD RMDA
2783
2784 005764 012760 000000 000006      MOV      #0,RMER1(R0)      ;LOAD RMER1
2785
2786 005772 012760 000000 000014      MOV      #0,RMOF(R0)      ;LOAD RMOF
2787
2788 006000 012760 000000 000032      MOV      #0,RMDC(R0)      ;LOAD RMDC
2789
2790 006006 012760 000000 000034      MOV      #0,RMER2(R0)      ;LOAD RMER2
2791
2792 006014 012760 000000 000042      ;READ BACK ALL REGISTERS
2793
2794      MOV      RMCS1(R0),RMCS1I      ;STORE RMCS1 IN INPUT BUFFER
2795 006022 016037 000000 001326      MOV      RMDA(R0),RMDAI      ;STORE RMDA IN INPUT BUFFER
2796
2797 006030 016037 000006 001334      MOV      RMER1(R0),RMER1I      ;STORE RMER1 IN INPUT BUFFER
2798
2799 006036 016037 000014 001342      MOV      RMOF(R0),RMOFI      ;STORE RMOF IN INPUT BUFFER
2800
2801 006044 016037 000032 001360
  
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2802
2803 006052 016037 000034 001362      MOV      RMDC(R0),RMDCI ;STORE RMDC IN INPUT BUFFER
2804
2805 006060 016037 000042 001370      MOV      RMER2(R0),RMER2I ;STORE RMER2 IN INPUT BUFFER
2806      ;CHECK EACH REGISTER CONTENT FOR ZERO BITS WRITTEN & READ
2807 006066 012702 177777      MOV      #-1,R2 ;ACCUMULATE ZEROS IN R2
2808 006072 052737 177701 001326      BIS      #^CILF76,RMCS1I ;SET ALL BITS NOT WRITTEN
2809 006100 052737 161577 001360      BIS      #XNUOF,RMOFI
2810 006106 052737 176000 001362      BIS      #XNUDC,RMDCI
2811 006114 052737 001567 001370      BIS      #XNUER2,RMER2I
2812 006122 005137 001326      COM      RMCS1I ;COMPLEMENT REGISTER CONTENTS
2813 006126 005137 001334      COM      RMDAI
2814 006132 005137 001342      COM      RMER1I
2815 006136 005137 001360      COM      RMOFI
2816 006142 005137 001362      COM      RMDCI
2817 006146 005137 001370      COM      RMER2I
2818 006152 043702 001326      BIC      RMCS1I,R2 ;ACCUMULATE ALL ZERO BITS
2819 006156 043702 001334      BIC      RMDAI,R2
2820 006162 043702 001342      BIC      RMER1I,R2
2821 006166 043702 001360      BIC      RMOFI,R2
2822 006172 043702 001362      BIC      RMDCI,R2
2823 006176 043702 001370      BIC      RMER2I,R2
2824 006202 001407      BEQ      10$ ;BRANCH IF EACH BIT IS ZERO
2825      ;ONE OR MORE BIT POSITIONS ARE NOT ZERO
2826 006204 010237 001142      MOV      R2,$BDDAT ;SAVE RESULT FOR TYPE
2827 006210 005037 001140      CLR      $GDDAT ;LOAD EXPECTED RESULT
2828 006214 104005      ERROR      5 ;TRISTATE BUS IS STUCK AT ONE
2829 006216 052702 000001      BIS      #BIT0,R2 ;SET ERROR FLAG
2830 006222      10$:
2831
2832 006222 012760 000040 000010      MOV      #CLR,RMCS2(R0) ;CLEAR THE MASSBUS
2833 006230 111160 000010      MOV      (R1),RMCS2(R0) ;SELECT UNIT
2834      ;PRESET SELECTED REGISTERS TO ZEROS
2835      ;(ASSUME RMCS1, RMER1, RMER2 WERE CLEARED BY INIT)
2836
2837 006234 012760 000000 000006      MOV      #0,RMDA(R0) ;LOAD RMDA
2838
2839 006242 012760 000000 000032      MOV      #0,RMOF(R0) ;LOAD RMOF
2840
2841 006250 012760 000000 000034      MOV      #0,RMDC(R0) ;LOAD RMDC
2842      ;WRITE ONES IN SELECTED REGISTERS
2843
2844 006256 012760 000076 000000      MOV      #ILF76,RMCS1(R0) ;LOAD RMCS1
2845
2846 006264 012760 177777 000006      MOV      #-1,RMDA(R0) ;LOAD RMDA
2847
2848 006272 012760 016200 000032      MOV      #^CXNUOF,RMOF(R0) ;LOAD RMOF
2849
2850 006300 012760 001777 000034      MOV      #^CXNUDC,RMDC(R0) ;LOAD RMDC
2851
2852 006306 012760 177777 000014      MOV      #-1,RMER1(R0) ;LOAD RMER1
2853
2854 006314 012760 176210 000042      MOV      #^CXNUER2,RMER2(R0) ;LOAD RMER2
2855      ;READ ALL REGISTERS
2856
2857 006322 016037 000000 001326      MOV      RMCS1(R0),RMCS1I ;STORE RMCS1 IN INPUT BUFFER
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2858
2859 006330 016037 000006 001334      MOV      RMDA(R0),RMDAI ;STORE RMDA IN INPUT BUFFER
2860
2861 006336 016037 000032 001360      MOV      RMOF(R0),RMOFI ;STORE RMOF IN INPUT BUFFER
2862
2863 006344 016037 000034 001362      MOV      RMDC(R0),RMDCI ;STORE RMDC IN INPUT BUFFER
2864
2865 006352 016037 000014 001342      MOV      RMER1(R0),RMER1I ;STORE RMER1 IN INPUT BUFFER
2866
2867 006360 016037 000042 001370      MOV      RMER2(R0),RMER2I ;STORE RMER2 IN INPUT BUFFER
2868      ;CHECK EACH REGISTER CONTENT FOR ONE BITS WRITTEN & READ
2869 006366 042737 177701 001326      BIC      #^CILF76,RMCS1I ;CLEAR ALL BITS NOT WRITTEN
2870 006374 042737 161577 001360      BIC      #XNUOF,RMOFI
2871 006402 042737 176000 001362      BIC      #XNUDC,RMDCI
2872 006410 042737 001567 001370      BIC      #XNUER2,RMER2I
2873 006416 005002                CLR      R2 ;ACCUMULATE ONES IN R2
2874 006420 053702 001326      BIS      RMCS1I,R2 ;ACCUMULATE ALL ONE BITS
2875 006424 053702 001334      BIS      RMDAI,R2
2876 006430 053702 001360      BIS      RMOFI,R2
2877 006434 053702 001362      BIS      RMDCI,R2
2878 006440 053702 001342      BIS      RMER1I,R2
2879 006444 053702 001370      BIS      RMER2I,R2
2880 006450 022702 177777      CMP      #-1,R2 ;SEE IF EACH BIT POSITION WAS ONE
2881 006454 001410      BEQ      20$ ;BRANCH IF NONE STUCK
2882      ;ONE OR MORE BIT POSITIONS ARE NOT ONE
2883 006456 010237 001142      MOV      R2,$BDDAT ;SAVE RESULT FOR TYPE
2884 006462 012737 177777 001140      MOV      #-1,$GDDAT ;EXPECTED RESULT
2885 006470 104006                ERROR      6
2886 006472 052702 000002      BIS      #BIT1,R2 ;SET ERROR FLAG
2887 006476                20$:
2888
2889 006476 005702                TST      R2 ;ANY ERRORS DETECTED ??
2890 006500 001131                BNE      30$ ;YES - DONT DO BIT TEST
2891 006502 012702 000001      MOV      #1,R2 ;R2=BIT POSITION
2892 006506                25$:
2893 006506 012760 000040 000010      MOV      #CLR,RMCS2(R0) ;CLEAR THE MASSBUS
2894 006514 111160 000010      MOV      (R1),RMCS2(R0) ;SELECT UNIT
2895      ;WRITE THE BIT PATTERN IN SELECTED DEVICE REGISTERS
2896
2897 006520 010260 000006      MOV      R2,RMDA(R0) ;LOAD RMDA
2898
2899 006524 010260 000032      MOV      R2,RMOF(R0) ;LOAD RMOF
2900
2901 006530 010260 000034      MOV      R2,RMDC(R0) ;LOAD RMDC
2902
2903 006534 010260 000014      MOV      R2,RMER1(R0) ;LOAD RMER1
2904
2905 006540 010260 000042      MOV      R2,RMER2(R0) ;LOAD RMER2
2906      ;READ BACK THE REGISTERS
2907
2908 006544 016037 000006 001334      MOV      RMDA(R0),RMDAI ;STORE RMDA IN INPUT BUFFER
2909
2910 006552 016037 000032 001360      MOV      RMOF(R0),RMOFI ;STORE RMOF IN INPUT BUFFER
2911
2912 006560 016037 000034 001362      MOV      RMDC(R0),RMDCI ;STORE RMDC IN INPUT BUFFER
2913
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2914 006566 016037 000014 001342      MOV      RMER1(R0),RMER1I      ;STORE RMER1 IN INPUT BUFFER
2915
2916 006574 016037 000042 001370      MOV      RMER2(R0),RMER2I      ;STORE RMER2 IN INPUT BUFFER
2917      ;CHECK REGISTER CONTENTS FOR CORRECT PATTERN
2918 006602 005003      CLR      R3      ;R3=ACCUMULATED ONE BIT
2919 006604 012704 177777      MOV      #-1,R4      ;R4=ACCUMULATED ZERO BITS
2920 006610 013705 001334      MOV      RMDAI,R5      ;GET ANY GOOD BITS FROM RMDA
2921 006614 050503      BIS      R5,R3
2922 006616 005105      COM      R5
2923 006620 040504      BIC      R5,R4
2924 006622 013705 001360      MOV      RMOFI,R5      ;GET GOOD BITS FROM RMOF
2925 006626 042705 161577      BIC      #XNUOF,R5
2926 006632 050503      BIS      R5,R3
2927 006634 005105      COM      R5
2928 006636 042705 161577      BIC      #XNUOF,R5
2929 006642 040504      BIC      R5,R4
2930 006644 013705 001362      MOV      RMDCI,R5      ;GET GOOD BITS FROM RMDC
2931 006650 042705 176000      BIC      #XNUDC,R5
2932 006654 050503      BIS      R5,R3
2933 006656 005105      COM      R5
2934 006660 042705 176000      BIC      #XNUDC,R5
2935 006664 040504      BIC      R5,R4
2936 006666 013705 001342      MOV      RMER1I,R5      ;GET GOOD BITS FROM RMER1
2937 006672 050503      BIS      R5,R3
2938 006674 005105      COM      R5
2939 006676 040504      BIC      R5,R4
2940 006700 013705 001370      MOV      RMER2I,R5      ;GET GOOD BITS FROM RMER2
2941 006704 042705 001567      BIC      #XNUER2,R5
2942 006710 050503      BIS      R5,R3
2943 006712 005105      COM      R5
2944 006714 042705 001567      BIC      #XNUER2,R5
2945 006720 040504      BIC      R5,R4
2946 006722 010205      MOV      R2,R5      ;RESET ALL ONES IN R3 EXCEPT
2947 006724 005105      COM      R5      ;FOR THE TEST BIT
2948 006726 040503      BIC      R5,R3
2949 006730 040204      BIC      R2,R4      ;RESET TEST BIT IN R4
2950 006732 050403      BIS      R4,R3      ;COMBINE ACCUMULATED 1'S + 0'S
2951 006734 020302      CMP      R3,R2      ;IS PATTERN OK??
2952 006736 001406      BEQ      26$      ;YES!!
2953 006740 010237 001140      MOV      R2,$GDDAT      ;SAVE TEST PATTERN
2954 006744 010337 001142      MOV      R3,$BDDAT      ;SAVE RESULT
2955 006750 104007      ERROR    7      ;BIT INTERFERENCE IN TRISTATE BUS
2956 006752 000404      BR       30$      ;SKIP TO NEXT
2957 006754
2958      26$:
2959      ;ADVANCE R2 TO THE NEXT PATTERN AND REPEAT TEST
2960      ASL      R2      ;SHIFT THE BIT
2961 006756 001402      BEQ      30$      ;EXIT IF DONE
2962 006760 000137 006506      JMP      25$
2963
2964      30$:
2965      ;*****
2966      ;*TEST 6      REGISTER SELECT TEST
2967      ;*****
2968 006764 000004      TST6:    SCOPE
2969 006766 012737 000006 001226      MOV      #6,$TESTN      ;;SET TEST NUMBER IN APT MAIL BOX
  
```

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2970
2971 006774 000240
2972 006776 012737 000024 001120
2973 007004 112737 000001 001131
2974 007012 012737 007026 001122
2975 007020 012737 007026 001124
2976 007026
2977 007026 012706 001100
2978 007032 013700 001276
2979 007036 013701 001456
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2987
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2990
2991
2992
2993
2994
2995
2996
2997
2998
2999
3000
3001
3002
3003
3004
3005
3006
3007
3008
3009
3010
3011
3012 007042 005002
3013 007044 012703 177777
3014
3015 007050 012760 000040 000010
3016 007056 111160 000010
3017
3018 007062 010260 000014
3019
3020 007066 010260 000034
3021
3022 007072 010360 000024
3023
3024 007076 010360 000036
3025

NOP
MOV #20,$ICNT ;20 ITERATIONS
MOVB #1,$ERMAX ;ONE ERROR ALLOWED
MOV #16,$LPADR ;LOAD LOOP ON TEST ADDRESS
MOV #T6,$LPERR ;LOAD LOOP ON ERROR ADDRESS

T6:
MOV #STACK,SP ;LOAD THE STACK POINTER
MOV $BASE,R0 ;R0 = UNIBUS ADDRESS OF UUT
MOV TSTQUE,R1 ;R1 = POINTER TO DEVICE

;THE FOLLOWING TABLE GIVES MASSBUS REGISTER SELECT VALUES FOR
;EACH DEVICE REGISTER

: REGISTER REG SEL
: NAME (16,8,4,2,1)
:
: RMCS1 00000
: RMD5 00001
: RMER1 00010
: RMMR1 00011
: RMA5 00100
: RMDA 00101
: RMDT 00110
: RMLA 00111
: RMSN 01000
: RMOF 01001
: RMDC 01010
: RMHR 01011
: RMMR2 01100
: RMER2 01101
: RMEC1 01110
: RMEC2 01111

;EACH REGISTER SELECT LINE IS TESTED FOR A STUCK AT ONE,
;STUCK AT ZERO FAULT. AS AN EXAMPLE, TO TEST REG SEL 1,
;FOR S-A-0, RMER1 IS WRITTEN WITH ZEROS. THEN THE REGISTER
;THAT HAS THE SAME SELECT VALUE, EXCEPT FOR THE SELECT LINE
;BEING TESTED, IS WRITTEN WITH ONES. IN THIS EXAMPLE,
;RMMR1 IS WRITTEN WITH ONES. IF SELECT LINE 1 IS S-A-0,
;THE ALL ONES WORD WILL BE WRITTEN IN RMER1, AND RMER1
;WILL NOT BE 0 WHEN READ BACK.

CLR R2 ;R2= ZEROS SOURCE
MOV #1,R3 ;R3= ONES SOURCE
;TEST REG SEL 1 FOR S-A-0
MOV #CLR,RMCS2(R0) ;CLEAR THE MASSBUS
MOVB (R1),RMCS2(R0) ;SELECT UNIT

MOV R2,RMER1(R0) ;LOAD RMER1

MOV R2,RMDC(R0) ;LOAD RMDC

MOV R3,RMMR1(R0) ;LOAD RMMR1

MOV R3,RMHR(R0) ;LOAD RMHR

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3026 007102 016037 000014 001342      MOV      RMER1(R0),RMER1I      ;STORE RMER1 IN INPUT BUFFER
3027
3028 007110 016037 000034 001362      MOV      RMDI(R0),RMDI      ;STORE RMDI IN INPUT BUFFER
3029 007116 020337 001342              CMP      R3,RMER1I
3030 007122 001007              BNE      10$
3031 007124 052737 176000 001362      BIS      #XNUDC,RMDI
3032 007132 020337 001362      CMP      R3,RMDI
3033 007136 001001              BNE      10$
3034 007140 104010              ERROR      10      ;REG SEL 1 IS S-A-0
3035 007142              10$:
3036
3037              ;TEST REG SEL 1 FOR S-A-1
3038 007142 012760 000040 000010      MOV      #CLR,RMCS2(R0) ;CLEAR THE MASSBUS
3039 007150 111160 000010      MOV      (R1),RMCS2(R0) ;SELECT UNIT
3040
3041 007154 010260 000006              MOV      R2,RMDA(R0)      ;LOAD RMDA
3042
3043 007160 010260 000032              MOV      R2,RMOF(R0)      ;LOAD RMOF
3044
3045 007164 010260 000042              MOV      R2,RMER2(R0)     ;LOAD RMER2
3046
3047 007170 010360 000016              MOV      R3,RMAS(R0)      ;LOAD RMAS
3048
3049 007174 010360 000030              MOV      R3,RMSN(R0)      ;LOAD RMSN
3050
3051 007200 010360 000040              MOV      R3,RMMR2(R0)     ;LOAD RMMR2
3052
3053 007204 016037 000006 001334      MOV      RMDA(R0),RMDAI ;STORE RMDA IN INPUT BUFFER
3054
3055 007212 016037 000032 001360      MOV      RMOF(R0),RMOFI ;STORE RMOF IN INPUT BUFFER
3056
3057 007220 016037 000042 001370      MOV      RMER2(R0),RMER2I ;STORE RMER2 IN INPUT BUFFER
3058 007226 020337 001334      CMP      R3,RMDAI
3059 007232 001015              BNE      20$
3060 007234 052737 161577 001360      BIS      #XNUOF,RMOFI
3061 007242 020337 001360      CMP      R3,RMOFI
3062 007246 001007              BNE      20$
3063 007250 052737 001567 001370      BIS      #XNUER2,RMER2I
3064 007256 020337 001370      CMP      R3,RMER2I
3065 007262 001001              BNE      20$
3066 007264 104011              ERROR      11      ;REG SEL 1 IS S-A-1
3067 007266              20$:
3068
3069              ;TEST REG SEL 2 FOR S-A-0
3070 007266 012760 000040 000010      MOV      #CLR,RMCS2(R0) ;CLEAR THE MASSBUS
3071 007274 111160 000010      MOV      (R1),RMCS2(R0) ;SELECT UNIT
3072
3073 007300 010260 000006              MOV      R2,RMDA(R0)      ;LOAD RMDA
3074
3075 007304 010260 000032              MOV      R2,RMOF(R0)      ;LOAD RMOF
3076
3077 007310 010260 000042              MOV      R2,RMER2(R0)     ;LOAD RMER2
3078
3079 007314 010360 000020              MOV      R3,RMLA(R0)      ;LOAD RMLA
3080
3081 007320 010360 000036              MOV      R3,RMHR(R0)      ;LOAD RMHR

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3082
3083 007324 010360 000046      MOV      R3,RMEC2(R0)      ;LOAD RMEC2
3084
3085 007330 016037 000006 001334  MOV      RMDA(R0),RMDAI    ;STORE RMDA IN INPUT BUFFER
3086
3087 007336 016037 000032 001360  MOV      RMOF(R0),RMOFI    ;STORE RMOF IN INPUT BUFFER
3088
3089 007344 016037 000042 001370  MOV      RMER2(R0),RMER2I    ;STORE RMER2 IN INPUT BUFFER
3090 007352 020337 001334      CMP      R3,RMDAI
3091 007356 001015      BNE      30$
3092 007360 052737 161577 001360  BIS      #XNUOF,RMOFI
3093 007366 020337 001360      CMP      R3,RMOFI
3094 007372 001007      BNE      30$
3095 007374 052737 001567 001370  BIS      #XNUER2,RMER2I
3096 007402 020337 001370      CMP      R3,RMER2I
3097 007406 001001      BNE      30$
3098 007410 104012      ERROR      12      ;REG SEL 2 IS S-A-0
3099 007412
3100
3101      30$:
3102      ;TEST REG SEL 2 FOR S-A-1
3102 007412 012760 000040 000010  MOV      #CLR,RMCS2(R0)    ;CLEAR THE MASSBUS
3103 007420 111160 000010      MOV      (R1),RMCS2(R0)    ;SELECT UNIT
3104
3105 007424 010260 000014      MOV      R2,RMER1(R0)    ;LOAD RMER1
3106
3107 007430 010260 000034      MOV      R2,RMDC(R0)    ;LOAD RMDC
3108
3109 007434 012760 000076 000000  MOV      #ILF76,RMCS1(R0)    ;LOAD RMCS1
3110
3111 007442 010360 000030      MOV      R3,RMSN(R0)    ;LOAD RMSN
3112
3113 007446 016037 000014 001342  MOV      RMER1(R0),RMER1I    ;STORE RMER1 IN INPUT BUFFER
3114
3115 007454 016037 000034 001362  MOV      RMDC(R0),RMDCI    ;STORE RMDC IN INPUT BUFFER
3116 007462 052737 177701 001342  BIS      #^CILF76,RMER1I
3117 007470 020337 001342      CMP      R3,RMER1I
3118 007474 001007      BNE      40$
3119 007476 052737 176000 001362  BIS      #XNUDC,RMDCI
3120 007504 020337 001362      CMP      R3,RMDCI
3121 007510 001001      BNE      40$
3122 007512 104013      ERROR      13      ;REG SEL 2 IS S-A-1
3123 007514
3124
3125      40$:
3126      ;TEST REG SEL 4 FOR S-A-0
3126 007514 012760 000040 000010  MOV      #CLR,RMCS2(R0)    ;CLEAR THE MASSBUS
3127 007522 111160 000010      MOV      (R1),RMCS2(R0)    ;SELECT UNIT
3128
3129 007526 010260 000014      MOV      R2,RMER1(R0)    ;LOAD RMER1
3130
3131 007532 010260 000032      MOV      R2,RMOF(R0)    ;LOAD RMOF
3132
3133 007536 010260 000034      MOV      R2,RMDC(R0)    ;LOAD RMDC
3134
3135 007542 010360 000026      MOV      R3,RMDT(R0)    ;LOAD RMDT
3136
3137 007546 010360 000042      MOV      R3,RMER2(R0)    ;LOAD RMER2

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```

3138
3139 007552 010360 000044      MOV    R3,RMEC1(R0)      ;LOAD RMEC1
3140
3141 007556 016037 000014 001342  MOV    RMER1(R0),RMER1I      ;STORE RMER1 IN INPUT BUFFER
3142
3143 007564 016037 000032 001360  MOV    RMOF(R0),RMOFI      ;STORE RMOF IN INPUT BUFFER
3144
3145 007572 016037 000034 001362  MOV    RMDC(R0),RMDCI      ;STORE RMDC IN INPUT BUFFER
3146 007600 020337 001342      CMP    R3,RMER1I
3147 007604 001015      BNE    50$
3148 007606 052737 161577 001360  BIS    #XNUOF,RMOFI
3149 007614 020337 001360      CMP    R3,RMOFI
3150 007620 001007      BNE    50$
3151 007622 052737 176000 001362  BIS    #XNUDC,RMDCI
3152 007630 020337 001362      CMP    R3,RMDCI
3153 007634 001001      BNE    50$
3154 007636 104014      ERROR    14      ;REG SEL 4 IS S-A-0
3155 007640      50$:
3156
3157      ;TEST REG SEL 4 FOR S-A-1
3158 007640 012760 000040 000010  MOV    #CLR,RMCS2(R0)      ;CLEAR THE MASSBUS
3159 007646 111160 000010      MOV    (R1),RMCS2(R0)      ;SELECT UNIT
3160
3161 007652 010260 000006      MOV    R2,RMDA(R0)      ;LOAD RMDA
3162
3163 007656 010260 000042      MOV    R2,RMER2(R0)      ;LOAD RMER2
3164
3165 007662 010360 000012      MOV    R3,RMDS(R0)      ;LOAD RMDS
3166
3167 007666 010360 000032      MOV    R3,RMOF(R0)      ;LOAD RMOF
3168
3169 007672 016037 000006 001334  MOV    RMDA(R0),RMDAI      ;STORE RMDA IN INPUT BUFFER
3170
3171 007700 016037 000042 001370  MOV    RMER2(R0),RMER2I      ;STORE RMER2 IN INPUT BUFFER
3172 007706 020337 001334      CMP    R3,RMDAI
3173 007712 001007      BNE    60$
3174 007714 052737 001567 001370  BIS    #XNUER2,RMER2I
3175 007722 020337 001370      CMP    R3,RMER2I
3176 007726 001001      BNE    60$
3177 007730 104015      ERROR    15      ;REG SEL 4 IS S-A-1
3178 007732      60$:
3179
3180      ;TEST REG SEL 8 FOR S-A-0
3181 007732 012760 000040 000010  MOV    #CLR,RMCS2(R0)      ;CLEAR THE MASSBUS
3182 007740 111160 000010      MOV    (R1),RMCS2(R0)      ;SELECT UNIT
3183
3184 007744 010260 000014      MOV    R2,RMER1(R0)      ;LOAD RMER1
3185
3186 007750 010260 000006      MOV    R2,RMDA(R0)      ;LOAD RMDA
3187
3188 007754 010360 000034      MOV    R3,RMDC(R0)      ;LOAD RMDC
3189
3190 007760 010360 000042      MOV    R3,RMER2(R0)      ;LOAD RMER2
3191
3192 007764 016037 000014 001342  MOV    RMER1(R0),RMER1I      ;STORE RMER1 IN INPUT BUFFER
3193
  
```

|      |        |        |        |        |  |       |                  |                                   |
|------|--------|--------|--------|--------|--|-------|------------------|-----------------------------------|
| 3194 | 007772 | 016037 | 000006 | 001334 |  | MOV   | RMDA(R0),RMDAI   | ;STORE RMDA IN INPUT BUFFER       |
| 3195 | 010000 | 020337 | 001342 |        |  | CMP   | R3,RMER1I        |                                   |
| 3196 | 010004 | 001004 |        |        |  | BNE   | 70\$             |                                   |
| 3197 | 010006 | 020337 | 001334 |        |  | CMP   | R3,RMDAI         |                                   |
| 3198 | 010012 | 001001 |        |        |  | BNE   | 70\$             |                                   |
| 3199 | 010014 | 104016 |        |        |  | ERROR | 16               | ;REG SEL 8 IS S-A-0               |
| 3200 | 010016 |        |        |        |  |       |                  |                                   |
| 3201 |        |        |        |        |  |       |                  |                                   |
| 3202 |        |        |        |        |  |       |                  |                                   |
| 3203 | 010016 | 012760 | 000040 | 000010 |  |       |                  |                                   |
| 3204 | 010024 | 111160 | 000010 |        |  | MOV   | #CLR,RMCS2(R0)   | ;CLEAR THE MASSBUS                |
| 3205 |        |        |        |        |  | MOVB  | (R1),RMCS2(R0)   | ;SELECT UNIT                      |
| 3206 | 010030 | 010260 | 000032 |        |  |       |                  |                                   |
| 3207 |        |        |        |        |  | MOV   | R2,RMOF(R0)      | ;LOAD RMOF                        |
| 3208 | 010034 | 010260 | 000034 |        |  |       |                  |                                   |
| 3209 |        |        |        |        |  | MOV   | R2,RMDC(R0)      | ;LOAD RMDC                        |
| 3210 | 010040 | 010260 | 000042 |        |  |       |                  |                                   |
| 3211 |        |        |        |        |  | MOV   | R2,RMER2(R0)     | ;LOAD RMER2                       |
| 3212 | 010044 | 010360 | 000012 |        |  |       |                  |                                   |
| 3213 |        |        |        |        |  | MOV   | R3,RMDS(R0)      | ;LOAD RMDS                        |
| 3214 | 010050 | 010360 | 000014 |        |  |       |                  |                                   |
| 3215 |        |        |        |        |  | MOV   | R3,RMER1(R0)     | ;LOAD RMER1                       |
| 3216 | 010054 | 010360 | 000006 |        |  |       |                  |                                   |
| 3217 |        |        |        |        |  | MOV   | R3,RMDA(R0)      | ;LOAD RMDA                        |
| 3218 | 010060 | 016037 | 000032 | 001360 |  |       |                  |                                   |
| 3219 |        |        |        |        |  | MOV   | RMOF(R0),RMOFI   | ;STORE RMOF IN INPUT BUFFER       |
| 3220 | 010066 | 016037 | 000034 | 001362 |  |       |                  |                                   |
| 3221 |        |        |        |        |  | MOV   | RMDC(R0),RMDCI   | ;STORE RMDC IN INPUT BUFFER       |
| 3222 | 010074 | 016037 | 000042 | 001370 |  |       |                  |                                   |
| 3223 | 010102 | 052737 | 161577 | 001360 |  | MOV   | RMER2(R0),RMER2I | ;STORE RMER2 IN INPUT BUFFER      |
| 3224 | 010110 | 001015 |        |        |  | BIS   | #XNUOF,RMOFI     |                                   |
| 3225 | 010112 | 022737 | 176000 | 001362 |  | BNE   | 80\$             |                                   |
| 3226 | 010120 | 020337 | 001362 |        |  | CMP   | #XNUDC,RMDCI     |                                   |
| 3227 | 010124 | 001007 |        |        |  | CMP   | R3,RMDCI         |                                   |
| 3228 | 010126 | 052737 | 001567 | 001370 |  | BNE   | 80\$             |                                   |
| 3229 | 010134 | 020337 | 001370 |        |  | BIS   | #XNUER2,RMER2I   |                                   |
| 3230 | 010140 | 001001 |        |        |  | CMP   | R3,RMER2I        |                                   |
| 3231 | 010142 | 104017 |        |        |  | BNE   | 80\$             |                                   |
| 3232 | 010144 |        |        |        |  | ERROR | 17               | ;REG SEL 8 IS S-A-1               |
| 3233 |        |        |        |        |  |       |                  |                                   |
| 3234 |        |        |        |        |  |       |                  |                                   |
| 3235 |        |        |        |        |  |       |                  |                                   |
| 3236 |        |        |        |        |  |       |                  |                                   |
| 3237 |        |        |        |        |  |       |                  |                                   |
| 3238 |        |        |        |        |  |       |                  |                                   |
| 3239 |        |        |        |        |  |       |                  |                                   |
| 3240 | 010144 | 000004 |        |        |  | TST7: | SCOPE            |                                   |
| 3241 | 010146 | 012737 | 000007 | 001226 |  | MOV   | #7,\$TESTN       | ::SET TEST NUMBER IN APT MAIL BOX |
| 3242 |        |        |        |        |  |       |                  |                                   |
| 3243 | 010154 | 000240 |        |        |  | NOP   |                  |                                   |
| 3244 | 010156 | 012737 | 000024 | 001120 |  | MOV   | #20,\$ICNT       | :20 ITERATIONS                    |
| 3245 | 010164 | 112737 | 000001 | 001131 |  | MOVB  | #1,\$ERMAX       | :ONE ERROR ALLOWED                |
| 3246 | 010172 | 012737 | 010206 | 001122 |  | MOV   | #T7,\$LPADR      | ;LOAD LOOP ON TEST ADDRESS        |
| 3247 | 010200 | 012737 | 010206 | 001124 |  | MOV   | #T7,\$LPERR      | ;LOAD LOOP ON ERROR ADDRESS       |
| 3248 | 010206 |        |        |        |  |       |                  |                                   |
| 3249 | 010206 | 012706 | 001100 |        |  | T7:   | MOV              | #STACK,SP ;LOAD THE STACK POINTER |

```
3250 010212 013700 001276      MOV    $BASE,R0      ;R0 - UNIBUS ADDRESS OF UUT
3251 010216 013701 001456      MOV    TSTQUE,R1     ;R1 = POINTER TO DEVICE
3252
3253 010222 016037 000026 001142  MOV    RMDT(R0),$BDDAT ;STORE RMDT AT $BDDAT
3254 010230 022737 020024 001142  CMP     #SNGPRT,$BDDAT ;SINGLE PORT RM03??
3255 010236 001432          BEQ     10$      ;YES!!
3256 010240 022737 024024 001142  CMP     #DULPRT,$BDDAT ;DUAL PORT RM03??
3257 010246 001426          BEQ     10$      ;YES!!
3258 010250 022737 020025 001142  CMP     #SNGPRT!BIT0,$BDDAT ;SINGLE PROT RM02 ?
3259 010256 001422          BEQ     10$      ;BRANCH IF SO
3260 010260 022737 024025 001142  CMP     #DULPRT!BIT0,$BDDAT ;DUAL PORT RM02 ?
3261 010266 001416          BEQ     10$      ;BRANCH IF SO
3262 010270 012737 020024 001174  MOV     #SNGPRT,$TMP0 ;LOAD ACCEPTABLE VALUES
3263 010276 012737 024024 001176  MOV     #DULPRT,$TMP1
3264 010304 010037 001136          MOV     R0,$BDADR    ;LOAD BAD ADDRESS
3265 010310 062737 000026 001136  ADD     #RMDT,$BDADR
3266 010316 104057          ERROR    57      ;DEVICE NOT AN RM03
3267 010320 000137 021442          JMP     $EOSP      ;GO TO NEXT DEVICE
3268 010324          10$:
3269
3270          ;*****
3271          ;*TEST 10      DEVICE AVAILABLE TEST
3272          ;*****
3273          ;*****
3274 010324 000004          TST10:  SCOPE
3275 010326 012737 000010 001226  MOV     #10,$TESTN    ;;SET TEST NUMBER IN APT MAIL BOX
3276
3277 010334 000240          NOP
3278 010336 012737 000024 001120  MOV     #20,$ICNT     ;20 ITERATIONS
3279 010344 112737 000001 001131  MOVB    #1,$ERMAX     ;ONE ERROR ALLOWED
3280 010352 012737 010366 001122  MOV     #T10,$LPADR   ;LOAD LOOP ON TEST ADDRESS
3281 010360 012737 010366 001124  MOV     #T10,$LPERR   ;LOAD LOOP ON ERROR ADDRESS
3282 010366          T10:
3283 010366 012706 001100          MOV     #STACK,SP    ;LOAD THE STACK POINTER
3284 010372 013700 001276          MOV     $BASE,R0      ;R0 = UNIBUS ADDRESS OF UUT
3285 010376 013701 001456          MOV     TSTQUE,R1     ;R1 = POINTER TO DEVICE
3286 010402 012760 000040 000010  MOV     #CLR,RMCS2(R0) ;CLEAR THE MASSBUS
3287 010410 111160 000010          MOVB    (R1),RMCS2(R0) ;SELECT UNIT
3288
3289 010414 016037 000000 001142  MOV     RMCS1(R0),$BDDAT ;STORE RMCS1 AT $BDDAT
3290 010422 042737 173777 001142  BIC     #^CDVA,$BDDAT ;CLEAR ALL BUT DVA
3291 010430 001006          BNE     10$      ;BRANCH IF DVA SET
3292 010432 012737 004000 001140  MOV     #DVA,$GDDAT   ;SETUP EXPECTED
3293 010440 010037 001136          MOV     R0,$BDADR    ;SETUP REG ADDRESS
3294 010444 104060          ERROR    60      ;DEVICE NOT AVAILABLE
3295 010446          10$:
3296
3297          ;*****
3298          ;*TEST 11      SEARCH TIMEOUT TEST
3299          ;*****
3300          ;*****
3301 010446 000004          TST11:  SCOPE
3302 010450 012737 000011 001226  MOV     #11,$TESTN    ;;SET TEST NUMBER IN APT MAIL BOX
3303 010456 000240          NOP
3304 010460 012737 000024 001120  MOV     #20,$ICNT     ;20 ITERATIONS
3305 010466 112737 000001 001131  MOVB    #1,$ERMAX     ;ONE ERROR ALLOWED
```

```
3306 010474 012737 010510 001122      MOV      #T11,$LPADR ;LOAD LOOP ON TEST ADDRESS
3307 010502 012737 010510 001124      MOV      #T11,$LPERR ;LOAD LOOP ON ERROR ADDRESS
3308 010510
3309 010510 012706 001100      T11:      MOV      #STACK,SP ;LOAD THE STACK POINTER
3310 010514 013700 001276      MOV      $BASE,R0 ;R0 = UNIBUS ADDRESS OF UUT
3311 010520 013701 001456      MOV      TSTQUE,R1 ;R1 = POINTER TO DEVICE
3312
3313 010524 012737 000000 001410      ;LOAD REGISTER OUTPUT BUFFER WITH COMMAND PARAMETERS
3314 010532 012737 000000 001436      MOV      #0,RMDAO ;SECTOR=0=TRACK
3315 010540 012737 010000 001434      MOV      #0,RMDCO ;CYLINDER=0
3316 010546 012737 054116 001406      MOV      #FMT16,RMOFO ;16 BIT FORMAT
3317 010554 012737 177777 001404      MOV      #BUFFER,RMBAO ;STARTING BUFFER ADDRESS
3318 010562 012737 000061 001402      MOV      #^C1+1,RMWCO ;WORD COUNT
3319
3320      MOV      #WD!GO,RMCS10 ;WRITE DATA COMMAND
3321
3321 010570 004737 023352      ;EXECUTE DATA COMMAND TO POINT WHERE SEARCH IS ENABLED USING SUBROUTINE
3322 010574 000402      JSR      PC,ENBSCH
3323 010576 104000      BR      10$ ;GO TO 10$ IF NO ERROR
3324 010600 000462      ERROR    ;RETURN HERE IF ERROR
3325 010602      BR      50$ ;SLOC REST PF TEST
3326
3326 010602 012737 000144 001524      10$:      ;START THE CLOCK AND WAIT FOR 100 MS
3327 010610 004777 170712      MOV      #100.,WATCH ;SET WATCHDOG TIMER VALUE
3328 010614 005737 001524      JSR      PC,@CLOCK ;START THE CLOCK
3329 010620 001375
3330 010622 004777 170702      20$:      TST      WATCH
3331      BNE     20$
3332      JSR      PC,@STOP ;STOP THE CLOCK
3333      ;VERIFY THAT OPI IS NOT SET (SEARCH TIMEOUT IS DISABLED)
3334 010626 016037 000014 001142      MOV      RMER1(R0),$BDDAT ;STORE RMER1 AT $BDDAT
3335 010634 010037 001136      MOV      R0,$BDADR ;SET UP FOR ERROR MSG
3336 010640 062737 000014 001136      ADD      #RMER1,$BDADR
3337 010646 042737 157777 001142      BIC      #^COPI,$BDDAT
3338 010654 001404      BEQ      30$ ;BRANCH IF NO ERROR
3339 010656 005037 001140      CLR      $GDDAT
3340 010662 104020      ERROR    20 ;OPI SET W/SEARCH TIMEOUT
3341      ;DISABLED
3342 010664 000430      BR      50$ ;SKIP
3343 010666
3344      30$:
3345      ;ENABLE SEARCH TIMEOUT, THEN WAIT 100 MS
3346 010666 012760 041401 000024      MOV      #DMD!MUR!DBEN.MOC,RMMR1(R0) ;LOAD RMMR1
3347 010674 012737 000144 001524      MOV      #100.,WATCH ;SET WATCHDOG TIMER VALUE
3348 010702 004777 170620      JSR      PC,@CLOCK ;START THE CLOCK
3349 010706 005737 001524      40$:      TST      WATCH
3350 010712 001375      BNE     40$
3351 010714 004777 170610      JSR      PC,@STOP ;STOP THE CLOCK
3352      ;OPI SHOULD NOW BE SET (SEARCH TIMEOUT IS ENABLED)
3353
3354 010720 016037 000014 001142      MOV      RMER1(R0),$BDDAT ;STORE RMER1 AT $BDDAT
3355 010726 042737 157777 001142      BIC      #^COPI,$BDDAT
3356 010734 001004      BNE     50$
3357 010736 012737 020000 001140      MOV      #OPI,$GDDAT
3358 010744 104021      ERROR    21 ;OPI NOT SET BY SEARCH TIMEOUT
3359 010746
3360
3361      50$:
3361      ;*****
```

```
3362      ;*TEST 12      SET DTE TEST
3363
3364      ;*****
3365      TST12: SCOPE
3366      010746 000004      MOV      #12,$TESTN      ;;SET TEST NUMBER IN APT MAIL BOX
3367      010750 012737 000012 001226      NOP
3368      010756 000240      MOV      #20,$ICNT      ;20 ITERATIONS
3369      010760 012737 000024 001120      MOV      #1,$ERMAX      ;ONE ERROR ALLOWED
3370      010766 112737 000001 001131      MOV      #T12,$LPADR      ;LOAD LOOP ON TEST ADDRESS
3371      010774 012737 011010 001122      MOV      #T12,$LPERR      ;LOAD LOOP ON ERROR ADDRESS
3372      011002 012737 011010 001124      T12:
3373      011010 012706 001100      MOV      #STACK,SP      ;LOAD THE STACK POINTER
3374      011014 013700 001276      MOV      $BASE,R0      ;R0 = UNIBUS ADDRESS OF UUT
3375      011020 013701 001456      MOV      TSTQUE,R1      ;R1 = POINTER TO DEVICE
3376      011024 010037 001136      MOV      R0,$BDADR      ;SETUP ERROR MSG
3377      011030 062737 000014 001136      ADD      #RMER1,$BDADR
3378      011036 005037 001140      CLR      $GDDAT
3379      ;INITIALIZE AND VERIFY THAT DRIVE TIMING ERROR IS RESET
3380      011042 012760 000040 000010      MOV      #CLR,RMCS2(R0) ;CLEAR THE MASSBUS
3381      011050 111160 000010      MOV      (R1),RMCS2(R0) ;SELECT UNIT
3382
3383      011054 016037 000014 001142      MOV      RMER1(R0),$BDDAT      ;STORE RMER1 AT $BDDAT
3384      011062 042737 167777 001142      BIC      #^CDTE,$BDDAT
3385      011070 001402      BEQ      10$      ;BRANCH IF DTE=0
3386      011072 104031      ERROR      31      ;CANT RESET DTE
3387      011074 000517      BR      50$      ;SKIP REST OF TEST
3388      ;SET MAINTENANCE INDEX PULSE AND VERIFY DTE REMAINS RESET
3389      011076      10$:
3390
3391      011076 012760 000001 000024      MOV      #DMD,RMMR1(R0) ;LOAD RMMR1
3392
3393      011104 012760 000005 000024      MOV      #DMD!MI,RMMR1(R0) ;LOAD RMMR1
3394
3395      011112 016037 000014 001142      MOV      RMER1(R0),$BDDAT      ;STORE RMER1 AT $BDDAT
3396      011120 042737 167777 001142      BIC      #^CDTE,$BDDAT
3397      011126 001402      BEQ      20$
3398      011130 104000      ERROR      ;DTE SET WHEN SECTOR
3399      011132 000500      BR      50$      ;COMPARE SHOULD BE RESET
3400      011134      20$:
3401      ;EXECUTE DUMMY DATA COMMAND TO ENABLE SEARCH
3402      011134 012737 000000 001410      MOV      #0,RMDAO
3403      011142 012737 000005 001436      MOV      #5,RMDCO
3404      011150 012737 010000 001434      MOV      #FMT16,RMOFO
3405      011156 012737 054116 001406      MOV      #BUFFER,RMBAO
3406      011164 012737 177777 001404      MOV      #^C1+1,RMWCO
3407      011172 012737 000061 001402      MOV      #WD!GO,RMCS10
3408
3409      ;EXECUTE DATA COMMAND TO POINT WHERE SEARCH IS ENABLED USING SUBROUTINE
3410      011200 004737 023352      JSR      PC,ENBSCH
3411      011204 000402      BR      30$      ;GO TO 30$ IF NO ERROR
3412      011206 104000      ERROR      ;RETURN HERE IF ERROR
3413      011210 000451      BR      50$
3414      ;WITH SEARCH ENABLED, SET AND RESET SECTOR PULSE TO SET ENABLE
3415      ;SEARCH FLOP.
3416      011212      30$:
3417
```

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CZRMKB0 RM03/2 DSKLS PRT 2          MACY11 30A(1052) 18-AUG-78 12:59 PAGE 73          SEQ 0073
CZRMKB.P11 14-AUG-78 15:53          T12      SET DTE TEST

3418 011212 012760 051441 000024      MOV      #DMD!MUR!DBEN!MOC!DTO!MS,RMMR1(R0)      ;LOAD RMMR1
3419
3420 011220 012760 051401 000024      MOV      #DMD!MUR!DBEN!MOC!DTO,RMMR1(R0) ;LOAD RMMR1
3421      ;SET SECTOR PULSE AND VERIFY DTE DOES NOT SET
3422      PUTMR1 #DMD!MUR!DBEN!MOC!DTO!MS
3423      PUTMR1 #DMD!MUR!DBEN!MOC!DTO
3424
3425 011226 016037 000014 001142      MOV      RMER1(R0), $BDDAT      ;STORE RMER1 AT $BDDAT
3426 011234 042737 167777 001142      BIC      #^CDTE, $BDDAT
3427 011242 001402                      BEQ      40$
3428 011244 104023                      ERROR    23      ;DTE SET WHEN SECTOR
3429 011246 001432                      BEQ      50$      ;COMPARE SHOULD BE RESET
3430 011250
3431      40$:
3432      ;FORCE SECTOR COMPARE
3433 011250 012760 051403 000024      MOV      #DMD!MUR!DBEN!MOC!DTO!MSC,RMMR1(R0) ;LOAD RMMR1
3434
3435 011256 012760 051443 000024      MOV      #DMD!MUR!DBEN!MOC!DTO!MSC!MS,RMMR1(R0) ;LOAD RMMR1
3436
3437 011264 012760 051403 000024      MOV      #DMD!MUR!DBEN!MOC!DTO!MSC,RMMR1(R0) ;LOAD RMMR1
3438      ;SET SECTOR PULSE AND VERIFY DTE SETS
3439
3440 011272 012760 051441 000024      MOV      #DMD!MUR!DBEN!MOC!DTO!MS,RMMR1(R0) ;LOAD RMMR1
3441
3442 011300 012760 051401 000024      MOV      #DMD!MUR!DBEN!MOC!DTO,RMMR1(R0) ;LOAD RMMR1
3443
3444 011306 016037 000014 001142      MOV      RMER1(R0), $BDDAT      ;STORE RMER1 AT $BDDAT
3445 011314 042737 167777 001142      BIC      #^CDTE, $BDDAT
3446 011322 001004                      BNE      50$
3447 011324 012737 010000 001142      MOV      #DTE, $BDDAT
3448 011332 104024                      ERROR    24      ;COULD NOT SET DTE WITH
3449      ;SECTOR COMPARE SET
3450 011334
3451      50$:
3452
3453      ;*****
3454      ;*TEST 13      FORMAT CHANGE TEST
3455      ;*****
3456 011334 000004
3457 011336 012737 000013 001226      TST13:  SCOPE
3458 011344 000240                      MOV      #13,$TESTN      ;;SET TEST NUMBER IN APT MAIL BOX
3459 011346 012737 000024 001120                      NOP
3460 011354 112737 000001 001131                      MOV      #20, $ICNT      ;20 ITERATIONS
3461 011362 012737 011376 001122                      MOV      #1, $ERMAX      ;ONE ERROR ALLOWED
3462 011370 012737 011376 001124                      MOV      #T13, $LPADR      ;LOAD LOOP ON TEST ADDRESS
3463 011376                      MOV      #T13, $LPERR      ;LOAD LOOP ON ERROR ADDRESS
3464 011376 012706 001100                      T13:      MOV      #STACK, SP      ;LOAD THE STACK POINTER
3465 011402 013700 001276                      MOV      $BASE, R0      ;R0 = UNIBUS ADDRESS OF UUT
3466 011406 013701 001456                      MOV      TSTQUE, R1      ;R1 = POINTER TO DEVICE
3467 011412 012702 011752                      MOV      #50$, R2      ;R2=TABLE POINTER
3468 011416
3469      10$:
3470      ;*****
3471 011416 012760 000040 000010      ;INITILAIZE AND SET THE FORMAT BIT, USE INDEX PULSE TO CLEAR FORMAT CHANGE
3472 011424 111160 000010                      MOV      #CLR, RMCS2(R0) ;CLEAR THE MASSBUS
3473                      MOV      (R1), RMCS2(R0) ;SELECT UNIT

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3474 011430 011260 000032      MOV      (R2),RMOF(R0)      ;LOAD RMOF
3475
3476 011434 012760 000001 000024      MOV      #DMD,RMMR1(R0)      ;LOAD RMMR1
3477
3478 011442 012760 000005 000024      MOV      #DMD!MI,RMMR1(R0)      ;LOAD RMMR1
3479      ;SETUP AND EXECUTE DUMMY DATA COMMAND USING OPPOSITE FORMAT
3480 011450 012737 000000 001410      MOV      #0,RMDAO
3481 011456 012737 000005 001436      MOV      #5,RMDCO
3482 011464 016237 000002 001434      MOV      2(R2),RMOFO
3483 011472 012737 054116 001406      MOV      #BUFFER,RMBAO
3484 011500 012737 177777 001404      MOV      #^C1+1,RMWCO
3485 011506 012737 000061 001402      MOV      #WD!GO,RMCS10
3486
3487      ;EXECUTE DATA COMMAND TO POINT WHERE SEARCH IS ENABLED USING SUBROUTINE
3488 011514 004737 023352      JSR      PC,ENBSCH
3489 011520 000402      BR      20$      ;GO TO 20$ IF NO ERROR
3490 011522 104000      ERROR      ;RETURN HERE IF ERROR
3491 011524 000515      BR      60$
3492 011526
3493      20$:
3494      ;FORMAT CHANGE FLOP SHOULD BE SET - VERIFY BY TRYING TO FORCE A
3495      ;DRIVE TIMING ERROR WHICH SHOULD NOT SET.
3496 011526 012760 051403 000024      MOV      #DMD!MUR!DBEN!MOC!DTO!MSC,RMMR1(R0)      ;LOAD RMMR1
3497
3498 011534 012760 051443 000024      MOV      #DMD!MUR!DBEN!MOC!DTO!MSC!MS,RMMR1(R0)      ;LOAD RMMR1
3499
3500 011542 012760 051403 000024      MOV      #DMD!MUR!DBEN!MOC!DTO!MSC,RMMR1(R0)      ;LOAD RMMR1
3501
3502 011550 012760 051401 000024      MOV      #DMD!MUR!DBEN!MOC!DTO,RMMR1(R0) ;LOAD RMMR1
3503      ;VERIFY THAT DRIVE TIMING ERROR DIDNT SET
3504
3505 011556 016037 000014 001142      MOV      RMER1(R0),SBDDAT      ;STORE RMER1 AT SBDDAT
3506 011564 042737 167777 001142      BIC      #^CDTE,SBDDAT
3507 011572 001416      BEQ      30$
3508 011574 010037 001136      MOV      R0,$BDADR      ;SETUP ERROR MESSAGE
3509 011600 062737 000014 001136      ADD      #RMER1,$BDADR
3510 011606 005037 001140      CLR      $GDDAT
3511 011612 011237 001174      MOV      (R2),$TMP0
3512 011616 016237 000002 001176      MOV      2(R2),$TMP1
3513 011624 104025      ERROR      25      ;DTE SET WHEN THERE WAS
3514 011626 000454      BR      60$      ;A FORMAT CHANGE
3515 011630
3516      30$:
3517      ;CLEAR THE FORMAT CHANGE FLOP W/INDEX PULSE
3518 011630 012760 051405 000024      MOV      #DMD!MUR!DBEN!MOC!DTO!MI,RMMR1(R0)      ;LOAD RMMR1
3519      ;ENABLE SEARCH AND FORCE SECTOR COMPARE
3520
3521 011636 012760 051403 000024      MOV      #DMD!MUR!DBEN!MOC!DTO!MSC,RMMR1(R0)      ;LOAD RMMR1
3522
3523 011644 012760 051443 000024      MOV      #DMD!MUR!DBEN!MOC!DTO!MSC!MS,RMMR1(R0)      ;LOAD RMMR1
3524
3525 011652 012760 051403 000024      MOV      #DMD!MUR!DBEN!MOC!DTO!MSC,RMMR1(R0)      ;LOAD RMMR1
3526      ;SET DTE W/ANOTHER SECTOR PULSE - VERIFY DTE IS SET
3527
3528 011660 012760 051441 000024      MOV      #DMD!MUR!DBEN!MOC!DTO!MS,RMMR1(R0)      ;LOAD RMMR1
3529

```

| Address | Hex1   | Hex2   | Hex3   | Hex4   | Assembly     | Comments                                                  |
|---------|--------|--------|--------|--------|--------------|-----------------------------------------------------------|
| 3530    | 011666 | 012760 | 051401 | 000024 | MOV          | #DMD!MUR!DBEN!MOC!D*O,RMMR1(R0);LOAD RMMR1                |
| 3531    |        |        |        |        |              |                                                           |
| 3532    | 011674 | 016037 | 000014 | 001142 | MOV          | RMR1(R0),\$BDDAT;STORE RMR1 AT \$BDDAT                    |
| 3533    | 011702 | 042737 | 167777 | 001142 | BIC          | #^CDTE,\$BDDAT                                            |
| 3534    | 011710 | 001012 |        |        | BNE          | 40\$                                                      |
| 3535    | 011712 | 010037 | 001136 |        | MOV          | RO,\$BDADR;SETUP ERROR MESSAGE                            |
| 3536    | 011716 | 062737 | 000014 | 001136 | ADD          | #RMR1,\$BDADR                                             |
| 3537    | 011724 | 012737 | 010000 | 001140 | MOV          | #DTE,\$GDDAT                                              |
| 3538    | 011732 | 104027 |        |        | ERROR        | 27;COULD NOT SET DTE                                      |
| 3539    | 011734 | 000411 |        |        | BR           | 60\$                                                      |
| 3540    | 011736 |        |        |        |              |                                                           |
| 3541    |        |        |        |        |              | *****                                                     |
| 3542    |        |        |        |        |              | ;DO TEST W/18 TO 16 FORMAT CHANGE DURING SECOND EXECUTION |
| 3543    | 011736 | 022702 | 011752 |        | CMP          | #50\$,R2                                                  |
| 3544    | 011742 | 001006 |        |        | BNE          | 60\$;BRANCH IF DONE TEST                                  |
| 3545    | 011744 | 062702 | 000002 |        | ADD          | #2,R2;MOVE POINTER                                        |
| 3546    | 011750 | 000622 |        |        | BR           | 10\$;REPEAT TEST                                          |
| 3547    |        |        |        |        |              |                                                           |
| 3548    | 011752 | 010000 |        |        |              | 50\$: .WORD #FMT16;16-18 FORMAT CHANGE                    |
| 3549    | 011754 | 000000 |        |        |              | .WORD 0;18-16 FORMAT CHANGE                               |
| 3550    | 011756 | 010000 |        |        |              | .WORD #FMT16                                              |
| 3551    | 011760 |        |        |        |              | 60\$:;END OF TEST                                         |
| 3552    |        |        |        |        |              |                                                           |
| 3553    |        |        |        |        |              | *****                                                     |
| 3554    |        |        |        |        |              | ;*TEST 14 PROM STROBE TEST                                |
| 3555    |        |        |        |        |              |                                                           |
| 3556    |        |        |        |        |              | *****                                                     |
| 3557    | 011760 | 000004 |        |        | TST14: SCOPE |                                                           |
| 3558    | 011762 | 012737 | 000014 | 001226 | MOV          | #14,\$TESTN;;SET TEST NUMBER IN APT MAIL BOX              |
| 3559    | 011770 | 000240 |        |        | NOP          |                                                           |
| 3560    | 011772 | 012737 | 000024 | 001120 | MOV          | #20,\$ICNT;20 ITERATIONS                                  |
| 3561    | 012000 | 112737 | 000001 | 001131 | MOVB         | #1,\$ERMAX;ONE ERROR ALLOWED                              |
| 3562    | 012006 | 012737 | 012022 | 001122 | MOV          | #T14,\$LPADR;LOAD LOOP ON TEST ADDRESS                    |
| 3563    | 012014 | 012737 | 012022 | 001124 | MOV          | #T14,\$LPERR;LOAD LOOP ON ERROR ADDRESS                   |
| 3564    | 012022 |        |        |        |              | T14:                                                      |
| 3565    | 012022 | 012706 | 001100 |        | MOV          | #STACK,SP;LOAD THE STACK POINTER                          |
| 3566    | 012026 | 013700 | 001276 |        | MOV          | \$BASE,R0;R0 = UNIBUS ADDRESS OF UUT                      |
| 3567    | 012032 | 013701 | 001456 |        | MOV          | TSTQUE,R1;R1 = POINTER TO DEVICE                          |
| 3568    | 012036 | 012760 | 000040 | 000010 | MOV          | #CLR,RMCS2(R0);CLEAR THE MASSBUS                          |
| 3569    | 012044 | 111160 | 000010 |        | MOVB         | (R1),RMCS2(R0);SELECT UNIT                                |
| 3570    | 012050 | 010037 | 001136 |        | MOV          | RO,\$BDADR;SETUP ERROR MESSAGE                            |
| 3571    | 012054 | 062737 | 000024 | 001136 | ADD          | #RMMR1,\$BDADR                                            |
| 3572    |        |        |        |        |              | ;SET DIAGNOSTIC MODE AND TRY TO RESET PROM STROBE         |
| 3573    |        |        |        |        |              |                                                           |
| 3574    | 012062 | 012760 | 000001 | 000024 | MOV          | #DMD,RMMR1(R0);LOAD RMMR1                                 |
| 3575    | 012070 | 012702 | 000021 |        | MOV          | #17.,R2;R2=MAXIMUM # CLOCK PULSES                         |
| 3576    | 012074 |        |        |        |              | 5\$:                                                      |
| 3577    |        |        |        |        |              |                                                           |
| 3578    | 012074 | 012760 | 004001 | 000024 | MOV          | #DMD!MCLK,RMMR1(R0);LOAD RMMR1                            |
| 3579    |        |        |        |        |              |                                                           |
| 3580    | 012102 | 012760 | 000001 | 000024 | MOV          | #DMD,RMMR1(R0);LOAD RMMR1                                 |
| 3581    |        |        |        |        |              |                                                           |
| 3582    | 012110 | 016037 | 000024 | 001142 | MOV          | RMMR1(R0),\$BDDAT;STORE RMMR1 AT \$BDDAT                  |
| 3583    | 012116 | 042737 | 177737 | 001142 | BIC          | #^CWC,\$BDDAT                                             |
| 3584    | 012124 | 001406 |        |        | BEQ          | 6\$                                                       |
| 3585    | 012126 | 005302 |        |        | DEC          | R2                                                        |

```
3586 012130 001361      BNE      5$
3587 012132 005037 001140 CLR      $GDDAT
3588 012136 104000      ERROR      ;CAN'T CLEAR PROM STROBE
3589 012140 000501      BR        60$
3590 012142 012702 000021 6$:      MOV      #17.,R2
3591 012146      10$:
3592
3593 012146 012760 004001 000024      MOV      #DMD.MCLK,RMMR1(R0) ;LOAD RMMR1
3594
3595 012154 012760 000001 000024      MOV      #DMD,RMMR1(R0) ;LOAD RMMR1
3596
3597 012162 016037 000024 001142      MOV      RMMR1(R0),$BDDAT ;STORE RMMR1 AT $BDDAT
3598 012170 042737 177737 001142      BIC      #^CWC,$BDDAT
3599 012176 001007      BNE      20$ ;EXIT LOOP WHEN PROM STROBE ON
3600 012200 005302      DEC      R2
3601 012202 001361      BNE      10$
3602 012204 012737 000040 001140      MOV      #WC,$GDDAT
3603 012212 104030      ERROR      30 ;CANT SET PROM STROBE
3604 012214 000453      BR        60$
3605 012216      20$:
3606 ;VERIFY PROM STROBE IS ON FOR 3 BIT CLOCKS
3607 012216 012702 000003      MOV      #3.,R2
3608 012222      25$:
3609
3610 012222 012760 004001 000024      MOV      #DMD!MCLK,RMMR1(R0) ;LOAD RMMR1
3611
3612 012230 012760 000001 000024      MOV      #DMD,RMMR1(R0) ;LOAD RMMR1
3613
3614 012236 016037 000024 001142      MOV      RMMR1(R0),$BDDAT ;STORE RMMR1 AT $BDDAT
3615 012244 042737 177737 001142      BIC      #^CWC,$BDDAT
3616 012252 001005      BNE      30$ ;BRANCH IF PROM STORBE DID NOT
3617 ;DROP EARLY
3618 012254 012737 000040 001140      MOV      #WC,$GDDAT
3619 012262 104032      ERROR      32
3620 012264 000427      BR        60$
3621 012266 005302      30$:      DEC      R2
3622 012270 001354      BNE      25$
3623 ;VERIFY PROM STROBE IS OFF FOR 8 BIT CLOCKS
3624 012272 012702 000010      MOV      #8.,R2
3625 012276      40$:
3626
3627 012276 012760 004001 000024      MOV      #DMD!MCLK,RMMR1(R0) ;LOAD RMMR1
3628
3629 012304 012760 000001 000024      MOV      #DMD,RMMR1(R0) ;LOAD RMMR1
3630
3631 012312 016037 000024 001142      MOV      RMMR1(R0),$BDDAT ;STORE RMMR1 AT $BDDAT
3632 012320 042737 177737 001142      BIC      #^CWC,$BDDAT
3633 012326 001404      BEQ      50$ ;BRANCH IF PROM STROBE
3634 012330 005037 001140      CLR      $GDDAT ;DID NOT SET EARLY
3635 012334 104033      ERROR      33
3636 012336 000402      BR        60$
3637 012340 005302      50$:      DEC      R2
3638 012342 001355      BNE      40$
3639 012344      60$:
3640
3641 ;*****
```

```

; *TEST 15 SYNC WORD COUNT INHIBIT TEST
;*****
TST15: SCOPE
        MOV     #15,$TESTN      ;;SET TEST NUMBER IN APT MAIL BOX
        NOP
        MOV     #20,$ICNT       ;20 ITERATIONS
        MOVB    #1,$ERMAX       ;ONE ERROR ALLOWED
        MOV     #T15,$LPADR     ;LOAD LOOP ON TEST ADDRESS
        MOV     #T15,$LPERR     ;LOAD LOOP ON ERROR ADDRESS

T15:
        MOV     #STACK,SP       ;LOAD THE STACK POINTER
        MOV     $BASE,R0        ;R0 = UNIBUS ADDRESS OF UUT
        MOV     TSTQUE,R1       ;R1 = POINTER TO DEVICE
;SETUP REGISTER OUTPUT BUFFER FOR SUBROUTINES
        MOV     #0,RMDAO        ;SECTOR=0, TRACK=0
        MOV     #5,RMDCO        ;CYLINDER=0
        MOV     #FMT16,RMOFO    ;16 BIT FORMAT
        MOV     #BUFFER,RMBAO    ;STARTING BUFFER ADDRESS
        MOV     #^C1+1,RMWCO    ;WORD COUNT
        MOV     #WD!GO,RMCS10    ;WRITE DATA COMMAND
        MOV     #CLR,RMCS2(R0)   ;CLEAR THE MASSBUS
        MOVB    (R1),RMCS2(R0)  ;SELECT UNIT

;EXECUTE DATA COMMAND TO POINT WHERE SEARCH IS ENABLED USING SUBROUTINE
        JSR     PC,ENBSCH
        BR      10$             ;GO TO 10$ IF NO ERROR
        ERROR   ;RETURN HERE IF ERROR
        BR      120$            ;SKIP IF FAILURE

10$:
;FORCE SECTOR COMPARE USING SUBROUTINE
        JSR     PC,SCTCMP
        BR      20$             ;GO TO 20$ IF NO ERROR
        ERROR   ;RETURN HERE IF ERROR
        BR      120$

;*****
;CAN NOW STEP DATA TIMING SEQUENCER WITH SECTOR COMPARE SET

;STEP THE SEQUENCER TO LOCATION 10(10) WHILE CHECKING 'PLFS'
20$:    MOV     #0,R2           ;R2=SEQUENCER ADDRESS
30$:
;PULSE MAINTENANCE CLOCK UNTIL PROM STROBE SETS

        MOV     #DMD!MUR!DBEN!MOC!DTO!MCLK,RMMR1(R0) ;LOAD RMMR1

        MOV     #DMD!MUR!DBEN!MOC!DTO,RMMR1(R0) ;LOAD RMMR1
;SEE IF PROM STROBE IS SET

        MOV     RMMR1(R0),R3    ;STORE RMMR1 AT R3
        BIT     #WC,R3
        BEQ     30$             ;ISSUE NEXT BIT CLOCK
        INC     R2              ;INCREMENT SEQUENCER ADDRESS
;CHECK 'LOOKING FOR SYNC' - SHOULD BE ZERO UNTIL LOCATION 11
        MOV     R3,$BDDAT
        BIC     #^CPLFS,$BDDAT
        BEQ     50$             ;BRANCH IF PLFS IS ZERO

```

[illegible]

| Address | Offset | Hex    | Symbol | Comment                                                           |
|---------|--------|--------|--------|-------------------------------------------------------------------|
| 3698    | 012574 | 005037 | 001140 | CLR \$GDDAT                                                       |
| 3699    | 012600 | 010037 | 001136 | MOV R0,\$BDADR                                                    |
| 3700    | 012604 | 062737 | 000024 | ADD #RMMR1,\$BDADR                                                |
| 3701    | 012612 | 010237 | 001174 | MOV R2,\$TMP0                                                     |
| 3702    | 012616 | 104034 |        | ERROR 34 ;PLFS SHOULD NOT BE SET                                  |
| 3703    | 012620 | 000516 |        | BR 120\$ ;SKIP REST OF TEST                                       |
| 3704    | 012622 |        |        | 50\$:                                                             |
| 3705    |        |        |        | ;EXIT LOOP IF SEQUENCER NOW AT LOCATION 10                        |
| 3706    | 012622 | 022702 | 000012 | CMP #10.,R2                                                       |
| 3707    | 012626 | 001414 |        | BEQ 70\$                                                          |
| 3708    |        |        |        | ;PULSE MAINTENANCE CLOCK UNTIL PROM STROBE RESETS                 |
| 3709    | 012630 |        |        | 60\$:                                                             |
| 3710    |        |        |        |                                                                   |
| 3711    | 012630 | 012760 | 055401 | MOV #DMD!MUR!DBEN!MOC!DTO!MCLK,RMMR1(R0) ;LOAD RMMR1              |
| 3712    |        |        |        |                                                                   |
| 3713    | 012636 | 012760 | 051401 | MOV #DMD!MUR!DBEN!MOC!DTO,RMMR1(R0) ;LOAD RMMR1                   |
| 3714    |        |        |        | ;SEE IF PROM STROBE IS RESET                                      |
| 3715    |        |        |        |                                                                   |
| 3716    | 012644 | 016003 | 000024 | MOV RMMR1(R0),R3 ;STORE RMMR1 AT R3                               |
| 3717    | 012650 | 032703 | 000040 | BIT #WC,R3                                                        |
| 3718    | 012654 | 001365 |        | BNE 60\$                                                          |
| 3719    | 012656 | 000724 |        | BR 30\$ ;GO STEP SEQUENCER TO NEXT LOC                            |
| 3720    | 012660 |        |        | 70\$:                                                             |
| 3721    |        |        |        | ;*****                                                            |
| 3722    |        |        |        | ;THE NEXT PROM STROBE SHOULD SET 'PLFS' AT LOCATION 11(10) OF THE |
| 3723    |        |        |        | ;DATA TIMING SEQUENCER.                                           |
| 3724    | 012660 | 012702 | 000020 | MOV #16.,R2 ;R2=NUMBER OF BIT CLOCKS                              |
| 3725    |        |        |        | ;ISSUE 16 BIT CLOCKS TO GET NEXT PROM STROBE                      |
| 3726    | 012664 |        |        | 80\$:                                                             |
| 3727    |        |        |        |                                                                   |
| 3728    | 012664 | 012760 | 055401 | MOV #DMD!MUR!DBEN!MOC!DTO!MCLK,RMMR1(R0) ;LOAD RMMR1              |
| 3729    |        |        |        |                                                                   |
| 3730    | 012672 | 012760 | 051401 | MOV #DMD!MUR!DBEN!MOC!DTO,RMMR1(R0) ;LOAD RMMR1                   |
| 3731    | 012700 | 005302 |        | DEC R2                                                            |
| 3732    | 012702 | 001370 |        | BNE 80\$                                                          |
| 3733    |        |        |        | ;VERIFY THAT 'PLFS' IS NOW SET                                    |
| 3734    |        |        |        |                                                                   |
| 3735    | 012704 | 016037 | 000024 | MOV RMMR1(R0),\$BDDAT ;STORE RMMR1 AT \$BDDAT                     |
| 3736    | 012712 | 042737 | 175777 | BIC #^CPLFS,\$BDDAT                                               |
| 3737    | 012720 | 001012 |        | BNE 90\$ ;BRANCH IF PLFS IS SET                                   |
| 3738    | 012722 | 012737 | 002000 | MOV #PLFS,\$GDDAT ;SETUP ERROR MESSAGE                            |
| 3739    | 012730 | 010037 | 001136 | MOV R0,\$BDADR                                                    |
| 3740    | 012734 | 062737 | 000024 | ADD #RMMR1,\$BDADR                                                |
| 3741    | 012742 | 104035 |        | ERROR 35 ;'PLFS' DID NOT SET                                      |
| 3742    | 012744 | 000444 |        | BR 120\$ ;SKIP REST OF TEST                                       |
| 3743    | 012746 |        |        | 90\$:                                                             |
| 3744    |        |        |        |                                                                   |
| 3745    |        |        |        | ;ISSUE 3 MORE BIT CLOCKS TO RESET PROM STROBE                     |
| 3746    |        |        |        |                                                                   |
| 3747    | 012746 | 012702 | 000003 | MOV #3,R2 ;                                                       |
| 3748    | 012752 |        |        | 95\$:                                                             |
| 3749    |        |        |        |                                                                   |
| 3750    | 012752 | 012760 | 055401 | MOV #DMD!MUR!DBEN!MOC.DTO!MCLK,RMMR1(R0) ;LOAD RMMR1              |
| 3751    |        |        |        |                                                                   |
| 3752    | 012760 | 012760 | 051401 | MOV #DMD.MUR.DBEN.MOC!DTO,RMMR1(R0) ;LOAD RMMR1                   |
| 3753    | 012766 | 005302 |        | DEC R2                                                            |

```
3754 012770 001370          BNE      95$
3755                      ;*****
3756                      ;WITH 'LOOKING FOR SYNC SET, FURTHER BIT CLOCKS SHOULD NOT SET
3757                      ;PROM STROBE
3758 012772 012702 000040      MOV      #32.,R2          ;R2=NUMBER OF BIT CLOCKS
3759 012776                  100$:
3760                      ;PULSE BIT CLOCK AND VERIFY PROM STROBE DOES NOT SET
3761
3762 012776 012760 055401 000024      MOV      #DMD.MUR!DBEN!MOC!DTO!MCLK,RMMR1(R0) ;LOAD RMMR1
3763
3764 013004 012760 051401 000024      MOV      #DMD!MUR!DBEN!MOC!DTO,RMMR1(R0) ;LOAD RMMR1
3765
3766 013012 016003 000024      MOV      RMMR1(R0),R3      ;STORE RMMR1 AT R3
3767 013016 042703 177737      BIC      #^CWC,R3
3768 013022 001413      BEQ      110$          ;BRANCH IF PROM STROBE IS 0
3769 013024 005037 001140      CLR      $GDDAT          ;SETUP ERROR MESSAGE
3770 013030 010337 001142      MOV      R3,$BDDAT
3771 013034 010037 001136      MOV      R0,$BDADR
3772 013040 062737 000024 001136      ADD      #RMMR1,$BDADR
3773 013046 104036      ERROR      36          ;PROM STROBE WHILE LOOKING FOR SYNC
3774 013050 000402      BR      120$
3775 013052 005302      110$: DEC      R2          ;CONTINUE FOR 32 BIT CLOCKS
3776 013054 001350      BNE      100$
3777
3778 013056                  120$:
3779                      ;END OF TEST
3780                      ;*****
3781                      ;*TEST 16 SYNC DETECTION TEST
3782                      ;*****
3783 013056 000004      TST16: SCOPE
3784 013060 012737 000016 001226      MOV      #16,$TESTN      ;;SET TEST NUMBER IN APT MAIL BOX
3785 013066 000240      NOP
3786 013070 012737 000024 001120      MOV      #20.,$ICNT      ;20 ITERATIONS
3787 013076 112737 000001 001131      MOV      #1,$ERMAX      ;ONE ERROR ALLOWED
3788 013104 012737 013120 001122      MOV      #T16,$LPADR      ;LOAD LOOP ON TEST ADDRESS
3789 013112 012737 013120 001124      MOV      #T16,$LPERR      ;LOAD LOOP ON ERROR ADDRESS
3790 013120
3791 013120 012706 001100      T16: MOV      #STACK,SP      ;LOAD THE STACK POINTER
3792 013124 013700 001276      MOV      $BASE,R0      ;R0 = UNIBUS ADDRESS OF UUT
3793 013130 013701 001456      MOV      TSTQUE,R1      ;R1 = POINTER TO DEVICE
3794                      ;SETUP REGISTER OUTPUT BUFFER FOR SUBROUTINES
3795 013134 012737 000000 001410      MOV      #0,RMDAO      ;SECTOR 0, TRACK 0
3796 013142 012737 000005 001436      MOV      #5,RMDCO      ;CYLINDER 5
3797 013150 012737 010000 001434      MOV      #FMT16,RMOFO      ;16 BIT MODE
3798 013156 012737 054116 001406      MOV      #BUFFER,RMBAO      ;BUFFER ADDRESS
3799 013164 012737 177777 001404      MOV      #^C1+1,RMWCO      ;CORD COUNT
3800 013172 012737 000071 001402      MOV      #RD!GO,RMCS10      ;READ DATA COMMAND
3801
3802                      ;EXECUTE DATA COMMAND TO POINT WHERE SEARCH IS ENABLED USING SUBROUTINE
3803 013200 004737 023352      JSR      PC,ENBSCH
3804 013204 000402      BR      10$          ;GO TO 10$ IF NO ERROR
3805 013206 104000      ERROR
3806 013210 000550      BR      100$      ;RETURN HERE IF ERROR
3807 013212
3808
3809 013212 004737 024232      10$:
3809                      ;FORCE SECTOR COMPARE USING SUBROUTINE
3809                      JSR      PC,SCTCMP
```

| Address | Offset | Hex    | Hex    | Hex    | Hex | Assembly                                                     | Comment                                    |
|---------|--------|--------|--------|--------|-----|--------------------------------------------------------------|--------------------------------------------|
| 3810    | 013216 | 000402 |        |        |     | BR                                                           | 20\$                                       |
| 3811    | 013220 | 104000 |        |        |     | ERROR                                                        | ;GO TO 20\$ IF NO ERROR                    |
| 3812    | 013222 | 000543 |        |        |     | BR                                                           | 100\$                                      |
| 3813    | 013224 |        |        |        |     |                                                              |                                            |
| 3814    |        |        |        |        |     | 20\$:                                                        |                                            |
| 3815    | 013224 | 004737 | 024340 |        |     | ;SET                                                         | 'LOOKING FOR SYNC' USING SUBROUTINE        |
| 3816    | 013230 | 000402 |        |        |     | JSR                                                          | PC,SETLFS                                  |
| 3817    | 013232 | 104000 |        |        |     | BR                                                           | 30\$                                       |
| 3818    | 013234 | 000536 |        |        |     | ERROR                                                        |                                            |
| 3819    | 013236 |        |        |        |     | BR                                                           | 100\$                                      |
| 3820    |        |        |        |        |     | 30\$:                                                        |                                            |
| 3821    |        |        |        |        |     | ;                                                            | *****                                      |
| 3822    |        |        |        |        |     | ;CLOCK ALL ONES SYNC PATTERN AND VERIFY SYNC IS NOT DETECTED |                                            |
| 3823    |        |        |        |        |     | ;(USING PROM STORBE AS INDICATION)                           |                                            |
| 3824    | 013236 | 012702 | 000020 |        |     | MOV                                                          | #16.,R2 ;NUMBER OF ONE BITS                |
| 3825    | 013242 | 010037 | 001136 |        |     | MOV                                                          | R0,\$BDADR ;SETUP ERROR MESSAGE            |
| 3826    | 013246 | 062737 | 000024 | 001136 |     | ADD                                                          | #RMMR1,\$BDADR                             |
| 3827    | 013254 | 005037 | 001140 |        |     | CLR                                                          | \$GDDAT                                    |
| 3828    |        |        |        |        |     |                                                              |                                            |
| 3829    | 013260 | 012760 | 053401 | 000024 |     | MOV                                                          | #MR1AAA!MRD,RMMR1(R0) ;LOAD RMMR1          |
| 3830    | 013266 |        |        |        |     | 40\$:                                                        |                                            |
| 3831    |        |        |        |        |     |                                                              |                                            |
| 3832    | 013266 | 012760 | 057401 | 000024 |     | MOV                                                          | #MR1AAA!MRD!MCLK,RMMR1(R0) ;LOAD RMMR1     |
| 3833    |        |        |        |        |     |                                                              |                                            |
| 3834    | 013274 | 012760 | 053401 | 000024 |     | MOV                                                          | #MR1AAA!MRD,RMMR1(R0) ;LOAD RMMR1          |
| 3835    |        |        |        |        |     |                                                              |                                            |
| 3836    | 013302 | 016037 | 000024 | 001142 |     | MOV                                                          | RMMR1(R0),\$BDDAT ;STORE RMMR1 AT \$BDDAT  |
| 3837    | 013310 | 042737 | 177737 | 001142 |     | BIC                                                          | #^CWC,\$BDDAT                              |
| 3838    | 013316 | 001405 |        |        |     | BEQ                                                          | 50\$                                       |
| 3839    | 013320 | 012737 | 177777 | 001174 |     | MOV                                                          | #177777,\$TMP0                             |
| 3840    | 013326 | 104037 |        |        |     | ERROR                                                        | 37                                         |
| 3841    | 013330 | 000500 |        |        |     | BR                                                           | 100\$                                      |
| 3842    | 013332 |        |        |        |     | 50\$:                                                        |                                            |
| 3843    | 013332 | 005302 |        |        |     | DEC                                                          | R2 ;REPEAT FOR 16 BITS                     |
| 3844    | 013334 | 001354 |        |        |     | BNE                                                          | 40\$                                       |
| 3845    | 013336 | 012702 | 000020 |        |     | MOV                                                          | #16.,R2 ;NUMBER OF ZERO BITS               |
| 3846    |        |        |        |        |     |                                                              |                                            |
| 3847    |        |        |        |        |     | ;                                                            | *****                                      |
| 3848    |        |        |        |        |     | ;CLOCK ALL ZERO SYNC PATTERN AND VERIFY SYNC IS NOT DETECTED |                                            |
| 3849    | 013342 |        |        |        |     | 60\$:                                                        |                                            |
| 3850    |        |        |        |        |     |                                                              |                                            |
| 3851    | 013342 | 012760 | 055401 | 000024 |     | MOV                                                          | #MR1AAA!MCLK,RMMR1(R0) ;LOAD RMMR1         |
| 3852    |        |        |        |        |     |                                                              |                                            |
| 3853    | 013350 | 012760 | 051401 | 000024 |     | MOV                                                          | #MR1AAA,RMMR1(R0) ;LOAD RMMR1              |
| 3854    |        |        |        |        |     |                                                              |                                            |
| 3855    | 013356 | 016037 | 000024 | 001142 |     | MOV                                                          | RMMR1(R0),\$BDDAT ;STORE RMMR1 AT \$BDDAT  |
| 3856    | 013364 | 042737 | 177737 | 001142 |     | BIC                                                          | #^CWC,\$BDDAT ;MAKE SURE SYNC NOT DETECTED |
| 3857    | 013372 | 001404 |        |        |     | BEQ                                                          | 70\$                                       |
| 3858    | 013374 | 005037 | 001174 |        |     | CLR                                                          | \$TMP0                                     |
| 3859    | 013400 | 104037 |        |        |     | ERROR                                                        | 37                                         |
| 3860    | 013402 | 000453 |        |        |     | BR                                                           | 100\$ ;SKIP IF FAILURE                     |
| 3861    | 013404 |        |        |        |     | 70\$:                                                        |                                            |
| 3862    | 013404 | 005302 |        |        |     | DEC                                                          | R2 ;REPEAT FOR 16 BITS                     |
| 3863    | 013406 | 001355 |        |        |     | BNE                                                          | 60\$                                       |
| 3864    | 013410 | 012702 | 000040 |        |     | MOV                                                          | #32.,R2 ;R2=NUMBER OF BITS                 |
| 3865    | 013414 | 012703 | 000031 |        |     | MOV                                                          | #000031,R3 ;R3=SYNC PATTERN FOR LEFT SHIFT |

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3866                                     ;:*****
3867                                     ;:CLOCK THE BINARY SYNC PATTERN (10011000) AND VERIFY THAT SYNC IS
3868                                     ;:DETECTED
3869
3870 013420 012737 051401 001426 80$: MOV #MR1AAA,RMMR10 ;GENERATE VALUE OF RMMR1
3871 013426 000241 CLC ;CLEAR THE CARR
3872 013430 006003 ROR R3 ;SHIFT RIGHT
3873 013432 103003 BCC 90$ ;BRANCH IF C BIT CLEAR
3874 013434 052737 002000 001426 BIS #MRD,RMMR10 ;SET MRD IF PATTERN BIT SETS
3875 013442
3876
3877 013442 013760 001426 000024 MOV RMMR10,RMMR1(R0) ;LOAD RMMR1
3878 013450 052737 004000 001426 BIS #MCLK,RMMR10 ;SET THE MAINTENANCE DATA CLK
3879
3880 013456 013760 001426 000024 MOV RMMR10,RMMR1(R0) ;LOAD RMMR1
3881 013464 042737 004000 001426 BIC #MCLK,RMMR10 ;RESET BIT CLOCK
3882
3883 013472 013760 001426 000024 MOV RMMR10,RMMR1(R0) ;LOAD RMMR1
3884
3885 013500 016037 000024 001142 MOV RMMR1(R0),$BDDAT ;STORE RMMR1 AT $BDDAT
3886 013506 042737 177737 001142 BIC #^CWC,$BDDAT
3887 013514 001006 BNE 100$ ;BRANCH IF PROM STROBE IS SET
3888 013516 005302 DEC R2 ;CONTINUE FOR 16 BIT CLOCKS
3889 013520 001337 BNE 80$
3890 013522 012737 000040 001140 MOV #WC,$GDDAT
3891 013530 104040 ERROR 40 ;SYNC PATTERN NOT DETECTED
3892 013532 100$: ;END OF TEST
3893
3894                                     ;:*****
3895                                     ;:*TEST 17 ABORT SYNC DETECTION TEST
3896
3897                                     ;:*****
3898 013532 000004 TST17: SCOPE
3899 013534 012737 000017 001226 MOV #17,$TESTN ;;SET TEST NUMBER IN APT MAIL BOX
3900 013542 000240 NOP
3901 013544 012737 000024 001120 MOV #20,$ICNT ;20 ITERATIONS
3902 013552 112737 000001 001131 MOV #1,$ERMAX ;ONE ERROR ALLOWED
3903 013560 012737 013574 001122 MOV #T17,$LPADR ;LOAD LOOP ON TEST ADDRESS
3904 013566 012737 013574 001124 MOV #T17,$LPERR ;LOAD LOOP ON ERROR ADDRESS
3905 013574
3906 013574 012706 001100 T17: MOV #STACK,SP ;LOAD THE STACK POINTER
3907 013600 013700 001276 MOV $BASE,R0 ;R0 = UNIBUS ADDRESS OF UUT
3908 013604 013701 001456 MOV TSTQUE,R1 ;R1 = POINTER TO DEVICE
3909 ;SETUP REGISTER OUTPUT BUFFER FOR SUBROUTINES
3910 013610 012737 000000 001410 MOV #0,RMDAO ;SECTOR 0, TRACK 0
3911 013616 012737 000005 001436 MOV #5,RMDCO ;CYLINDER 5
3912 013624 012737 010000 001434 MOV #FMT16,RMOFO ;16 BIT FORMAT
3913 013632 012737 054116 001406 MOV #BUFFER,RMBAO ;STARTING BUFFER ADDRESS
3914 013640 012737 177777 001404 MOV #^C1+1,RMWCO ;WORD COUNT
3915 013646 012737 000071 001402 MOV #RD!GO,RMCS10 ;READ DATA COMMAND
3916
3917 ;EXECUTE DATA COMMAND TO POINT WHERE SEARCH IS ENABLED USING SUBROUTINE
3918 013654 004737 023352 JSR PC,ENBSCH
3919 013660 00^ ^2 BR 10$ ;GO TO 10$ IF NO ERROR
3920 013662 104000 ERROR ;RETURN HERE IF ERROR
3921 013664 000447 BR 50$

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```
3922 013666      10$:
3923      ;FORCE SECTOR COMPARE USING SUBROUTINE
3924 013666 004737 024232      JSR      PC,SCTCMP
3925 013672 000402      BR        20$      ;GO TO 20$ IF NO ERROR
3926 013674 104000      ERROR      ;RETURN HERE IF ERROR
3927 013676 000442      BR        50$
3928 013700      20$:
3929      ;SET 'LOOKING FOR SYNC' USING SUBROUTINE
3930 013700 004737 024340      JSR      PC,SETLFS
3931 013704 000402      BR        30$
3932 013706 104000      ERROR
3933 013710 000435      BR        50$
3934 013712      30$:
3935      ;*****
3936      ;LOOKING FOR SYNC INHIBITS WORD CLOCK, HOWEVER, 'DRIVE TIMING ERROR'
3937      ;SHOULD RESET 'LFS WORD COUNT INHIBIT' FLOP
3938      ;FORCE DRIVE TIMING ERROR
3939
3940
3941 013712 012760 051441 000024      MOV      #MR1AAA!MS,RMMR1(R0)      ;LOAD RMMR1
3942      ;PULSE BIT CLOCK AND VERIFY PROM STROBE SETS
3943 013720 012702 000020      MOV      #16.,R2      ;R2, NUMBER OF BIT CLOCKS
3944 013724      40$:
3945
3946 013724 012760 055441 000024      MOV      #MR1AAA!MS.MCLK,RMMR1(R0)      ;LOAD RMMR1
3947
3948 013732 012760 051441 000024      MOV      #MR1AAA!MS,RMMR1(R0)      ;LOAD RMMR1
3949
3950 013740 016037 000024 001142      MOV      RMMR1(R0), $BDDAT      ;STORE RMMR1 AT $BDDAT
3951 013746 042737 177737 001142      BIC      #^CWC,$BDDAT
3952 013754 001013      BNE      50$
3953 013756 005302      DEC      R2
3954 013760 001361      BNE      40$
3955 013762 012737 000040 001140      MOV      #WC,$GDDAT
3956 013770 010037 001136      MOV      R0,$BDADR
3957 013774 062737 000024 001136      ADD      #RMMR1,$BDADR
3958 014002 104041      ERROR      41      ;DTE DIDNOT CLEAR WORD COUNT INH
3959 014004      50$:
3960
3961
3962      ;*****
3963      ;*TEST 20      SYNC GENERATION TEST
3964
3965      ;*****
3966 014004 000004      TST20: SCOPE
3967 014006 012737 000020 001226      MOV      #20,$TESTN      ;;SET TEST NUMBER IN APT MAIL BOX
3968 014014 000240      NOP
3969 014016 012737 000024 001120      MOV      #20.,$ICNT      ;20 ITERATIONS
3970 014024 112737 000001 001131      MOVB     #1,$ERMAX      ;ONE ERROR ALLOWED
3971 014032 012737 014046 001122      MOV      #T20,$LPADR      ;LOAD LOOP ON TEST ADDRESS
3972 014040 012737 014046 001124      MOV      #T20,$LPERR      ;LOAD LOOP ON ERROR ADDRESS
3973 014046      T20:
3974 014046 012706 001100      MOV      #STACK,SP      ;LOAD THE STACK POINTER
3975 014052 013700 001276      MOV      $BASE,R0      ;R0 = UNIBUS ADDRESS OF UUT
3976 014056 013701 001456      MOV      TSTQUE,R1      ;R1 = POINTER TO DEVICE
3977      ;SETUP REGISTER OUTPUT BUFFER FOR SUBROUTINES
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3978 014062 012737 000000 001410      MOV      #0,RMDAO          ;SECTOR 0, TRACK 0
3979 014070 012737 000005 001436      MOV      #5,RMDCO          ;CYL 5
3980 014076 012737 010000 001434      MOV      #FMT16,RMOFO      ;16 BIT MODE
3981 014104 012737 054116 001406      MOV      #BUFFER,RMBAO     ;BUFFER ADDRESS
3982 014112 012737 177776 001404      MOV      #^C2+1,RMWCO      ;WORD COUNT
3983 014120 012737 000063 001402      MOV      #WH.GO,RMCS10     ;WHITE HEAD AND DATA COM
3984
3985                                ;EXECUTE DATA COMMAND TO POINT WHERE SEARCH IS ENABLED USING SUBROUTINE
3986 014126 004737 023352      JSR      PC,ENBSCH
3987 014132 000403      BR      10$              ;GO TO 10$ IF NO ERROR
3988 014134 104000      ERROR    ;RETURN HERE IF ERROR
3989                                ;
3990 014136 000137 014526      BR      160$
3991 014142      JMP      160$
3992                                ;
3993                                10$:
3994                                ;FORCE SECTOR COMPARE USING SUBROUTINE
3995                                JSR      PC,SCTCMP
3996 014142 004737 024232      BR      20$              ;GO TO 20$ IF NO ERROR
3997 014146 000402      ERROR    ;RETURN HERE IF ERROR
3998 014150 104000      BR      160$
3999 014152 000565      ;
4000                                20$:
4001                                ;*****
4002                                ;WRITE PROM OF DATA TIMING SEQUENCER SHOULD NOW BE ENABLED
4003                                ;FIRST, VERIFY THAT WRITE GATE IS ON, INDICATING THAT
4004                                ;SECTOR COMPARE SET
4005                                ;
4006 014154 016037 000040 001142      MOV      RMMR2(R0),SBDDAT      ;STORE RMMR2 AT SBDDAT
4007 014162 042737 177776 001142      BIC      #^CB00,SBDDAT      ;BUS BIT 0 IS WRITE GATE
4008 014170 001011      BNE      30$
4009 014172 005037 001140      CLR      $GDDAT
4010 014176 010037 001136      MOV      R0,$BDADR
4011 014202 062737 000040 001136      ADD      #RMMR2,$BDADR
4012 014210 104042      ERROR    42
4013 014212 000545      BR      160$              ;WRITE GATE NOT ON DURING
4014                                ;FORMAT-CS FAILURE
4015                                30$:
4016                                ;STEP THE DATA TIMING SEQUENCER TO LOCATION 16 AND VERIFY WRITE
4017                                ;GATE STAYS ON
4018                                MOV      #14.,R2              ;MAXMUM NUMBER OF CLOCK
4019                                40$:
4020                                MOV      RMMR2(R0),SBDDAT      ;STORE RMMR2 AT SBDDAT
4021                                BIT      #BB00,SBDDAT
4022                                BNE      50$
4023                                ;BRANCH IF WRITE GATE ON
4024                                DEC      R2
4025                                BNE      40$
4026                                MOV      R0,$BDADR
4027                                ADD      #RMMR2,$BDADR
4028                                MOV      #BB00,$GDDAT
4029                                ERROR    42
4030                                BR      160$              ;WRITE GATE DROP DURING
4031                                ;FORMAT - CS FAILURE
4032                                50$:
4033                                60$:
4034                                MOV      #MR1AAA!MCLK,RMMR1(R0) ;LOAD RMMR1

```

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4034 014274 012760 051401 000024      MOV      #MR1AAA,RMMR1(R0)      ;LOAD RMMR1
4035
4036 014302 016003 000024      MOV      RMMR1(R0),R3      ;STORE RMMR1 AT R3
4037 014306 032703 000040      BIT      #WC,R3
4038 014312 001765      BEQ      60$
4039      ;FROM STROBE CAME ON-DECREMENT FROM STROBE COUNT
4040 014314 005302      DEC      R2
4041 014316 001414      BEQ      80$
4042      ;WAIT FOR FROM STROBE TO GO OFF, THEN REPEAT LOOP
4043 014320      70$:
4044
4045 014320 012760 055401 000024      MOV      #MR1AAA!MCLK,RMMR1(R0) ;LOAD RMMR1
4046
4047 014326 012760 051401 000024      MOV      #MR1AAA,RMMR1(R0)      ;LOAD RMMR1
4048
4049 014334 016003 000024      MOV      RMMR1(R0),R3      ;STORE RMMR1 AT R3
4050 014340 032703 000040      BIT      #WC,R3
4051 014344 001725      BEQ      40$
4052 014346 000764      BR      70$
4053 014350      80$:
4054
4055      ;*****
4056      ;VERIFY HEADER SYNC GENERATION
4057      ;WRITE DATA BIT IS INVERTED AT MAINTENANCE REGISTER
4058      ;FIRST,COUNT NUMBER OF ZERO BITS UNTIL FIRST ONE BIT
4059 014350 012702 000020      MOV      #16.,R2      ;MAX TIMES THRU LOOP
4060 014354 005003      CLR      R3
4061 014356      90$:
4062
4063 014356 016004 000024      MOV      RMMR1(R0),R4      ;STORE RMMR1 AT R4
4064 014362 032704 000010      BIT      #MWD,R4
4065 014366 001414      BEQ      110$      ;JUMP OUT OF LOOP WITH FIRST 1
4066 014370 005203      INC      R3      ;INCREMENT ZERO COUNT
4067 014372 005302      DEC      R2      ;DECREMENT MAX LOOP COUNT
4068 014374 001002      BNE      100$
4069 014376 104043      ERROR    43
4070 014400 000452      BR      160$      ;HEADER SYNC ,CANT GET FIRST 1
4071 014402      100$:
4072
4073 014402 012760 055401 000024      MOV      #MR1AAA.MCLK,RMMR1(R0) ;LOAD RMMR1
4074
4075 014410 012760 051401 000024      MOV      #MR1AAA,RMMR1(R0)      ;LOAD RMMR1
4076 014416 000757      BR      90$
4077 014420      110$:
4078      ;MAKE SURE THERE WERE AT LEAST 8 ZERO BITS IN HEADER SYNC
4079 014420 020327 000010      CMP      R3,#8.
4080 014424 103002      BHS      120$
4081 014426 104043      ERROR    43
4082 014430 000436      BR      160$      ;HEADER SYNC
4083 014432      120$:
4084      ;SAMPLE AND STORE THE REST OF THE HEADER SYNC
4085 014432 012702 000010      MOV      #8.,R2      ;NUMBER OF SAMPLES
4086 014436 005003      CLR      R3      ;HEADER SYNC
4087 014440      130$:
4088
4089 014440 016004 000024      MOV      RMMR1(R0),R4      ;STORE RMMR1 AT R4
  
```

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4090 014444 006303          ASL      R3
4091 014446 032704 000010    BIT      #MWD,R4          ;SHIFT SAMPLE,IF SYNC BIT IS 1
4092 014452 001002          BNE      140$          ;THEN SET SAMPLE INPUT
4093 014454 052703 000001    BIS      #BIT0,R3
4094 014460 005302          140$: DEC      R2
4095 014462 001407          BEQ      150$
4096
4097 014464 012760 055401 000024    MOV      #MR1AAA.MCLK,RMMR1(R0) ;LOAD RMMR1
4098
4099 014472 012760 051401 000024    MOV      #MR1AAA,RMMR1(R0) ;LOAD RMMR1
4100 014500 000757          BR        130$          ;DO LOOP TIL R2=0
4101 014502
4102          150$:
;VERIFY THE SYNC BIT STREAM IS 0000000010011000
4103 014502 012737 000230 001140    MOV      #000230,$GDDAT
4104 014510 010337 001142          MOV      R3,$BDDAT
4105 014514 023737 001140 001142    CMP      $GDDAT,$BDDAT
4106 014522 001401          BEQ      160$
4107 014524 104044          ERROR    44          ;INCORRECT HEADER SYNC
4108 014526
4109          160$:
;*****
4110          ;*TEST 21      WRITE HEADER TEST
4111
4112          ;*****
4113 014526 000004          TST21: SCOPE
4114 014530 012737 000021 001226    MOV      #21,$TESTN          ;;SET TEST NUMBER IN APT MAIL BOX
4115 014536 000240          NOP
4116 014540 012737 000024 001120    MOV      #20,$ICNT          ;20 ITERATIONS
4117 014546 112737 000001 001131    MOVVB    #1,$ERMAX          ;ONE ERROR ALLOWED
4118 014554 012737 014570 001122    MOV      #T21,$LPADR      ;LOAD LOOP ON TEST ADDRESS
4119 014562 012737 014570 001124    MOV      #T21,$LPERR      ;LOAD LOOP ON ERROR ADDRESS
4120 014570
4121 014570 012706 001100          T21: MOV      #STACK,SP          ;LOAD THE STACK POINTER
4122 014574 013700 001276          MOV      $BASE,R0          ;R0 = UNIBUS ADDRESS OF UUT
4123 014600 013701 001456          MOV      TSTQUE,R1          ;R1 = POINTER TO DEVICE
4124 014604 012760 000040 000010    MOV      #CLR,RMCS2(R0)      ;CLEAR THE MASSBUS
4125 014612 111160 000010          MOVVB    (R1),RMCS2(R0) ;SELECT UNIT
4126
;SETUP THE REGISTER OUTPUT BUFFER FOR SUBROUTINES
4127 014616 012737 002037 001410    MOV      #002037,RMDAO      ;TRACK 4, SECTOR 31
4128 014624 012737 001466 001436    MOV      #1466,RMDCO        ;CYLINDER 822.
4129 014632 012737 010000 001434    MOV      #FMT16,RMOFO       ;IN 16 BIT FORMAT
4130 014640 012702 054116          MOV      #BUFFER,R2          ;BUFFER ADDRESS
4131 014644 010237 001406          MOV      R2,RMBAO          ;BUFFER STARTS
4132 014650 012722 151466          MOV      #151466,(R2)+      ;STORE FIRST HEADER WORD
4133 014654 012712 002037          MOV      #002037,(R2)      ;STORE SECOND HEADER WORD
4134 014660 012737 177776 001404    MOV      #^C2+1,RMWCO        ;WORD CTR - 2
4135 014666 012737 000063 001402    MOV      #WH!GO,RMCS10       ;WRITE HEADER COMMAND
4136
;EXECUTE DATA COMMAND TO POINT WHERE SEARCH IS ENABLED USING SUBROUTINE
4137          JSR      PC,ENBSCH
4138 014674 004737 023352          BR        10$          ;GO TO 10$ IF NO ERROR
4139 014700 000403          ERROR    ;RETURN HERE IF ERROR
4140 014702 104000          JMP      160$
4141 014704 000137 015506          10$:
4142 014710          ;FORCE SECTOR COMPARE USING SUBROUTINE
4143          JSR      PC,SCTCMP
4144 014710 004737 024232          BR        20$          ;GO TO 20$ IF NO ERROR
4145 014714 000403

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```
4146 014716 104000          ERROR          ;RETURN HERE IF ERROR
4147 014720 000137 015506    JMP          160$
4148 014724                20$:
4149                ;*****
4150                ;STEP THE DATA TIMING SEQUENCER UNTIL 'HEADER AREA' COMES ON
4151 014724 012702 000017    MOV          #15.,R2          ;ALLOW 15 MORE PROM STROBES
4152 014730 012704 000041    30$: MOV          #33.,R4          ;ALLOW 33 BIT CLOCKS PER PROM STROBE
4153
4154                ;PULSE BIT CLOCK UNTIL PROM STROBE IS ON
4155 014734                40$:
4156
4157 014734 012760 055401 000024    MOV          #MR1AAA!MCLK,RMMR1(R0) ;LOAD RMMR1
4158
4159 014742 012760 051401 000024    MOV          #MR1AAA,RMMR1(R0)      ;LOAD RMMR1
4160
4161 014750 016003 000024    MOV          RMMR1(R0),R3      ;STORE RMMR1 AT R3
4162 014754 032703 000040    BIT          #WC,R3
4163 014760 001004          BNE          50$
4164 014762 005304          DEC          R4
4165 014764 001363          BNE          40$
4166 014766 000137 015506    JMP          160$          ;COUNT EXHAUSTED
4167 014772                50$:
4168
4169                ;SEE IF HEADER AREA CAME ON
4170 014772 032703 000200    BIT          #PHA,R3
4171 014776 001062          BNE          80$
4172 015000 005302          DEC          R2
4173 015002 001015          BNE          60$
4174
4175 015004 012737 000200 001140    ;ERROR-HEADER AREA NEVER CAME ON
4176 015012 005037 001142    MOV          #PHA,$GDDAT      ;SETUP ERROR MESSAGE
4177 015016 010037 001136    CLR          $BDDAT
4178 015022 062737 000024 001136    MOV          R0,$BDADR
4179 015030 104045          ADD          #RMMR1,$BDADR
4180 015032 000137 015506    ERROR        45          ;HEADER AREA WONT SET
4181 015036                JMP          160$          ;SKIP REST OF TEST
4182
4183                60$:
4184                ;WAIT FOR PROM STROBE TO GO OFF
4185
4186 015036 012760 055401 000024    MOV          #MR1AAA.MCLK,RMMR1(R0) ;LOAD RMMR1
4187
4188 015044 012760 051401 000024    MOV          #MR1AAA,RMMR1(R0)      ;LOAD RMMR1
4189
4190 015052 016003 000024    MOV          RMMR1(R0),R3      ;STORE RMMR1 AT R3
4191 015056 032703 000040    BIT          #WC,R3
4192 015062 001404          BEQ          70$
4193 015064 005304          DEC          R4
4194 015066 001363          BNE          60$
4195 015070 000137 015506    JMP          160$          ;COUNT EXHAUSTED
4196
4197                70$:
4198                ;VERIFY THE TAG BUS ONCE EVERY PROM STROBE
4199
4200 015074 016037 000040 001142    MOV          RMMR2(R0),$BDDAT      ;STORE RMMR2 AT $BDDAT
4201 015102 042737 176000 001142    BIC          #^C1777,$BDDAT
4202 015110 022737 000001 001142    CMP          #BB00,$BDDAT      ;WRITE GATE SHOULD BE ON
4203 015116 001704          BEQ          30$          ;ALL ELSE OFF
4204 015120 010037 001136    MOV          R0,$BDADR
4205
```

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4202 015124 062737 000040 001136 ADD #RMMR2,$BDADR
4203 015132 012737 000001 001140 MOV #BB00,$GDDAT
4204 015140 104042 ERROR 42 ;TAG BUS WRONG DURING FORMAT
4205 015142 000561 BR 160$
4206 015144
4207 80$:
;HEADER AREA IS NOW ON CAN START SAMPLE
4208 ;DATA AFTER 5 MORE BIT CLOCKS
4209 015144 012702 000005 MOV #5,R2
4210 015150
4211 81$:
4212 015150 012760 055401 000024 MOV #MR1AAA!MCLK,RMMR1(R0) ;LOAD RMMR1
4213
4214 015156 012760 051401 000024 MOV #MR1AAA,RMMR1(R0) ;LOAD RMMR1
4215 015164 005302 DEC R2
4216 015166 001370 BNE 81$
4217 ;*****
4218 ;SAMPLE AND STORE THE TWO HEADER WORDS
4219 015170 005037 001174 CLR $TMP0
4220 015174 005037 001176 CLR $TMP1
4221 015200 012702 001174 MOV # $TMP0,R2 ;R2 NUMBER OF WORDS/ADDRESS
4222 015204 012703 000020 90$: MOV #16.,R3 ;NUMBER OF BITS
4223 015210 005004 CLR R4 ;WORD STORAGE
4224 015212
4225 100$:
4226 015212 016005 000024 MOV RMMR1(R0),R5 ;STORE RMMR1 AT R5
4227 015216 006304 ASL R4 ;SHIFT WORD SAMPLE
4228 015220 032705 000010 BIT #MWD,R5 ;SET BIT 0 IF WRITE BIT ON
4229 015224 001002 BNE 110$
4230 015226 052704 000001 BIS #BIT0,R4
4231 015232
4232 110$:
4233 015232 012760 055401 000024 MOV #MR1AAA!MCLK,RMMR1(R0) ;LOAD RMMR1
4234
4235 015240 012760 051401 000024 MOV #MR1AAA,RMMR1(R0) ;LOAD RMMR1
4236 015246 005303 DEC R3
4237 015250 001360 BNE 100$
4238 015252 010422 MOV R4,(R2)+ ;STORE WORD SAMPLE
4239 015254 022702 001200 CMP # $TMP0+4,R2 ;DONE ?
4240 015260 101415 BLOS 120$ ;YES
4241 ;HEADER AREA SHOULD STILL BE ON FOR SECOND HEADER WORD
4242 015262 042705 177577 BIC #^C<PHA>,R5
4243 015266 001346 BNE 90$ ;BRANCH IF ON
4244 015270 010037 001136 MOV R0,$BDADR
4245 015274 062737 000024 001136 ADD #RMMR1,$BDADR
4246 015302 012737 000200 001140 MOV #PHA,$GDDAT
4247 015310 104045 ERROR 45
4248 015312 000475 BR 160$
4249 015314
4250 120$:
4251 ;*****
4252 015314 005003 ;WAIT UNTIL ECRC SETS
4253 CLR R3 ;CHECK NUMBER BITS DIFFER BET PHA AND ECRC
4254 015316
4255 125$:
4256 015316 016005 000024 MOV RMMR1(R0),R5 ;STORE RMMR1 AT R5
4257 015322 042705 176777 BIC #^C<ECRC>,R5 ;CHECK OUT THE REST BITS

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SEQ 0088

| Address | Offset | PC | Op | Op2 | Op3 | Op4 | Op5 | Op6 | Op7 | Op8 | Op9 | Op10 | Op11 | Op12 | Op13 | Op14 | Op15 | Op16 | Op17 | Op18 | Op19 | Op20 | Op21 | Op22 | Op23 | Op24 | Op25 | Op26 | Op27 | Op28 | Op29 | Op30 | Op31 | Op32 | Op33 | Op34 | Op35 | Op36 | Op37 | Op38 | Op39 | Op40 | Op41 | Op42 | Op43 | Op44 | Op45 | Op46 | Op47 | Op48 | Op49 | Op50 | Op51 | Op52 | Op53 | Op54 | Op55 | Op56 | Op57 | Op58 | Op59 | Op60 | Op61 | Op62 | Op63 | Op64 | Op65 | Op66 | Op67 | Op68 | Op69 | Op70 | Op71 | Op72 | Op73 | Op74 | Op75 | Op76 | Op77 | Op78 | Op79 | Op80 | Op81 | Op82 | Op83 | Op84 | Op85 | Op86 | Op87 | Op88 | Op89 | Op90 | Op91 | Op92 | Op93 | Op94 | Op95 | Op96 | Op97 | Op98 | Op99 | Op100 | Op101 | Op102 | Op103 | Op104 | Op105 | Op106 | Op107 | Op108 | Op109 | Op110 | Op111 | Op112 | Op113 | Op114 | Op115 | Op116 | Op117 | Op118 | Op119 | Op120 | Op121 | Op122 | Op123 | Op124 | Op125 | Op126 | Op127 | Op128 | Op129 | Op130 | Op131 | Op132 | Op133 | Op134 | Op135 | Op136 | Op137 | Op138 | Op139 | Op140 | Op141 | Op142 | Op143 | Op144 | Op145 | Op146 | Op147 | Op148 | Op149 | Op150 | Op151 | Op152 | Op153 | Op154 | Op155 | Op156 | Op157 | Op158 | Op159 | Op160 | Op161 | Op162 | Op163 | Op164 | Op165 | Op166 | Op167 | Op168 | Op169 | Op170 | Op171 | Op172 | Op173 | Op174 | Op175 | Op176 | Op177 | Op178 | Op179 | Op180 | Op181 | Op182 | Op183 | Op184 | Op185 | Op186 | Op187 | Op188 | Op189 | Op190 | Op191 | Op192 | Op193 | Op194 | Op195 | Op196 | Op197 | Op198 | Op199 | Op200 | Op201 | Op202 | Op203 | Op204 | Op205 | Op206 | Op207 | Op208 | Op209 | Op210 | Op211 | Op212 | Op213 | Op214 | Op215 | Op216 | Op217 | Op218 | Op219 | Op220 | Op221 | Op222 | Op223 | Op224 | Op225 | Op226 | Op227 | Op228 | Op229 | Op230 | Op231 | Op232 | Op233 | Op234 | Op235 | Op236 | Op237 | Op238 | Op239 | Op240 | Op241 | Op242 | Op243 | Op244 | Op245 | Op246 | Op247 | Op248 | Op249 | Op250 | Op251 | Op252 | Op253 | Op254 | Op255 | Op256 | Op257 | Op258 | Op259 | Op260 | Op261 | Op262 | Op263 | Op264 | Op265 | Op266 | Op267 | Op268 | Op269 | Op270 | Op271 | Op272 | Op273 | Op274 | Op275 | Op276 | Op277 | Op278 | Op279 | Op280 | Op281 | Op282 | Op283 | Op284 | Op285 | Op286 | Op287 | Op288 | Op289 | Op290 | Op291 | Op292 | Op293 | Op294 | Op295 | Op296 | Op297 | Op298 | Op299 | Op300 | Op301 | Op302 | Op303 | Op304 | Op305 | Op306 | Op307 | Op308 | Op309 | Op310 | Op311 | Op312 | Op313 | Op314 | Op315 | Op316 | Op317 | Op318 | Op319 | Op320 | Op321 | Op322 | Op323 | Op324 | Op325 | Op326 | Op327 | Op328 | Op329 | Op330 | Op331 | Op332 | Op333 | Op334 | Op335 | Op336 | Op337 | Op338 | Op339 | Op340 | Op341 | Op342 | Op343 | Op344 | Op345 | Op346 | Op347 | Op348 | Op349 | Op350 | Op351 | Op352 | Op353 | Op354 | Op355 | Op356 | Op357 | Op358 | Op359 | Op360 | Op361 | Op362 | Op363 | Op364 | Op365 | Op366 | Op367 | Op368 | Op369 | Op370 | Op371 | Op372 | Op373 | Op374 | Op375 | Op376 | Op377 | Op378 | Op379 | Op380 | Op381 | Op382 | Op383 | Op384 | Op385 | Op386 | Op387 | Op388 | Op389 | Op390 | Op391 | Op392 | Op393 | Op394 | Op395 | Op396 | Op397 | Op398 | Op399 | Op400 | Op401 | Op402 | Op403 | Op404 | Op405 | Op406 | Op407 | Op408 | Op409 | Op410 | Op411 | Op412 | Op413 | Op414 | Op415 | Op416 | Op417 | Op418 | Op419 | Op420 | Op421 | Op422 | Op423 | Op424 | Op425 | Op426 | Op427 | Op428 | Op429 | Op430 | Op431 | Op432 | Op433 | Op434 | Op435 | Op436 | Op437 | Op438 | Op439 | Op440 | Op441 | Op442 | Op443 | Op444 | Op445 | Op446 | Op447 | Op448 | Op449 | Op450 | Op451 | Op452 | Op453 | Op454 | Op455 | Op456 | Op457 | Op458 | Op459 | Op460 | Op461 | Op462 | Op463 | Op464 |
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| Address | Offset | PC | PC+1 | PC+2 | PC+3 | PC+4 | PC+5 | PC+6 | PC+7 | PC+8 | PC+9 | PC+10 | PC+11 | PC+12 | PC+13 | PC+14 | PC+15 | PC+16 | PC+17 | PC+18 | PC+19 | PC+20 | PC+21 | PC+22 | PC+23 | PC+24 | PC+25 | PC+26 | PC+27 | PC+28 | PC+29 | PC+30 | PC+31 | PC+32 | PC+33 | PC+34 | PC+35 | PC+36 | PC+37 | PC+38 | PC+39 | PC+40 | PC+41 | PC+42 | PC+43 | PC+44 | PC+45 | PC+46 | PC+47 | PC+48 | PC+49 | PC+50 | PC+51 | PC+52 | PC+53 | PC+54 | PC+55 | PC+56 | PC+57 | PC+58 | PC+59 | PC+60 | PC+61 | PC+62 | PC+63 | PC+64 | PC+65 | PC+66 | PC+67 | PC+68 | PC+69 | PC+70 | PC+71 | PC+72 | PC+73 | PC+74 | PC+75 | PC+76 | PC+77 | PC+78 | PC+79 | PC+80 | PC+81 | PC+82 | PC+83 | PC+84 | PC+85 | PC+86 | PC+87 | PC+88 | PC+89 | PC+90 | PC+91 | PC+92 | PC+93 | PC+94 | PC+95 | PC+96 | PC+97 | PC+98 | PC+99 | PC+100 | PC+101 | PC+102 | PC+103 | PC+104 | PC+105 | PC+106 | PC+107 | PC+108 | PC+109 | PC+110 | PC+111 | PC+112 | PC+113 | PC+114 | PC+115 | PC+116 | PC+117 | PC+118 | PC+119 | PC+120 | PC+121 | PC+122 | PC+123 | PC+124 | PC+125 | PC+126 | PC+127 | PC+128 | PC+129 | PC+130 | PC+131 | PC+132 | PC+133 | PC+134 | PC+135 | PC+136 | PC+137 | PC+138 | PC+139 | PC+140 | PC+141 | PC+142 | PC+143 | PC+144 | PC+145 | PC+146 | PC+147 | PC+148 | PC+149 | PC+150 | PC+151 | PC+152 | PC+153 | PC+154 | PC+155 | PC+156 | PC+157 | PC+158 | PC+159 | PC+160 | PC+161 | PC+162 | PC+163 | PC+164 | PC+165 | PC+166 | PC+167 | PC+168 | PC+169 | PC+170 | PC+171 | PC+172 | PC+173 | PC+174 | PC+175 | PC+176 | PC+177 | PC+178 | PC+179 | PC+180 | PC+181 | PC+182 | PC+183 | PC+184 | PC+185 | PC+186 | PC+187 | PC+188 | PC+189 | PC+190 | PC+191 | PC+192 | PC+193 | PC+194 | PC+195 | PC+196 | PC+197 | PC+198 | PC+199 | PC+200 | PC+201 | PC+202 | PC+203 | PC+204 | PC+205 | PC+206 | PC+207 | PC+208 | PC+209 | PC+210 | PC+211 | PC+212 | PC+213 | PC+214 | PC+215 | PC+216 | PC+217 | PC+218 | PC+219 | PC+220 | PC+221 | PC+222 | PC+223 | PC+224 | PC+225 | PC+226 | PC+227 | PC+228 | PC+229 | PC+230 | PC+231 | PC+232 | PC+233 | PC+234 | PC+235 | PC+236 | PC+237 | PC+238 | PC+239 | PC+240 | PC+241 | PC+242 | PC+243 | PC+244 | PC+245 | PC+246 | PC+247 | PC+248 | PC+249 | PC+250 | PC+251 | PC+252 | PC+253 | PC+254 | PC+255 | PC+256 | PC+257 | PC+258 | PC+259 | PC+260 | PC+261 | PC+262 | PC+263 | PC+264 | PC+265 | PC+266 | PC+267 | PC+268 | PC+269 | PC+270 | PC+271 | PC+272 | PC+273 | PC+274 | PC+275 | PC+276 | PC+277 | PC+278 | PC+279 | PC+280 | PC+281 | PC+282 | PC+283 | PC+284 | PC+285 | PC+286 | PC+287 | PC+288 | PC+289 | PC+290 | PC+291 | PC+292 | PC+293 | PC+294 | PC+295 | PC+296 | PC+297 | PC+298 | PC+299 | PC+300 | PC+301 | PC+302 | PC+303 | PC+304 | PC+305 | PC+306 | PC+307 | PC+308 | PC+309 | PC+310 | PC+311 | PC+312 | PC+313 | PC+314 | PC+315 | PC+316 | PC+317 | PC+318 | PC+319 | PC+320 | PC+321 | PC+322 | PC+323 | PC+324 | PC+325 | PC+326 | PC+327 | PC+328 | PC+329 | PC+330 | PC+331 | PC+332 | PC+333 | PC+334 | PC+335 | PC+336 | PC+337 | PC+338 | PC+339 | PC+340 | PC+341 | PC+342 | PC+343 | PC+344 | PC+345 | PC+346 | PC+347 | PC+348 | PC+349 | PC+350 | PC+351 | PC+352 | PC+353 | PC+354 | PC+355 | PC+356 | PC+357 | PC+358 | PC+359 | PC+360 | PC+361 | PC+362 | PC+363 | PC+364 | PC+365 | PC+366 | PC+367 | PC+368 | PC+369 | PC+370 | PC+371 | PC+372 | PC+373 | PC+374 | PC+375 | PC+376 | PC+377 | PC+378 | PC+379 |  |
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```
4370 ;VERIFY READ GATE IS OFF AND TAG BUS IS ZERO
4371
4372
4373 015752 016003 000040      MOV      RMMR2(R0),R3      ;STORE RMMR2 AT R3
4374 015756 042703 176000      BIC      #^C1777,R3
4375 015762 001407              BEQ      60$              ;BRANCH IF TAG BUS ZERO
4376 015764 010337 001142      MOV      R3,$BDDAT
4377 015770 005037 001140      CLR      $GDDAT
4378 015774 104050              ERROR   50
4379 015776 000137 016756      JMP      230$              ;READ HEADER FUNCTION
4380 016002
4381 60$:
4382 ;CLOCK BIT CLOCK TIL PROM STROBE GOES OFF
4383
4384 016002 012760 055401 000024      MOV      #MR1AAA!MCLK,RMMR1(R0) ;LOAD RMMR1
4385
4386 016010 012760 051401 000024      MOV      #MR1AAA,RMMR1(R0) ;LOAD RMMR1
4387
4388 016016 016003 000024      MOV      RMMR1(R0),R3      ;STORE RMMR1 AT R3
4389 016022 032703 000040      BIT      #WC,R3
4390 016026 001404              BEQ      70$              ;BRANCH IF PROM STROBE OFF
4391 016030 005304              DEC      R4
4392 016032 001363              BNE      60$
4393 016034 000137 016756      JMP      230$              ;*****
4394 016040
4395 70$:
4396 ;CONTINUE FOR 3 BIT CYCLE TOTAL (LOC 0 NOT SAMPLED)
4397
4398 016040 005302              DEC      R2
4399 016042 001322              BNE      30$
4400
4401 ;*****
4402 ;READ GATE SHOULD COME ON WITH NEXT PROM STROBE AND STAY
4403 ;ON FOR 7 CYCLES (AND MORE)
4404
4404 016044 012702 000006      MOV      #6,R2
4405 016050 012703 000021      MOV      #17,R3
4406
4407 ;CLOCK BIT CLOCK TIL PROM STROBE SETS
4408
4408 016054
4409 90$:
4410 016054 012760 055401 000024      MOV      #MR1AAA!MCLK,RMMR1(R0) ;LOAD RMMR1
4411
4412 016062 012760 051401 000024      MOV      #MR1AAA,RMMR1(R0) ;LOAD RMMR1
4413
4414 016070 016004 000024      MOV      RMMR1(R0),R4      ;STORE RMMR1 AT R4
4415 016074 032704 000040      BIT      #WC,R4
4416 016100 001004              BNE      100$             ;BRANCH WHEN PROM STROBE ON
4417 016102 005303              DEC      R3
4418 016104 001363              BNE      90$
4419 016106 000137 016756      JMP      230$              ;*****
4420 016112
4421 100$:
4422 ;VERIFY READ GATE ON AND REST OF TAG BUS OFF
4423
4423 016112 016004 000040      MOV      RMMR2(R0),R4      ;STORE RMMR2 AT R4
4424 016116 042704 176000      BIC      #^C1777,R4
4425 016122 022704 000002      CMP      #BB01,R4
```

| Address | Offset | Label  | Instruction | Comment                                                    |
|---------|--------|--------|-------------|------------------------------------------------------------|
| 4426    | 016126 | 001410 | BEQ         | 110\$ ;BRANCH IF READ GATE ON                              |
| 4427    | 016130 | 010437 | MOV         | R4,\$BDDAT                                                 |
| 4428    | 016134 | 012737 | MOV         | #B01,\$GDDAT                                               |
| 4429    | 016142 | 104050 | ERROR       | 50 ;TAG BUS INCORRECT DURING                               |
| 4430    | 016144 | 000137 | JMP         | 230\$ ;READ HEADER FUNCTION                                |
| 4431    |        |        |             |                                                            |
| 4432    | 016150 |        | 110\$:      |                                                            |
| 4433    |        |        |             | ;CLOCK BIT CLOCK TIL PROM STROBE GOES OFF                  |
| 4434    |        |        |             |                                                            |
| 4435    |        |        |             |                                                            |
| 4436    | 016150 | 012760 | MOV         | #MR1AAA!MCLK,RMMR1(R0) ;LOAD RMMR1                         |
| 4437    |        |        |             |                                                            |
| 4438    | 016156 | 012760 | MOV         | #MR1AAA,RMMR1(R0) ;LOAD RMMR1                              |
| 4439    |        |        |             |                                                            |
| 4440    | 016164 | 016004 | MOV         | RMMR1(R0),R4 ;STORE RMMR1 AT R4                            |
| 4441    | 016170 | 032704 | BIT         | #WC,R4                                                     |
| 4442    | 016174 | 001404 | BEQ         | 120\$ ;BRANCH WHEN PROM STROBE OFF                         |
| 4443    | 016176 | 005303 | DEC         | R3                                                         |
| 4444    | 016200 | 001363 | BNF         | 110\$                                                      |
| 4445    | 016202 | 000137 | JMP         | 230\$                                                      |
| 4446    |        |        |             |                                                            |
| 4447    | 016206 |        | 120\$:      |                                                            |
| 4448    |        |        |             | ;CONTINUE FOR TOATL OF 7 CYCLES                            |
| 4449    | 016206 | 005302 | DEC         | R2                                                         |
| 4450    | 016210 | 001317 | BNE         | 80\$ ;*8**88                                               |
| 4451    |        |        |             | ::*****                                                    |
| 4452    |        |        |             | ;LOOKING FOR SYNC SHOULD SET WITH NEXT PROM STORBE         |
| 4453    | 016212 | 012702 | MOV         | #17.,R2 ;MAX BIT CLOCKS                                    |
| 4454    | 016216 | 000021 |             |                                                            |
| 4455    |        |        | 130\$:      |                                                            |
| 4456    |        |        |             | ;CLOCK BIT CLOCK TIL PROM STROBE SETS                      |
| 4457    |        |        |             |                                                            |
| 4458    | 016216 | 012760 | MOV         | #MR1AAA!MCLK,RMMR1(R0) ;LOAD RMMR1                         |
| 4459    |        |        |             |                                                            |
| 4460    | 016224 | 012760 | MOV         | #MR1AAA,RMMR1(R0) ;LOAD RMMR1                              |
| 4461    |        |        |             |                                                            |
| 4462    | 016232 | 016003 | MOV         | RMMR1(R0),R3 ;STORE RMMR1 AT R3                            |
| 4463    | 016236 | 032703 | BIT         | #WC,R3                                                     |
| 4464    | 016242 | 001004 | BNE         | 140\$ ;BRANCH WHEN PROM STROBE ON                          |
| 4465    | 016244 | 005302 | DEC         | R2                                                         |
| 4466    | 016246 | 001363 | BNE         | 130\$                                                      |
| 4467    | 016250 | 000137 | JMP         | 230\$                                                      |
| 4468    | 016254 |        | 140\$:      |                                                            |
| 4469    |        |        |             | ;VERIFY 'PLFS' IS NOW ON                                   |
| 4470    | 016254 | 042703 | BIC         | #^CPLFS,R3                                                 |
| 4471    | 016260 | 001015 | BNE         | 150\$                                                      |
| 4472    | 016262 | 010337 | MOV         | R3,\$BDDAT                                                 |
| 4473    | 016266 | 012737 | MOV         | #PLFS,\$GDDAT                                              |
| 4474    | 016274 | 010037 | MOV         | R0,\$BDADR                                                 |
| 4475    | 016300 | 062737 | ADD         | #RMMR1,\$BDADR                                             |
| 4476    | 016306 | 104035 | ERROR       | 35                                                         |
| 4477    | 016310 | 000137 | JMP         | 230\$                                                      |
| 4478    | 016314 |        | 150\$:      |                                                            |
| 4479    | 016314 | 012703 | MOV         | #5,R3                                                      |
| 4480    |        | 000005 |             | ;WITH PLFS ON, WORD COUNT INHIBIT WILL SET IN 5 BIT CLOCKS |
| 4481    | 016320 |        | 155\$:      |                                                            |

```
4482
4483 016320 012760 055401 000024      MOV      #MR1AA;!MCLK,RMMR1(R0) ;LOAD RMMR1
4484
4485 016326 012760 051401 000024      MOV      #MR1AAA,RMMR1(R0) ;LOAD RMMR1
4486 016334 005303      DEC      R3
4487 016336 001370      BNE      155$
4488
4489      ;*****
4490      ;SIMULATE THE SYNC PATTERN BEING READ
4491 016340 012702 000031      MOV      #31,R2 ;SYNC PATTERN=00011001
4492 016344 012703 000010      MOV      #8.,R3 ;8 BITS IN PATTERN
4493 016350
4494 016350 012737 055401 001426 160$: MOV      #MR1AAA!MCLK,RMMR10
4495 016356 000241      CLC
4496 016360 006002      ROR      R2
4497 016362 103003      BCC      165$
4498 016364 052737 002000 001426 165$: BIS      #MRD,RMMR10
4499 016372
4500
4501 016372 013760 001426 000024      MOV      RMMR10,RMMR1(R0) ;LOAD RMMR1
4502 016400 042737 004000 001426      BIC      #MCLK,RMMR10
4503
4504 016406 013760 001426 000024      MOV      RMMR10,RMMR1(R0) ;LOAD RMMR1
4505 016414 005303      DEC      R3 ;CONTINUE TIL SHIFT COUNT
4506 016416 001354      BNE      160$ ;IS ZERO
4507      ;*****
4508      ;SIMULATE THE HEADER BEING READ
4509 016420 012702 001174      MOV      #$TMP0,R2
4510 016424 012737 151466 001174      MOV      #151466,$TMP0
4511 016432 012737 002037 001176      MOV      #2037,$TMP1 ;*****
4512 016440 012737 101367 001200      MOV      #101367,$TMP2 ;CRC PATTERN ***
4513 016446
4514 016446 012703 000020 170$: MOV      #16.,R3 ;NUMBER OF BITS EACH WORD
4515 016452 012204      MOV      (R2)+,R4 ;HEADER WORD 1,2 OR 3
4516 016454
4517 016454 012737 055401 001426 175$: MOV      #MR1AAA!MCLK,RMMR10
4518 016462 000241      CLC
4519 016464 006004      ROR      R4
4520 016466 103003      BCC      180$
4521 016470 052737 002000 001426 180$: BIS      #MRD,RMMR10
4522 016476
4523
4524 016476 013760 001426 000024      MOV      RMMR10,RMMR1(R0) ;LOAD RMMR1
4525 016504 042737 004000 001426      BIC      #MCLK,RMMR10
4526
4527 016512 013760 001426 000024      MOV      RMMR10,RMMR1(R0) ;LOAD RMMR1
4528 016520 005303      DEC      R3 ;SHIFT OUT 16 BITS
4529 016522 001354      BNE      175$
4530 016524 020227 001200      CMP      R2,$TMP0+4 ;ALL DONE ?
4531 016530 101746      BLOS     170$ ;BRANCH IF NOT
4532      ;*****
4533      ;LOOKING FOR SYNC SHOULD COME ON WITHIN 6 STROBES
4534 016532 012702 000006      MOV      #6,R2
4535
4536 016536 012703 000021 185$: MOV      #17.,R3
4537      ;CLOCK UNTIL PROM STROBE ON
```

```

4538 016542 190$:
4539
4540 016542 012760 055401 000024 MOV #MR1AAA.MCLK,RMMR1(R0) ;LOAD RMMR1
4541
4542 016550 012760 051401 000024 MOV #MR1AAA,RMMR1(R0) ;LOAD RMMR1
4543
4544 016556 016004 000024 MOV RMMR1(R0),R4 ;STORE RMMR1 AT R4
4545 016562 032704 000040 BIT #WC,R4
4546 016566 001003 BNE 195$
4547 016570 005303 DEC R3
4548 016572 001363 BNE 190$
4549 016574 000470 BR 230$
4550 016576
4551 195$:
4552 016576 042704 175777 ;SEE IF 'PLFS' IS ON
4553 016602 001034 BIC #^CPLFS,R4
4554 BNE 210$
4555 ;CONTINUE IF LESS THAN 6 PROM STROBES
4556 016604 005302 DEC R2
4557 016606 001014 BNE 200$
4558 016610 010437 001142 MOV R4,$BDDAT ;SETUP ERROR
4559 016614 012737 002000 001140 MOV #PIFS,$CDDAT
4560 016622 010037 001136 MOV R0,$BDADR
4561 016626 062737 000024 001136 ADD #RMMR1,$BDADR
4562 016634 104035 ERROR 35
4563 016636 000447 BR 230$ ;HEADER
4564 016640
4565 200$:
4566 016640 012760 055401 000024 ;CLOCK UNTIL PROM STROBE OFF
4567
4568 016646 012760 051401 000024 MOV #MR1AAA.MCLK,RMMR1(R0) ;LOAD RMMR1
4569
4570 016654 016004 000024 MOV #MR1AAA,RMMR1(R0) ;LOAD RMMR1
4571 016660 032704 000040 MOV RMMR1(R0),R4 ;STORE RMMR1 AT R4
4572 016664 001724 BIT #WC,R4
4573 016666 005303 BEQ 185$
4574 016670 001363 DEC R3
4575 016672 000431 BNE 200$
4576 016674 BR 230$
4577
4578 210$:
4579 016674 016037 000014 001142 ;VERIFY NO HEADER ERROR IS SET
4580 016702 042737 177157 001142 MOV RMER1(R0),$BDDAT ;STORE RMER1 AT $BDDAT
4581 016710 001411 BIC #^C<HCRC.HCE!FER>,$BDDAT
4582 016712 005037 001140 BEQ 220$
4583 016716 010037 001136 CLR $GDDAT
4584 016722 062737 000014 001136 MOV R0,$BDADR
4585 016730 104051 ADD #RMER1,$BDADR
4586 016732 000411 ERROR 51
4587 016734 BR 230$ ;HEADER ERROR SET
4588
4589 016734 023737 054116 001174 220$:
4590 016742 001004 ;VERIFY DATA IN MEMORY OK
4591 016744 023737 054120 001176 CMP BUFFER,$TMP0 ;COMPARE 1 ST HEADER WORD
4592 016752 001401 BNE 225$
4593 016754 BEQ 230$ ;COMPARE 2 ND HEADER WORD
  
```

```
4594 ;REPORT ERROR IN ONE OR MORE HEADER WORDS
4595 016754 104052 ERROR 52
4596 016756
4597 230$:
4598 ;*****
4599 ;*TEST 23 ECC GENERATION TEST
4600 ;*****
4601 016756 000004 TST23: SCOPE
4602 016760 012737 000023 001226 MOV #23,$TESTN ;;SET TEST NUMBER IN APT MAIL BOX
4603 016766 000240 NOP
4604 016770 012737 000024 001120 MOV #20,$ICNT ;20 ITERATIONS
4605 016776 112737 000001 001131 MOV #1,$ERMAX ;ONE ERROR ALLOWED
4606 017004 012737 017020 001122 MOV #T23,$LPADR ;LOAD LOOP ON TEST ADDRESS
4607 017012 012737 017020 001124 MOV #T23,$LPERR ;LOAD LOOP ON ERROR ADDRESS
4608 017020
4609 017020 012706 001100 T23: MOV #STACK,SP ;LOAD THE STACK POINTER
4610 017024 013700 001276 MOV $BASE,R0 ;R0 = UNIBUS ADDRESS OF UUT
4611 017030 013701 001456 MOV TSTQUE,R1 ;R1 = POINTER TO DEVICE
4612 017034 012760 000040 000010 MOV #CLR,RMCS2(R0) ;CLEAR THE MASSBUS
4613 017042 111160 000010 MOV (R1),RMCS2(R0) ;SELECT UNIT
4614 ;SETUP REGISTER OUTPUT BUFFER FOR WRITE DATA CAMOMMAND
4615 017046 012737 002037 001410 MOV #002037,RMDAO ;TRK 4, SEC 31
4616 017054 012737 001466 001436 MOV #1466,RMDCO ;CYL=822.
4617 017062 012737 012000 001434 MOV #FMT16!HCI,RMOFO ;16 BIT FORMAT,IGNORE HEADER
4618 017070 012702 054116 MOV #BUFFER,R2
4619 017074 010237 001406 MOV R2,RMBAO ;DATA ADDRESS
4620 017100 012703 177400 MOV #^C256.+1,R3
4621 017104 010337 001404 MOV R3,RMWCO
4622 017110 012737 000061 001402 MOV #WD!GO,RMCS10 ;WRITE DATA COMMAND ***
4623 ;FILL THE DATA BUFFER WITH ALL ONES
4624 017116 012704 177777 MOV #177777,R4 ;DATA PATTERN ALL ONES
4625 017122 012703 000400 MOV #400,R3 ;ONE SECTOR DATA FIELD
4626 017126 010422 10$: MOV R4,(R2)+
4627 017130 005303 DEC R3
4628 017132 001375 BNE 10$
4629
4630 ;EXECUTE DATA COMMAND TO POINT WHERE SEARCH IS ENABLED USING SUBROUTINE
4631 017134 004737 023352 JSR PC,ENBSCH
4632 017140 000403 BR 20$ ;GO TO 20$ IF NO ERROR
4633 017142 104000 ERROR ;RETURN HERE IF ERROR
4634 017144 000137 017742 JMP 220$
4635 017150
4636 20$:
4637 ;FORCE SECTOR COMPARE USING SUBROUTINE
4638 017150 004737 024232 JSR PC,SCCMP
4639 017154 000403 BR 30$ ;GO TO 30$ IF NO ERROR
4640 017156 104000 ERROR ;RETURN HERE IF ERROR
4641 017160 000137 017742 JMP 220$
4642 30$:
4643 ;SET 'LOOKING FOR SYNC' USING SUBROUTINE
4644 017164 004737 024340 JSR PC,SETLFS
4645 017170 000403 BR 40$
4646 017172 104000 ERROR
4647 017174 000137 017742 JMP 220$
4648 40$:
4649 017200 004737 024522 ;CLOCK THE SYNC PATTERN USING SUBROUTINE
JSR PC,CLKSNC
```

```
4650 017204 000403          BR      50$
4651 017206 104000          ERROR
4652 017210 000137 017742   JMP      220$
4653
4654          ;HEADER COMPARE IS INHIBITED FOR THIS TEST
4655          ;CLOCK THE DATA TIMING SEQUENCER AND VERIFY THE FOLLOWING WAVEFORMS
4656          ;FOR EACH LEADING EDGD OF PROM STROBE
4657          ;      HEADER ARE, READ GATE (DATA TIMING SEQUENCER 200 OCTAL)
4658          ;      ENABLE CRC OUT
4659          ;      WRITE GATE
4660
4661 017214 012702 017746   50$:    MOV      #230$,R2          ;***** POINTER TO WAVE FORM TABLE
4662
4663 017220   70$:
4664          ;CLOCK BIT CLOCK (MCLK) UNTIL PROM STROBE COMES ON
4665 017220 004737 017766   JSR      PC,300$
4666 017224   80$:
4667          ;PROM STROBE IS ON - VERIFY WAVEFORM
4668
4669 017224 016037 000024 001142   MOV      RMMR1(R0), $BDDAT          ;STORE RMMR1 AT $BDDAT
4670 017232 042737 176157 001142   BIC      #^C<ECRC!PDA!PHA.EECC>, $BDDAT
4671 017240 012237 001140          MOV      (R2)+, $GDDAT
4672 017244 023737 001140 001142   CMP      $GDDAT, $BDDAT
4673 017252 001410          BEQ      90$          ;BRANCH IF RMMR1 OK
4674          ;ERROR - THE DATA TIMING SEQUENCER OUTPUT IS ONCORRECT
4675 017254 010037 001136          MOV      R0, $BDADR
4676 017260 062737 000024 001136   ADD      #RMMR1, $BDADR
4677 017266 104054          ERROR      54          ;DATA TIMING SEQUENCER WRONG
4678 017270 000137 017742   JMP      220$
4679 017274   90$:
4680          ;VERIFY THE TAB BUS
4681
4682 017274 016037 000040 001142   MOV      RMMR2(R0), $BDDAT          ;STORE RMMR2 AT $BDDAT
4683 017302 042737 176000 001142   BIC      #^C1777, $BDDAT
4684 017310 012237 001140          MOV      (R2)+, $GDDAT
4685 017314 023737 001140 001142   CMP      $GDDAT, $BDDAT
4686 017322 001410          BEQ      100$          ;BRANCH IF TAG BUS OK
4687          ;ERROR- TAG BUS IS WRONG
4688 017324 010037 001136          MOV      R0, $BDADR
4689 017330 062737 000040 001136   ADD      #RMMR2, $BDADR
4690 017336 104053          ERROR      53          ;TAG BUS WRONG
4691 017340 000137 017742   JMP      220$
4692 017344   100$:
4693          ;CLOCK BIT CLOCK TIL PROM STROBE RESETS
4694 017344 004737 020074   JSR      PC,350$
4695 017350   110$:
4696          ;CONTINUE CHECKING THROUGH 4 PROM CYCLES
4697 017350 020227 017764   CMP      R2, #230$+16          ;*****
4698 017354 103721          BLO      70$
4699          ;*****
4700          ;VERIFY THAT DATA AREA COMES ON WITHIN 9 PROM STROBES
4701 017356 012702 000011          MOV      #9., R2          ;R2=9 STROBES
4702 017362
4703   130$:
4704          ;CLOCK PROM STROBE ON
4705 017362 004737 017766   JSR      PC,300$
4705 017366   140:
```

```
4706      ;PROM STROBE ON CKECK IF DATA AREA ON
4707
4708 017366 016004 000024      MOV      RMMR1(R0),R4      ;STORE RMMR1 AT R4
4709 017372 042704 177377      BIC      #^CPDA,R4
4710 017376 001020      BNE      160$
4711      ;CLOCK PROM STROBE OFF
4712
4713 017400      150$:
4714 017400 004737 020074      JSR      PC,350$
4715 017404 005302      DEC      R2
4716 017406 001365      BNE      130$
4717      ;ERROR-DATA AREA DIDN'T COME ON
4718 017410 012737 000400 001140      MOV      #PDA,$GDDAT      ;SETUP ERROR MESSAGE
4719 017416 005037 001142      CLR      $BDDAT
4720 017422 010037 001136      MOV      R0,$BDADR
4721 017426 062737 000024 001136      ADD      #RMMR1,$BDADR
4722 017434 104055      ERROR      55
4723 017436 000541      BR      220$
4724 017440
4725      160$:
4726      ;*****
4727 017440 012702 000400      ;VERIFY THAT DATA AREA IS ON FOR 256 CYCLES
4728 017444      MOV      #256.,R2
4729
4730      170$:
4731      ;VERIFY THAT DATA AREA IS ON AND ECC IS OFF
4732
4731 017444 016003 000024      MOV      RMMR1(R0),R3      ;STORE RMMR1 AT R3
4732 017450 042703 177357      BIC      #^C<PDA.EECC>,R3
4733 017454 022703 000400      CMP      #PDA,R3
4734 017460 001414      BEQ      180$      ;DATA AREA IS ON
4735 017462 010337 001142      MOV      R3,$BDDAT
4736 017466 012737 000400 001140      MOV      #PDA,$GDDAT
4737 017474 010037 001136      MOV      R0,$BDADR
4738 017500 062737 000024 001136      ADD      #RMMR1,$BDADR
4739 017506 104055      ERROR      55      ;DATA ERROR NOT ON
4740 017510 000514      BR      220$
4741 017512
4742      180$:
4743 017512 004737 020074      ;CLOCK PROM STROBE OFF
4744      JSR      PC,350$
4745 017516 004737 017766      ;CLOCK PROM STROBE ON
4746      JSR      PC,300$
4747      ;CONTINUE TIL COUNT ZERO
4748 017522 005302      DEC      R2
4749 017524 001347      BNE      170$
4750      ;ECC SHOULD BE ENABLED WITHIN 4 CLOCK BITS
4751
4751 017526 005002      CLR      R2
4752 017530
4753      182$:
4754 017530 016003 000024      MOV      RMMR1(R0),R3      ;STORE RMMR1 AT R3
4755 017534 042703 177357      BIC      #^C<PDA!EECC>,R3
4756 017540 022703 000020      CMP      #EECC,R3
4757 017544 001426      BEQ      190$
4758 017546 005202      INC      R2
4759
4760 017550 012760 055401 000024      MOV      #MR1AAA.MCLK,RMMR1(R0)      ;LOAD RMMR1
4761
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4762 017556 012760 051401 C00024      MOV      #MR1AAA,RMMR1(R0)      ;LOAD RMMR1
4763 017564 022702 000007      CMP      #7,R2
4764 017570 101357      BHI      182$
4765 017572 010337 001142      MOV      R3,$BDDAT
4766 017576 012737 000020 001140      MOV      #EECC,$GDDAT
4767 017604 010037 001136      MOV      R0,$BDADR
4768 017610 062737 000024 001136      ADD      #RMMR1,$BDADR
4769 017616 104056      ERROR      56
4770 017620 000450      BR      220$
4771 017622      190$:
4772      ;SAMPLE ECC CHARACTER FOR 32 BITS
4773 017622 012702 001174      MOV      #$TMP0,R2
4774 017626 005003      195$: CLR      R3
4775 017630 012704 000020      MOV      #16.,R4
4776 017634      200$:
4777
4778 017634 016005 000024      MOV      RMMR1(R0),R5      ;STORE RMMR1 AT R5
4779 017640 006303      ASL      R3
4780 017642 032705 000010      BIT      #MWD,R5
4781 017646 001002      BNE      205$
4782 017650 052703 000001      BIS      #BIT0,R3      ;BRANCH IF ECC BIT OFF (MWD INVERTED)
4783 017654      205$:
4784
4785 017654 012760 055401 000024      MOV      #MR1AAA.MCLK,RMMR1(R0) ;LOAD RMMR1
4786
4787 017662 012760 051401 000024      MOV      #MR1AAA,RMMR1(R0)      ;LOAD RMMR1
4788 017670 005304      DEC      R4
4789 017672 001360      BNE      200$
4790 017674 010322      MOV      R3,(R2)+
4791 017676 022702 001200      CMP      #$TMP0+4,R2
4792 017702 101351      BHI      195$
4793      ;*****
4794      ;VERIFY ECC CHARACTER GENERATED
4795 017704 022737 131177 001174      CMP      #131177,$TMP0      ;*****
4796 017712 001004      BNE      210$
4797 017714 022737 175154 001176      CMP      #175154,$TMP1      ;*****
4798 017722 001407      BEQ      220$
4799 017724 012737 131177 001200 210$: MOV      #131177,$TMP2      ;*****
4800 017732 012737 175154 001202      MOV      #175154,$TMP3      ;*****
4801 017740 104061      ERROR      61      ;ECC GENERATED INCORRECT
4802 017742      220$:
4803 017742 000137 020200      JMP      400$      ;GREAT ESCAPE
4804
4805 017746 000200      230$: .WORD    PHA
4806 017750 000002      .WORD    BB01
4807 017752 000200      .WORD    PHA
4808 017754 000002      .WORD    BB01
4809 017756 000000      .WORD    0
4810 017760 000002      .WORD    2      ;*****
4811 017762 000000      .WORD    0      ;*****
4812 017764 000000      .WORD    0      ;
4813
4814
4815 017766 012737 000021 020070 300$: MOV      #17.,320$
4816      ;
4817 017774      305$:

```

CLOCK PROM STROBE ON

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4818
4819 017774 012760 055401 000024      MOV      #MR1AAA.MCLK,RMMR1(R0) ;LOAD RMMR1
4820
4821 020002 012760 051401 000024      MOV      #MR1AAA,RMMR1(R0)      ;LOAD RMMR1
4822
4823 020010 016037 000024 020072      MOV      RMMR1(R0),330$ ;STORE RMMR1 AT 330$
4824 020016 042737 177737 020072      BIC      #^CWC,330$
4825 020024 001020                      BNE      310$                ;EXIT IF PROM STROBE ON
4826 020026 005337 020070                      DEC      320$
4827 020032 001360                      BNE      305$
4828 020034 013737 020070 001142      MOV      320$, $BDDAT      ,SETUP ERROR MESSAGE
4829 020042 012737 000040 001140      MOV      #WC,$GDDAT
4830 020050 010037 001136                      MOV      R0,$BDADR
4831 020054 062737 000024 001136      ADD      #RMMR1,$BDADR
4832 020062 104030                      ERROR    30
4833 020064 000445                      BR       400$
4834 020066 000207                      310$:    RTS      PC
4835 020070 000000                      320$:    .WORD    0                ;MAX BIT COUNT
4836 020072 000000                      330$:    .WORD    0                ;RMMR1 CONTENTS
4837
4838 020074 012737 000021 020174 350$:    MOV      #17.,370$
4839
4840 020102                      355$:
4841
4842 020102 012760 055401 000024      MOV      #MR1AAA.MCLK,RMMR1(R0) ;LOAD RMMR1
4843
4844 020110 012760 051401 000024      MOV      #MR1AAA,RMMR1(R0)      ;LOAD RMMR1
4845
4846 020116 016037 000024 020176      MOV      RMMR1(R0),380$ ;STORE RMMR1 AT 380$
4847 020124 042737 177737 020176      BIC      #^CWC,380$
4848 020132 001417                      BEQ      360$
4849 020134 005337 020174                      DEC      370$
4850 020140 001360                      BNE      355$
4851 020142 013737 020176 001142      MOV      380$, $BDDAT
4852 020150 005037 001140                      CLR      $GDDAT
4853 020154 010037 001136                      MOV      R0,$BDADR
4854 020160 062737 000024 001136      ADD      #RMMR1,$BDADR
4855 020166 104062                      ERROR    62                ;CAN'T CLEAR PROM STROBE
4856 020170 000403                      BR       400$
4857 020172 000207                      360$:    RTS      PC
4858
4859 020174 000000                      370$:    .WORD    0                ;MAX BIT COUNT
4860 020176 000000                      380$:    .WORD    0                ;CONTENTS OF RMMR1
4861
4862 020200                      400$:
4863 020200 000240                      NOP
4864
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4867
4868 020202 000004                      ;*****
4869 020204 012737 000024 001226      ;*TEST 24      ECC DETECTION TEST
4870 020212 000240                      ;*****
4871 020214 012737 000024 001120      TST24:  SCOPE
4872 020222 112737 000001 001131      MOV      #24,$TESTN      ;;SET TEST NUMBER IN APT MAIL BOX
4873 020230 012737 020244 001122      NOP
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4874 020236 012737 020244 001124      MOV      #T24,$LPERR ;LOAD LOOP ON ERROR ADDRESS
4875 020244      T24:
4876 020244 012706 001100      MOV      #STACK,SP ;LOAD THE STACK POINTER
4877 020250 013700 001276      MOV      $BASE,R0 ;R0 = UNIBUS ADDRESS OF UUT
4878 020254 013701 001456      MOV      TSTQUE,R1 ;R1 = POINTER TO DEVICE
4879 020260 012760 000040 000010      MOV      #CLR,RMCS2(R0) ;CLEAR THE MASSBUS
4880 020266 111160 000010      MOV      (R1),RMCS2(R0) ;SELECT UNIT
4881      ;SETUP REGISTER OUTPUT BUFFER FOR READ DATA COMMAND
4882 020272 012737 002037 001410      MOV      #2037,RMDAO
4883 020300 012737 001466 001436      MOV      #1466,RMDCO ;CYL-822. TRK =4, SEC 31
4884 020306 012737 012000 001434      MOV      #FMT16!HCI,RMOFO ;INHIBIT HEADER COMPARE
4885 020314 012702 054116      MOV      #BUFONE,R2
4886 020320 010237 001406      MOV      R2,RMBAO
4887 020324 012737 177400 001404      MOV      #^C256.+1,RMWCO ;256 WORDS
4888 020332 012737 000071 001402      MOV      #RD!GO,RMCS10 ;READ DATA COMMAND
4889 020340
4890      20$:
4891 020340 004737 023352      ;EXECUTE DATA COMMAND TO POINT WHERE SEARCH IS ENABLED USING SUBROUTINE
4892 020344 000403      JSR      PC,ENBSCH
4893 020346 104000      BR      30$ ;GO TO 30$ IF NO ERROR
4894 020350 000137 021222      ERROR    ;RETURN HERE IF ERROR
4895 020354      JMP      190$
4896
4897 020354 004737 024232      30$:
4898 020360 000403      ;FORCE SECTOR COMPARE USING SUBROUTINE
4899 020362 104000      JSR      PC,SCTCMP
4900 020364 000137 021222      BR      40$ ;GO TO 40$ IF NO ERROR
4901 020370      ERROR    ;RETURN HERE IF ERROR
4902      JMP      190$
4903
4904 020370 004737 024340      40$:
4905 020374 000403      ;SET 'LOOKING FOR SYNC' USING SUBROUTINE
4906 020376 104000      JSR      PC,SETLFS
4907 020400 000137 021222      BR      50$
4908 020404      ERROR    ;GO TO 50$ IF NO ERROR
4909 020404 004737 024522      50$:
4910 020410 000403      ;CLOCK THE SYNC PATTERN USING SUBROUTINE
4911 020412 104000      JSR      PC,CLKSNC
4912 020414 000137 021222      BR      55$
4913 020414 000137 021222      ERROR    ;GO TO 55$ IF NO ERROR
4914 020414 000137 021222      JMP      190$
4915
4916 020420 012702 000002      ;*****
4917 020424 000405      ;HEADER COMPARE IS INHIBITED FOR THIS TEST
4918 020426 004737 021334      ;'LOOKING FOR SYNC' SHOULD GO OFF WITHIN ONE CYCLE
4919 020432 004737 021226      55$: MOV      #2,R2 ;ALLOW 2 PASSES THRU LOOP
4920 020436 000240      BR      70$
4921 020440
4922
4923 020440 016003 000024      60$: JSR      PC,350$ ;RESET PROM STROBE
4924 020444 032703 002000      JSR      PC,300$ ;SET PROM STROBE
4925 020450 001421      NOP
4926 020452 005302
4927 020454 001364
4928
4929 020456 010337 001142      70$:
      MOV      RMMR1(R0),R3 ;STORE RMMR1 AT R3
      BIT      #PLFS,R3
      BEQ      80$ ;BRANCH IF LOOKING FOR SYNC OFF
      DEC      R2
      BNE      60$
      ;ERROR-LOOKING FOR SYNC DID NOT RESET DURING HEADER
      MOV      R3,$BDDAT ;SETUP ERROR MESSAGE
  
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4930 020462 042737 175777 001142      BIC      #^CPLFS,$BDDAT
4931 020470 005037 001140      CLR      $GDDAT
4932 020474 010037 001136      MOV      R0,$BDADR
4933 020500 062737 000024 001136      ADD      #RMMR1,$BDADR
4934 020506 104040      ERROR    40      ;PLFS NOT RESET AGTER HEADER
4935 020510 000137 021222      JMP      190$
4936 020514      80$:
4937      ;*****
4938      ;LOOKING FOR SYNC SHOULD COME ON FOR DATA AREA WITHIN 9 PROM CYCLES
4939 020514 012702 000011      MOV      #9.,R2
4940 020520 004737 021334 85$:      JSR      PC,350$      ;SET STROBE OFF
4941 020524 004737 021226      JSR      PC,300$      ;SET PROM STROBE
4942
4943 020530 016003 000024      MOV      RMMR1(R0),R3      ;STORE RMMR1 AT R3
4944 020534 032703 002000      BIT      #PLFS,R3
4945 020540 001022      BNE      90$      ;BRANCH IF SYNC ENABLED
4946 020542 005302      DEC      R2
4947 020544 001365      BNE      85$
4948      ;ERROR-CAN'T LOOKING FOR SYNC DURING DATA AREA
4949 020546 012737 002000 001140      MOV      #PLFS,$GDDAT
4950 020554 010337 001142      MOV      R3,$BDDAT
4951
4952 020560 042737 175777 001142      BIC      #^CPLFS,$BDDAT
4953 020566 010037 001136      MOV      R0,$BDADR
4954 020572 062737 000024 001136      ADD      #RMMR1,$BDADR
4955 020600 104035      ERROR    35      ;CAN'T SET PLFS DURING DATA
4956 020602 000137 021222      JMP      190$
4957 020606      90$:
4958 020606 004737 021334      JSR      PC,350$      ;RESET PROM STROBE
4959      ;CLOCK THE SYNC PATTERN USING SUBROUTINE
4960 020612 004737 024522      JSR      PC,CLKSNC
4961 020616 000402      BR      100$
4962 020620 104000      ERROR    100$
4963 020622 000577      BR      190$
4964 020624      100$:
4965      ;*****
4966      ;SIMULATE READ DATA
4967 020624 012702 000400      MOV      #256.,R2      ;WORD COUNT
4968 020630 012703 000020 110$:      MOV      #16.,R3      ;BIT COUNT
4969 020634      115$:
4970
4971 020634 012760 057401 000024      MOV      #MR1AAA.MRD.MCLK,RMMR1(R0)      ;LOAD RMMR1
4972
4973 020642 012760 053'01 000024      MOV      #MR1AAA.MRD,RMMR1(R0)      ;LOAD RMMR1
4974 020650 005303      DEC      R3
4975 020652 001370      BNE      115$
4976 020654 005302      DEC      R2
4977 020656 001364      BNE      110$
4978      ;*****
4979      ;SIMULATE ECC PATTERN
4980 020660 012737 177446 001174      MOV      #177446,$TMP0      ;FIRST ECC WORD
4981 020666 012737 015457 001176      MOV      #015457,$TMP1      ;SECOND ECC WORD
4982 020674 012702 001174      MOV      #$TMP0,R2
4983 020700 012703 000020 120$:      MOV      #16.,R3
4984 020704 012704 051401 125$:      MOV      #MR1AAA,R4
4985 020710 000241      CLC
  
```

```

4986 020712 006012 ROR (R2)
4987 020714 103002 BCC 130$
4988 020716 052704 002000 BIS #MRD,R4
4989 020722 130$:
4990
4991 020722 010460 000024 MOV R4,RMMR1(R0) ;LOAD RMMR1
4992 020726 052704 004000 BIS #MCLK,R4
4993
4994 020732 010460 000024 MOV R4,RMMR1(R0) ;LOAD RMMR1
4995 020736 042704 004000 BIC #MCLK,R4
4996
4997 020742 010460 000024 MOV R4,RMMR1(R0) ;LOAD RMMR1
4998 020746 005303 DEC R3
4999 020750 001355 BNE 125$ ;CLOCK A WORD
5000 020752 062702 000002 ADD #2,R2
5001 020756 022702 001176 CMP #TMP1,R2
5002 020762 001746 BEQ 120$ ;CLOCK THE NEXT WORD
5003 ;VERIFY DATA AREA AND READ GATE RESET
5004 020764 012702 000005 MOV #5,R2
5005
5006 020770 004737 021226 140$: JSR PC,300$ ;SET PROM STROBE
5007 020774 004737 021334 JSR PC,350$ ;CLEAR PROM STROBE
5008
5009 021000 016003 000024 MOV RMMR1(R0),R3 ;STORE RMMR1 AT R3
5010 021004 032703 000400 BIT #PDA,R3
5011 021010 001417 BEQ 150$
5012 021012 005302 DEC R2
5013 021014 001365 BNE 140$
5014 021016 042703 177377 BIC #^CPDA,R3 ;SETUP ERROR MESSAGE
5015 021022 010337 001142 MOV R3,$BDDAT
5016 021026 005037 001140 CLR $GDDAT
5017 021032 010037 001136 MOV R0,$BDADR
5018 021036 062737 000024 001136 ADD #RMMR1,$BDADR
5019 021044 104063 ERROR 63 ;DATA AREA WON'T RESET
5020 021046 000465 BR 190$
5021 021050 150$:
5022
5023 021050 016003 000040 MOV RMMR2(R0),R3 ;STORE RMMR2 AT R3
5024 021054 042703 176000 BIC #^C1777,R3
5025 021060 001413 BEQ 160$
5026 021062 010337 001142 MOV R3,$BDDAT
5027 021066 005037 001140 CLR $GDDAT
5028 021072 010037 001136 MOV R0,$BDADR
5029 021076 062737 000040 001136 ADD #RMMR2,$BDADR
5030 021104 104053 ERROR 53 ;READ GATE WON'T RESET
5031 021106 000445 BR 190$
5032 021110 160$:
5033 ;*****
5034 ;VERIFY THERE ARE NO ECC ERRORS
5035
5036 021110 016003 000014 MOV RMER1(R0),R3 ;STORE RMER1 AT R3
5037 021114 042703 077677 BIC #^C<DCK!ECH>,R3
5038 021120 012737 000000 001140 MOV #000000,$GDDAT
5039 021126 023703 001140 CMP $GDDAT,R3
5040 021132 001411 BEQ 170$
5041 021134 010337 001142 MOV R3,$BDDAT
  
```

```

5042 021140 010037 001136      MOV    R0,$BDADR
5043 021144 062737 000014 001136  ADD    #RMR1,$BDADR
5044 021152 104064              ERROR   64
5045 021154 000422              BR      190$
5046 021156              170$:
5047              :*****
5048              :VERIFY DATA BUFFER
5049 021156 012702 054116      MOV    #BUFONE,R2      ;DATA WAS STORED HERE
5050 021162 012703 177777      MOV    #177777,R3      ;EACH WORD ALL ONES
5051 021166 012704 000400      MOV    #256.,R4
5052 021172 022203              180$:  CMP    (R2)+,R3
5053 021174 001003              BNE     185$
5054 021176 005304              DEC     R4
5055 021200 001374              BNE     180$
5056 021202 000407              BR      190$      ;EXIT IF ALL THE LOCATIONS CHECKED
5057 021204 014237 001142      185$:  MOV    -(R2),$BDDAT      ;SETUP ERROR MESSAGE
5058 021210 010337 001140      MOV    R3,$GDDAT
5059 021214 010237 001136      MOV    R2,$BDADR
5060 021220 104065              ERROR   65      ;DATA INCORRECT DURING READ
5061 021222 000137 021440      190$:  JMP    400$      ;GREAT ESCAPE
5062 021226 012737 000021 021330 300$:  MOV    #17.,320$
5063              :CLOCK PROM STROBE ON
5064 021234              305$:
5065
5066 021234 012760 055401 000024      MOV    #MR1AAA!MCLK,RMMR1(R0) ;LOAD RMMR1
5067
5068 021242 012760 051401 000024      MOV    #MR1AAA,RMMR1(R0)      ;LOAD RMMR1
5069
5070 021250 016037 000024 021332      MOV    RMMR1(R0),330$ ;STORE RMMR1 AT 330$
5071 021256 042737 177737 021332      BIC    #^CWC,330$
5072 021264 001020              BNE     310$      ;EXIT IF PROM STROBE ON
5073 021266 005337 021330              DEC     320$
5074 021272 001360              BNE     305$
5075 021274 013737 021330 001142      MOV    320,$BDDAT      ;SETUP ERROR MESSAGE
5076 021302 012737 000040 001140      MOV    #WC,$GDDAT
5077 021310 010037 001136      MOV    R0,$BDADR
5078 021314 062737 000024 001136      ADD    #RMMR1,$BDADR
5079 021322 104030              ERROR   30
5080 021324 000445              BR      400$
5081 021326 000207              310$:  RTS     PC
5082 021330 000000              320$:  .WORD   0
5083
5084 021332 000000              330$:  .WORD   0
5085
5086 021334 012737 000021 021434      350$:  MOV    #17.,370$
5087              :CLOCK THE STROBE OFF
5088 021342              355$:
5089
5090 021342 012760 055401 000024      MOV    #MR1AAA!MCLK,RMMR1(R0) ;LOAD RMMR1
5091
5092 021350 012760 051401 000024      MOV    #MR1AAA,RMMR1(R0)      ;LOAD RMMR1
5093
5094 021356 016037 000024 021436      MOV    RMMR1(R0),380$ ;STORE RMMR1 AT 380$
5095 021364 042737 177737 021436      BIC    #^CWC,380$
5096 021372 001417              BEQ     360$
5097 021374 005337 021434              DEC     370$
  
```

SEQ 0103

|      |        |        |        |        |       |                 |                           |
|------|--------|--------|--------|--------|-------|-----------------|---------------------------|
| 5098 | 021400 | 001360 |        |        | BNE   | 355\$           |                           |
| 5099 | 021402 | 013737 | 021436 | 001142 | MOV   | 380\$, \$BDDAT  |                           |
| 5100 | 021410 | 005037 | 001140 |        | CLR   | \$GDDAT         |                           |
| 5101 | 021414 | 010037 | 001136 |        | MOV   | R0, \$BDADR     |                           |
| 5102 | 021420 | 062737 | 000024 | 001136 | ADD   | #RMMR1, \$BDADR |                           |
| 5103 | 021426 | 104062 |        |        | ERROR | 62              | ; CAN'T CLEAR PROM STROBE |
| 5104 | 021430 | 000403 |        |        | BR    | 400\$           |                           |
| 5105 | 021432 | 000207 |        | 360\$: | RTS   | PC              |                           |
| 5106 | 021434 | 000000 |        | 370\$: | .WORD | 0               |                           |
| 5107 | 021436 | 000000 |        | 380\$: | .WORD | 0               |                           |
| 5108 | 021440 | 000240 |        | 400\$: | NOP   |                 | ; SUB-TEST EXIT POINT     |

[illegible]

| Address | Offset | Hex    | Symbol | Label  | Instruction                                                            | Comment                            |
|---------|--------|--------|--------|--------|------------------------------------------------------------------------|------------------------------------|
| 5109    | 021442 |        |        |        | \$EOSP: NOP                                                            |                                    |
| 5110    | 021442 | 000240 |        |        | MOV TSTQUE,R0                                                          |                                    |
| 5111    | 021444 | 013700 | 001456 |        | ADD #2,R0                                                              |                                    |
| 5112    | 021450 | 062700 | 000002 |        | MOV R0,TSTQUE                                                          |                                    |
| 5113    | 021454 | 010037 | 001456 |        | TST (R0)                                                               |                                    |
| 5114    | 021460 | 005710 |        |        | BEQ 1\$                                                                |                                    |
| 5115    | 021462 | 001402 |        |        | JMP READY                                                              |                                    |
| 5116    | 021464 | 000137 | 004414 |        | MOV #TSTQUE+2,TSTQUE                                                   |                                    |
| 5117    | 021470 | 012737 | 001460 | 001456 | 1\$: .SBTTL                                                            | END OF PASS ROUTINE                |
| 5118    |        |        |        |        |                                                                        |                                    |
| 5119    |        |        |        |        |                                                                        |                                    |
| 5120    |        |        |        |        | *****                                                                  |                                    |
| 5121    |        |        |        |        | *INCREMENT THE PASS NUMBER (\$PASS)                                    |                                    |
| 5122    |        |        |        |        | *TYPE 'END PASS #XXXXX TOTAL NUMBER OF ERRORS SINCE LAST REPORT YYYYY' |                                    |
| 5123    |        |        |        |        | *WHERE XXXXX AND YYYYY ARE DECIMAL NUMBERS                             |                                    |
| 5124    |        |        |        |        | *IF THERES A MONITOR GO TO IT                                          |                                    |
| 5125    |        |        |        |        | *IF THERE ISN'T JUMP TO READY                                          |                                    |
| 5126    |        |        |        |        |                                                                        |                                    |
| 5127    | 021476 |        |        |        | \$EOP:                                                                 |                                    |
| 5128    | 021476 | 000240 |        |        | NOP                                                                    |                                    |
| 5129    | 021500 | 005037 | 001116 |        | CLR \$TSTNM                                                            | ::ZERO THE TEST NUMBER             |
| 5130    | 021504 | 005037 | 001206 |        | CLR \$TIMES                                                            | ::ZERO THE NUMBER OF ITERATIONS    |
| 5131    | 021510 | 005237 | 001230 |        | INC \$PASS                                                             | ::INCREMENT THE PASS NUMBER        |
| 5132    | 021514 | 042737 | 100000 | 001230 | BIC #100000,\$PASS                                                     | ::DON'T ALLOW A NEG. NUMBER        |
| 5133    | 021522 | 005327 |        |        | DEC (PC)+                                                              | ::LOOP?                            |
| 5134    | 021524 | 000001 |        |        | \$EOPCT: .WORD 1                                                       |                                    |
| 5135    | 021526 | 003063 |        |        | BGT \$DOAGN                                                            | ::YES                              |
| 5136    | 021530 | 012737 |        |        | MOV (PC)+,@(PC)+                                                       | ::RESTORE COUNTER                  |
| 5137    | 021532 | 000001 |        |        | \$ENDCT: .WORD 1                                                       |                                    |
| 5138    | 021534 | 021524 |        |        | \$EOPCT                                                                |                                    |
| 5139    | 021536 | 104401 | 021544 |        | TYPE ,65\$                                                             | ::TYPE ASCIZ STRING                |
| 5140    | 021542 | 000407 |        |        | BR 64\$                                                                | ::GET OVER THE ASCIZ               |
| 5141    |        |        |        |        | ::65\$: .ASCIZ                                                         | <12><15>/END PASS #/               |
| 5142    | 021562 |        |        |        | 64\$:                                                                  |                                    |
| 5143    | 021562 | 013746 | 001230 |        | MOV \$PASS,-(SP)                                                       | ::SAVE \$PASS FOR TYPEOUT          |
| 5144    |        |        |        |        |                                                                        | ::TYPE PASS NUMBER                 |
| 5145    | 021566 | 104405 |        |        | TYPDS                                                                  | ::GO TYPE--DECIMAL ASCII WITH SIGN |
| 5146    | 021570 | 104401 | 021576 |        | TYPE ,67\$                                                             | ::TYPE ASCIZ STRING                |
| 5147    | 021574 | 000421 |        |        | BR 66\$                                                                | ::GET OVER THE ASCIZ               |
| 5148    |        |        |        |        | ::67\$: .ASCIZ                                                         | / TOTAL ERRORS SINCE LAST REPORT / |
| 5149    | 021640 |        |        |        | 66\$:                                                                  |                                    |
| 5150    | 021640 | 013746 | 001126 |        | MOV \$ERTTL,-(SP)                                                      | ::SAVE \$ERTTL FOR TYPEOUT         |
| 5151    |        |        |        |        |                                                                        | ::TOTAL NUMBER OF ERRORS           |
| 5152    | 021644 | 104405 |        |        | TYPDS                                                                  | ::GO TYPE--DECIMAL ASCII WITH SIGN |
| 5153    | 021646 | 104401 | 001217 |        | TYPE , \$CRLF                                                          | ::TYPE CARRIAGE RETURN, LINE FEED  |
| 5154    | 021652 | 005037 | 001126 |        | CLR \$ERTTL                                                            | ::CLEAR ERROR TOTAL                |
| 5155    | 021656 | 013700 | 000042 |        | \$GET42: MOV @#42,R0                                                   | ::GET MONITOR ADDRESS              |
| 5156    | 021662 | 001405 |        |        | BEQ \$DOAGN                                                            | ::BRANCH IF NO MONITOR             |
| 5157    | 021664 | 000005 |        |        | RESET                                                                  | ::CLEAR THE WORLD                  |
| 5158    | 021666 | 004710 |        |        | \$ENDAD: JSR PC,(R0)                                                   | ::GO TO MONITOR                    |
| 5159    | 021670 | 000240 |        |        | NOP                                                                    | ::SAVE ROOM                        |
| 5160    | 021672 | 000240 |        |        | NOP                                                                    | ::FOR                              |
| 5161    | 021674 | 000240 |        |        | NOP                                                                    | ::ACT11                            |
| 5162    | 021676 |        |        |        | \$DOAGN:                                                               |                                    |
| 5163    | 021676 | 000137 |        |        | JMP @ (PC)+                                                            | ::RETURN                           |
| 5164    | 021700 | 004414 |        |        | \$RTNAD: .WORD                                                         | READY                              |

[illegible]

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CZRMKB.P11 14-AUG-78 15:53 END OF PASS ROUTINE

SEQ 0105

5165 021702 377 377 000 \$ENULL: .BYTE -1,-1,0 ;:NULL CHARACTER STRING  
5166 021706 .EVEN

```
5167      .SBTTL SUBROUTINES
5168
5169      ;*****
5170      .SBTTL ERROR TYPEOUT ROUTINE
5171
5172      ;*THE ERROR TYPEOUT ROUTINE ASSEMBLES AND PRINTS INFORMATION
5173      ;*REGARDING THE DETECTION OF AN ERROR AS FOLLOWS:
5174      ;*
5175      ;*      .UNIT NUMBER, TEST NUMBER, ERROR NUMBER AND PROGRAM COUNTER ARE
5176      ;*PRINTED ON THE FIRST LINE;
5177      ;*      .ERROR MESSAGE IS ASSEMBLED, FORMATTED AND PRINTED ON
5178      ;*ONE OR MORE SUCCEEDING LINES;
5179      ;*      .PAIRED LINES OF ERROR HEADERS AND ERROR DATA
5180      ;*ARE PRINTED AFTER THE ERROR MESSAGE.
5181
5182      ERRYP:
5183      021706      SAVREG
5184      021706      104414      BIT      #SW13,@SWR      ;INHIBIT TYPEOUTS??
5185      021710      032777      020000      157236      BEQ      1$      ;NO!!
5186      021716      001402      JMP      21$      ;YES!!
5187      021720      000137      022436
5188      021724      104401      001217      ;TYPE UNIT NUMBER, TEST NUMBER, ERROR NUMBER, AND PROGRAM COUNTER
5189      021730      104401      022452      1$:      TYPE      , $CRLF
5190      021734      013746      001234      TYPE      ,ERTY00      ;TYPE 'UNT#'
5191      MOV      $UNIT,-(SP)      ;;SAVE $UNIT FOR TYPEOUT
5192      021740      104403      TYPOS      ;;TYPE UNIT NUMBER
5193      021742      003      .BYTE      3      ;;GO TYPE--OCTAL ASCII
5194      021743      000      .BYTE      0      ;;TYPE 3 DIGIT(S)
5195      021744      005037      022442      CLR      TSTNMB      ;;SUPPRESS LEADING ZEROS
5196      021750      013737      001226      022442      MOV      $TSTN,TSTNMB      ;LOAD TEST NUMBER FOR
5197      021756      104401      022460      TYPE      ,ERTY01      ;TYPE 'TST#'
5198      021762      013746      022442      MOV      TSTNMB,-(SP)      ;;SAVE TSTNMB FOR TYPEOUT
5199      TYPOS      ;;TYPE TEST NUMBER
5200      021766      104403      TYPOS      ;;GO TYPE--OCTAL ASCII
5201      021770      003      .BYTE      3      ;;TYPE 3 DIGIT(S)
5202      021771      000      .BYTE      0      ;;SUPPRESS LEADING ZEROS
5203      021772      005037      022444      CLR      ERNMB      ;LOAD ERROR NUMBER FOR
5204      021776      113737      001130      022444      MOVB      $ITEMB,ERNMB      ;TYPEOUT
5205      022004      001406      BEQ      2$      ;SKIP IF NO ERROR CALLED
5206      022006      104401      022470      TYPE      ,ERTY02      ;TYPE 'ERR#'
5207      022012      013746      022444      MOV      ERNMB,-(SP)      ;;SAVE ERNMB FOR TYPEOUT
5208      TYPOS      ;;TYPE ERROR NUMBER
5209      022016      104403      TYPOS      ;;GO TYPE--OCTAL ASCII
5210      022020      003      .BYTE      3      ;;TYPE 3 DIGIT(S)
5211      022021      000      .BYTE      0      ;;SUPPRESS LEADING ZEROS
5212      022022      104401      022477      2$:      TYPE      ,ERTY03      ;TYPE 'PC='
5213      022026      013746      001132      MOV      $ERRPC,-(SP)      ;;SAVE $ERRPC FOR TYPEOUT
5214      TYPOS      ;;TYPE PROGRAM COUNTER
5215      022032      104403      TYPOS      ;;GO TYPE--OCTAL ASCII
5216      022034      006      .BYTE      6      ;;TYPE 6 DIGIT(S)
5217      022035      001      .BYTE      1      ;;TYPE LEADING ZEROS
5218      ;GENERATE POINTER TO ERROR TABLE UNLESS ERROR NUMBER IS 0
5219      022036      005737      022444      3$:      TST      ERNMB      ;WAS AN ERROR CALLED?
5220      022042      001575      BEQ      21$      ;NO!!
5221      022044      104401      001217      TYPE      , $CRLF      ;YES-TYPE CRLF
5222      022050      105037      022450      CLRB      BOTFLG      ;CLEAR BOT FLAG
```

|      |        |        |        |        |                                   |                |                               |                |
|------|--------|--------|--------|--------|-----------------------------------|----------------|-------------------------------|----------------|
| 5223 | 022054 | 105037 | 022451 |        | CLRB                              | CHRCNT         | ;CLEAR CHARACTER COUNTER      |                |
| 5224 | 022060 | 013700 | 022444 |        | MOV                               | ERRNMB,R0      | ;R0 POINTS TO FIRST OF        |                |
| 5225 | 022064 | 006300 |        |        | ASL                               | R0             | ;FOUR ENTRIES IN ERROR        |                |
| 5226 | 022066 | 006300 |        |        | ASL                               | R0             | ;TABLE                        |                |
| 5227 | 022070 | 006300 |        |        | ASL                               | R0             |                               |                |
| 5228 | 022072 | 062700 | 001522 |        | ADD                               | #\$ERRTB-8.,R0 |                               |                |
| 5229 | 022076 | 011001 |        |        | MOV                               | (R0),R1        | ;R1 POINTS TO ERROR MESSAGE   |                |
| 5230 |        |        |        |        |                                   |                | ;TABLE                        |                |
| 5231 | 022100 | 001507 |        |        | BEQ                               | 12\$           | ;BRANCH IF NO ERROR MESSAGE   |                |
| 5232 |        |        |        |        | ;TYPE THE ERROR MESSAGE           |                |                               |                |
| 5233 | 022102 | 012102 |        | 4\$:   | MOV                               | (R1)+,R2       | ;R2=ADDRESS OF MESSAGE STRING |                |
| 5234 | 022104 | 001505 |        |        | BEQ                               | 12\$           | ;BRANCH IF END OF MESSAGE     |                |
| 5235 | 022106 | 010237 | 022254 |        | MOV                               | R2,11\$        | ;LOAD ADDRESS OF STRING       |                |
| 5236 | 022112 | 005037 | 022446 |        | CLR                               | BOTADR         | ;CLEAR BOT ADDRESS            |                |
| 5237 | 022116 | 112203 |        | 5\$:   | MOVB                              | (R2)+,R3       | ;END OF STRING??              |                |
| 5238 | 022120 | 001454 |        |        | BEQ                               | 10\$           | ;YES!!                        |                |
| 5239 | 022122 | 122703 | 000015 |        | CMPB                              | #CR,R3         | ;CARRIAGE RETURN??            |                |
| 5240 | 022126 | 001003 |        |        | BNE                               | 6\$            | ;NO!!                         |                |
| 5241 | 022130 | 105037 | 022451 |        | CLRB                              | CHRCNT         | ;YES-CLEAR CHAR COUNT         |                |
| 5242 | 022134 | 000770 |        |        | BR                                | 5\$            | ;GET NEXT CHARACTER           |                |
| 5243 | 022136 | 122703 | 000012 | 6\$:   | CMPB                              | #LF,R3         | ;LINE FEED??                  |                |
| 5244 | 022142 | 001765 |        |        | BEQ                               | 5\$            | ;YES-GET NEXT CHARACTER       |                |
| 5245 | 022144 | 122703 | 000011 |        | CMPB                              | #HT,R3         | ;HORIZONTAL TAB??             |                |
| 5246 | 022150 | 001007 |        |        | BNE                               | 8\$            | ;NO.!                         |                |
| 5247 | 022152 | 105237 | 022451 | 7\$:   | INCB                              | CHRCNT         | ;ADJUST CHARACTER COUNT       |                |
| 5248 | 022156 | 132737 | 000007 | 022451 | BITB                              | #7,CHRCNT      |                               |                |
| 5249 | 022164 | 001372 |        |        | BNE                               | 7\$            |                               |                |
| 5250 | 022166 | 000407 |        |        | BR                                | 9\$            |                               |                |
| 5251 | 022170 | 105237 | 022451 | 8\$:   | INCB                              | CHRCNT         | ;INCREMENT CHARACTER COUNT    |                |
| 5252 | 022174 | 122703 | 000040 |        | CMPB                              | #' ,R3         | ;SPACE??                      |                |
| 5253 | 022200 | 001002 |        |        | BNE                               | 9\$            | ;NO!!                         |                |
| 5254 | 022202 | 010237 | 022446 |        | MOV                               | R2,BOTADR      | ;SAVE ADDRESS OF SPACE        |                |
| 5255 | 022206 | 122737 | 000100 | 022451 | 9\$:                              | CMPB           | #64.,CHRCNT                   | ;END OF LINE?? |
| 5256 | 022214 | 103340 |        |        | BHIS                              | 5\$            | ;NO!!                         |                |
| 5257 | 022216 | 013704 | 022446 |        | MOV                               | BOTADR,R4      | ;GET ADDRESS OF LAST SPACE    |                |
| 5258 | 022222 | 001007 |        |        | BNE                               | 90\$           | ;BRANCH IF SPACE DETECTED     |                |
| 5259 | 022224 | 104401 | 001217 |        | TYPE                              | ,\$CRLF        | ;TYPE CRLF                    |                |
| 5260 | 022230 | 105037 | 022451 |        | CLRB                              | CHRCNT         | ;CLEAR CHARACTER COUNT        |                |
| 5261 | 022234 | 013702 | 022254 |        | MOV                               | 11\$,R2        | ;SET UP R2 FOR TESTING        |                |
| 5262 | 022240 | 000726 |        |        | BR                                | 5\$            |                               |                |
| 5263 | 022242 | 105044 |        | 90\$:  | CLRB                              | -(R4)          | ;REPLACE SPACE                |                |
| 5264 | 022244 | 112737 | 177777 | 022450 | MOVB                              | #-1,BOTFLG     | ;SET BOT FLAG                 |                |
| 5265 | 022252 | 104401 |        | 10\$:  | TYPE                              |                | ;TYPE ERROR MESSAGE STRING    |                |
| 5266 | 022254 | 000000 |        | 11\$:  | .WORD                             |                | ;STRING ADDRESS GOES HERE     |                |
| 5267 | 022256 | 105737 | 022450 |        | TSTB                              | BOTFLG         | ;WAS STRING TRUNCATED??       |                |
| 5268 | 022262 | 001707 |        |        | BEQ                               | 4\$            | ;NO!!                         |                |
| 5269 | 022264 | 104401 | 001217 |        | TYPE                              | ,\$CRLF        | ;YES-TYPE CRLF                |                |
| 5270 | 022270 | 105037 | 022450 |        | CLRB                              | BOTFLG         | ;CLEAR BOT FLAG               |                |
| 5271 | 022274 | 105037 | 022451 |        | CLRB                              | CHRCNT         | ;CLEAR CHARACTER COUNT        |                |
| 5272 | 022300 | 013702 | 022446 |        | MOV                               | BOTADR,R2      | ;SETUP R2 FOR TESTING         |                |
| 5273 | 022304 | 010237 | 022254 |        | MOV                               | R2,11\$        | ;SETUP 11\$ FOR TYPING        |                |
| 5274 | 022310 | 112742 | 000040 |        | MOVB                              | #' ,-(R2)      | ;RESTORE SPACE                |                |
| 5275 | 022314 | 105722 |        |        | TSTB                              | (R2)+          | ;RESTORE R2                   |                |
| 5276 | 022316 | 000677 |        |        | BR                                | 5\$            | ;TYPE REST OF STRING          |                |
| 5277 | 022320 |        |        | 12\$:  |                                   |                |                               |                |
| 5278 |        |        |        |        | ;TYPE ERROR HEADER AND ERROR DATA |                |                               |                |

```

5279 022320
5280 022320 016001 000002
5281 022324 001444
5282 022326 104401 001217
5283 022332 016002 000004
5284 022336 016003 000006
5285 022342 012137 022352
5286 022346 001433
5287
5288 022350 104401
5289 022352 000000
5290 022354 104401 001217
5291 022360 005702
5292 022362 001767
5293 022364 012204
5294 022366 012305
5295 022370 105725
5296 022372 100407
5297 022374 001403
5298 022376 013446
5299 022400 104405
5300 022402 000405
5301 022404 013446
5302 022406 104402
5303 022410 000402
5304 022412 013446
5305 022414 104406
5306 022416 005714
5307 022420 001403
5308 022422 104401 022505
5309 022426 000760
5310 022430 104401 001217
5311 022434 000742
5312 022436 104415
5313 022440 000207
5314
5315 022442 000000
5316 022444 000000
5317 022446 000000
5318 022450 000
5319 022451 000
5320
5321 022452 047125 052111 000043
5322 022460 020054 042524 052123
5323 022466 000043
5324 022470 020054 051105 021522
5325 022476 000
5326 022477 054 050040 036503
5327 022504 000
5328 022505 040 000040
5329
5330

13$: MOV 2(R0),R1 ;R1 POINTS TO ERROR HEADER TABLE
      BEQ 21$ ;BRANCH IF NO HEADER
      TYPE , $CRLF ;(ASSUME NO DATA)
      MOV 4(R0),R2 ;R2 POINTS TO DATA ADDRESS TABLE
      MOV 6(R0),R3 ;R3 POINTS TO FORMAT TABLE
14$: MOV (R1)+,15$ ;PUT HEADER ADDRESS FOR TYPE
      BEQ 21$ ;BRANCH IF END OF HEADERS
      ;(ASSUME END OF DATA)

15$: TYPE ;
      .WORD 0 ;HEADER ADDRESS GOES HERE
      TYPE , $CRLF
      TST R2 ;DATA WITH HEADER??
      BEQ 14$ ;NO!!
      MOV (R2)+,R4 ;R4 POINTS TO DATA ADDRESS
      MOV (R3)+,R5 ;R5 POINTS TO FORMAT
16$: TSTB (R5)+ ;WHAT KIND OF DATA??
      BMI 18$ ;BINARY
      BEQ 17$ ;OCTAL
      MOV @ (R4)+, -(SP) ;DECIMAL
      TYPDS
      BR 19$
17$: MOV @ (R4)+, -(SP)
      TYPOC
      BR 19$
18$: MOV @ (R4)+, -(SP)
      TYPBN
19$: TST (R4) ;MORE DATA??
      BEQ 20$ ;NO!!
      TYPE , ERTY04 ;YES-TYPE 2 SPACES
      BR 16$ ;AND CONTINUE
20$: TYPE , $CRLF ;TYPE ONE BLANK LINE
      BR 14$ ;BEFORE NEXT HEADER
21$: RESREG
      RTS PC

TSTNMB: .WORD 0 ;TEST NUMBER
ERRNMB: .WORD 0 ;ERROR NUMBER
BOTADR: .WORD 0 ;BEGINNING OF TEXT ADDRESS
BOTFLG: .BYTE 0 ;BOT FLAG
CHRCNT: .BYTE 0 ;CHARACTER COUNT

ERTY00: .ASCIZ @UNIT#@
ERTY01: .ASCIZ @, TEST#@
ERTY02: .ASCIZ @, ERR#@
ERTY03: .ASCIZ @, PC @
ERTY04: .ASCIZ @ @
      .EVEN

```

```
5331 .SBTTL CLOCK SUBROUTINES
5332
5333 ;ROUTINE TO SIZE FOR CLOCKS (KW11-L OR KW11-P)
5334 ;*****
5335 SIZCLK: NOP
5336 022510 000240      MOV     ERRVEC,-(SP)      ;;PUSH ERRVEC ON STACK
5337 022512 013746 000004  MOV     ERRVEC+2,-(SP)      ;;PUSH ERRVEC+2 ON STACK
5338 022516 013746 000006  MOV     #10$,ERRVEC      ;LOAD 04 TRAP VECTORS
5339 022522 012737 022606 000004  MOV     #PR6,ERRVEC+2
5340 022530 012737 000300 000006
5341 ;SEE IF A KW11-P CLOCK IS PRESENT - GO TO 10$ IF NOT PRESENT
5342 022536 005777 156740      TST     @SLPCSR      ;TEST FOR P CLOCK
5343 022542 012737 022750 001526  MOV     #PCLOCK,CLOCK      ;LOAD SUBROUTINE ADDRESS
5344 022550 012737 023072 001530  MOV     #PSTOP,STOP      ;LOAD STOP ADDRESS
5345 022556 012777 023036 156722  MOV     #PCOUNT,@SLPVEC      ;LOAD P CLOCK INTERRUPT VECTOR
5346 022564 012777 000300 156716  MOV     #PR6,@SLPVEC+2
5347 022572 013777 001516 156714  MOV     $LLVEC+2,@$LLVEC;CLEAR L CLOCK INTERRUPT VECTOR
5348 022600 005077 156712      CLR     @$LLVEC+2
5349 022604 000454      BR      30$
5350 022606 012716 022614      10$:  MOV     #15$,(SP)      ;DUMMY RTI ADDRESS
5351 022612 000002      RTI      ;RESTORE PRIORITY
5352 022614
5353 15$:
5354 ;NO P CLOCK-SEE IF L CLOCK IS PRESENT-GO TO 20$ IF NOT PRESET
5355 022614 012737 022672 000004  MOV     #20$,ERRVEC      ;CHANGE 04 TRAP VECTOR
5356 022622 005777 156664      TST     @$LLCSR      ;TEST FOR L CLOCK
5357 022626 012737 022766 001526  MOV     #LCLOCK,CLOCK      ;LOAD SUBROUTINE ADDRESS
5358 022634 012737 023100 001530  MOV     #LSTOP,STOP      ;LOAD STOP ADDRESS
5359 022642 012777 023036 156644  MOV     #LCOUNT,@$LLVEC      ;LOAD L CLOCK INTERRUPT VECTOR
5360 022650 012777 000300 156640  MOV     #PR6,@$LLVEC+2
5361 022656 013777 001510 156622  MOV     $LPVEC+2,@$LPVEC;CLEAR P CLOCK INTERRUPT VECTOR
5362 022664 005077 156620      CLR     @$LPVEC+2
5363 022670 000422      BR      30$
5364 022672 012716 022700      20$:  MOV     #25$,(SP)      ;DUMMY RTI ADDRESS
5365 022676 000002      RTI      ;RESTORE PRIORITY
5366 022700
5367 25$:
5368 ;NO CLOCK AVAILABLE - AUGMENT RETURN ADDRESS
5369 022700 005037 001526      CLR     CLOCK      ;CLEAR SUBROUTINE ADDRESS
5370 022704 012737 001510 001506  MOV     #$LPVEC+2,$LPVEC;CLEAR P CLOCK INTERRUPT VECTOR
5371 022712 005037 001510      CLR     $LPVEC+2
5372 022716 012737 001516 001514  MOV     #$LLVEC+2,$LLVEC;CLEAR L CLOCK INTERRUPT VECTOR
5373 022724 005037 001516      CLR     $LLVEC+2
5374 022730 062766 000002 000004  ADD     #2,4(SP)      ;CHANGE RETURN ADDRESS
5375 30$:
5376 022736 012637 000006      MOV     (SP)+,ERRVEC+2      ;;POP STACK INTO ERRVEC+2
5377 022742 012637 000004      MOV     (SP)+,ERRVEC      ;;POP STACK INTO ERRVEC
5378 022746 000207      RTS     PC
5379 ;ROUTINES TO START THE CLOCK (KW11-L OR KW11-P)
5380 ;*****
5381 022750 012777 177777 156526 PCLOCK: MOV     #-1,@$LPCSB      ;LOAD COUNT SET BUFFER
5382 022756 012777 000135 156516  MOV     #135,@$LPCSR      ;LOAD CONTROL REGISTER
5383 022764 000403      BR      PLCLK      ;GO TO COMMON CODE
5384
5385 022766 012777 000100 156516 LCLOCK: MOV     #100,@$LLCSR      ;LOAD CONTROL REGISTER
5386
```

```
5387 022774 005037 001522      PLCLK: CLR      TIME      ;CLEAR TIMER COUNT
5388 023000 104400              TRAP              ;;PUSH OLD PSW AND PC ON STACK
5389 023002 012605              MOV      (SP)+,R5    ;;SAVE THE PSW IN R5
5390 023004 010537 001520      MOV      R5,$PSW    ;;SAVE PRIORITY
5391 023010 042705 177437      BIC      #^CPR7,R5    ;MASK X
5392 023014 022705 000300      CMP      #PR6,R5    ;IS PRIORITY TOO HIGH??
5393 023020 101005              BHI      40$        ;NO!!
5394 023022 012746 000240      MOV      #PR5,-(SP)    ;;PUT NEW PS ON STACK
5395 023026 012746 023034      MOV      #30$,-(SP)    ;;PUT NEW PC ON STACK
5396 023032 000002              RTI              ;;POP NEW PC AND PS
5397 023034              30$:
5398 023034 000207              40$: RTS      PC
5399
5400      ;ROUTINES TO HANDLE CLOCK INTERRUPTS (KW11-L OR KW11-P)
5401
5402 023036      PCOUNT:
5403 023036      LCOUNT:
5404 023036 062737 000021 001522      ADD      #17.,TIME    ;ADD 17MS TO ELAPSED TIME
5405 023044 103003              BCC      10$        ;BRANCH IF NO OVERFLOW
5406 023046 012737 177777 001522      MOV      #-1,TIME    ;RESTORE MAXIMUM COUNT
5407 023054 162737 000021 001524      10$: SUB      #17.,WATCH    ;DECREMENT REMAINING TIME
5408 023062 100002              BPL      20$        ;BRANCH IF POSITIVE
5409 023064 005037 001524      CLR      WATCH    ;CLEAR REMAINING TIME
5410 023070 000002              20$: RTI              ;RETURN TO USER
5411
5412      ;ROUTINES TO STOP THE CLOCK (KW11-L OR KW11-P)
5413
5414 023072 005077 156404      PSTOP: CLR      @SLPCSR    ;STOP P CLOCK
5415 023076 000402              BR      PLSTP        ;GO TO COMMON STOP CODE
5416
5417 023100 005077 156406      LSTOP: CLR      @SLLCSR    ;STOP L CLOCK
5418
5419 023104      PLSTP:
5420 023104 013746 001520      MOV      $PSW,-(SP)    ;;PUT NEW PS ON STACK
5421 023110 012746 023116      MOV      #10$,-(SP)    ;;PUT NEW PC ON STACK
5422 023114 000002              RTI              ;;POP NEW PC AND PS
5423 023116      10$:
5424 023116 000207              RTS      PC
5425
5426      .SBTTL SET VOLUME VALID SUBROUTINE
5427
5428      ;THIS SUBROUTINE INITIALIZES THE SUBSYSTEM AND SETS VOLUME VALID,
5429      ;RETURNING WITH THE DRIVE STILL IN DIAGNOSTIC MODE. THE SUBROUTINE
5430      ;RETURNS TO THE WORD FOLLOWING THE CALL, EXCEPT WHEN AN ERROR IS
5431      ;DETECTED, IN WHICH CASE IT RETURNS TO THE SECOND WORD FOLLOWING THE
5432      ;CALL.
5433      ;
5434      ;CALL: JSR      PC,SETVV      JUMP TO SUBROUTINE
5435      ;      BR      ??            RETURN HERE IF NO ERROR
5436      ;      ERROR      RETURN HERE IF ERROR
5437
5438 023120      SETVV:
5439 023120 012760 000040 000010      MOV      #CLR,RMCS2(R0) ;CLEAR THE MASSBUS
5440 023126 111160 000010              MOV      (R1),RMCS2(R0) ;SELECT UNIT
5441
5442 023132 012760 000001 000024      MOV      #DMD,RMMR1(R0) ;LOAD RMMR1
```

```

5443
5444 023140 012760 001001 000024      MOV    #DMD.MUR,RMMR1(R0)      ;LOAD RMMR1
5445
5446 023146 012760 000000 000014      MOV    #0,RMER1(R0)      ;LOAD RMER1
5447
5448 023154 012760 000000 000042      MOV    #0,RMER2(R0)      ;LOAD RMER2
5449
5450 023162 012760 000023 000000      MOV    #PACACK.GO,RMCS1(R0)    ;LOAD RMCS1
5451
5452 023170 016037 000012 001142      MOV    RMD5(R0),$BDDAT ;STORE RMD5 AT $BDDAT
5453 023176 042737 177677 001142      BIC    #^CVV,$BDDAT
5454 023204 001020                BNE    10$                ;BRANCH IF VOLUME VALID SET
5455 023206 010037 001136                MOV    R0,$BDADR          ;SETUP FOR ERROR MSG
5456 023212 062737 000012 001136      ADD    #RMD5,$BDADR
5457 023220 012737 000100 001140      MOV    #VV,$GDDAT
5458 023226 062716 000002                ADD    #2,(SP)            ;MOVE RETURN ADDRESS TO ERROR
5459 023232 112776 000100 000000      MOV    #100,@(SP)        ;WRITE ERROR NUMBER
5460 023240 012737 000022 001174      MOV    #PACACK,$TMP0
5461 023246 000207      10$:    RTS    PC                ;RETURN

```

.SBTTL SET OFFSET MODE SUBROUTINE

;THIS SUBROUTINE EXECUTES AN OFFSET COMMAND AND VERIFIES THAT OFFSET  
 ;MODE SETS. THE DRIVE SHOULD BE IN DIAGNOSTIC MODE WHEN CALLING THE  
 ;SUBROUTINE, WHICH WILL LEAVE DMD ON. THE SUBROUTINE RETURNS TO THE  
 ;WORD FOLLOWING THE CALL UNLESS THERE IS AN ERROR, IN WHICH CASE IT  
 ;RETURNS TO THE SECOND WORD FOLLOWING THE CALL

```

;CALL: JSR    PC,SETOM      JUMP TO SUBROUTINE
;      BR     ??           RETURN HERE IF NO ERROR
;      ERROR   RETURN HERE IF ERROR

```

SETOM:

```

5475 023250
5476
5477 023250 012760 001001 000024      MOV    #DMD.MUR,RMMR1(R0)      ;LOAD RMMR1
5478
5479 023256 012760 000000 000014      MOV    #0,RMER1(R0)      ;LOAD RMER1
5480
5481 023264 012760 000000 000042      MOV    #0,RMER2(R0)      ;LOAD RMER2
5482
5483 023272 012760 000015 000000      MOV    #OFFSET!GO,RMCS1(R0)    ;LOAD RMCS1
5484
5485 023300 016037 000012 001142      MOV    RMD5(R0),$BDDAT ;STORE RMD5 AT $BDDAT
5486 023306 042737 177776 001142      BIC    #^COM,$BDDAT
5487 023314 001015                BNE    10$                ;BRANCH IF OFFSET ON
5488 023316 012737 000001 001140      MOV    #OM,$GDDAT
5489 023324 010037 001136                MOV    R0,$BDADR
5490 023330 062737 000012 001136      ADD    #RMD5,$BDADR
5491 023336 062716 000002                ADD    #2,(SP)            ;MOVE RETURN ADDRESS TO ERROR
5492 023342 112776 000111 000000      MOV    #111,@(SP)        ;WRITE ERROR NUMBER
5493 023350
5494 023350 000207      10$:    RTS    PC                ;RETURN TO USER

```

.SBTTL ENABLE SEARCH SUBROUTINE

;\*\*\*\*\*

ENBSCH:

5498 023352

```
5499
5500      ;THE REGISTER OUTPUT BUFFER SHOULD CONTAIN:
5501      :      RMDA0  = DESIRED SECTOR AND TRACK ADDRESS
5502      :      RMDCO  = DESIRED CYLINDER ADDRESS
5503      :      RMOFO  = FORMAT, ECI, HCI
5504      :      RMBAO  = BUFFER ADDRESS
5505      :      RMWCO  = WORD COUNT
5506      :      RMCS10 = FUNCTION CODE
5507
5508      ;NOTE: OFFSET IS NOT ENABLED WHEN USING THIS SUBROUTINE
5509
5510      ;*****
5511      ;SET VOLUME VALID
5512      ;FIRST,CLEAR -SET DIAGNOSTIC MODE-SYNCHRONIZE
5513      ;PROM STROBE
5514      023352 012760 000040 000010      MOV      #CLR,RMCS2(R0) ;CLEAR THE MASSBUS
5515      023360 111160 000010              MOV      (R1),RMCS2(R0) ;SELECT UNIT
5516
5517      023364 012760 000001 000024      MOV      #DMD,RMMR1(R0) ;LOAD RMMR1
5518      023372 012704 000041              MOV      #33.,R4          ;ALLOW UP TO 33 BIT CLOCLS
5519                                      ;TO SYNC PROM STROBE
5520
5521      023376      5$: .....
5522
5523      023376 012760 005001 000024      MOV      #DMD!MUR!MCLK,RMMR1(R0) ;LOAD RMMR1
5524
5525      023404 012760 001001 000024      MOV      #DMD!MUR,RMMR1(R0)      ;LOAD RMMR1
5526
5527      023412 016005 000024              MOV      RMMR1(R0),R5      ;STORE RMMR1 AT R5
5528      023416 032705 000040              BIT      #WC,R5          ;WAIT FOR PROM STROBE TO COME ON
5529      023422 001023                      BNE      6$
5530      023424 005304                      DEC      R4
5531      023426 001363                      BNE      5$
5532      023430 010037 001136              MOV      R0,$BDADR          ;PROM STROBE WONT SET
5533      023434 062737 000024 001136      ADD      #RMMR1,$BDADR
5534      023442 005037 001142              CLR      $BDDAT
5535      023446 012737 000040 001140      MOV      #WC,$GDDAT
5536      023454 062716 000002              ADD      #2,(SP)
5537      023460 112776 000030 000000      MOV      #30,@(SP)
5538      023466 000137 024230              JMP      60$              ;REPROT ERROR
5539      023472      6$:
5540
5541      023472 012760 005001 000024      MOV      #DMD!MUR!MCLK,RMMR1(R0) ;LOAD RMMR1
5542
5543      023500 012760 001001 000024      MOV      #DMD!MUR,RMMR1(R0)      ;LOAD RMMR1
5544
5545      023506 016005 000024              MOV      RMMR1(R0),R5      ;STORE RMMR1 AT R5
5546      023512 032705 000040              BIT      #WC,R5          ;WAIT FOR PROM STROBE TO GO OFF
5547      023516 001423                      BEQ      7$
5548      023520 005304                      DEC      R4
5549      023522 001363                      BNE      6$
5550      023524 010037 001136              MOV      R0,$BDADR          ;PROM STROBE WONT RESET
5551      023530 062737 000024 001136      ADD      #RMMR1,$BDADR      ;
5552      023536 012737 000040 001142      MOV      #WC,$BDDAT
5553      023544 005037 001140              CLR      $GDDAT
5554      023550 062716 000002              ADD      #2,(SP)
```

```
5555 023554 112776 000062 000000      MOVB    #62,a(SP)
5556 023562 000137 024230      JMP      60$
5557 023566      7$:
5558      ;SECOND, CLOCK INDEX PULSE TO 1. CLEAR FORMAT CHANGE FLOP
5559      ;
5560      ;
5561 023566 012760 001005 000024      MOV      #DMD!MUR!MI,RMMR1(R0) ;LOAD RMMR1
5562      MOV      #DMD!MUR,RMMR1(R0) ;LOAD RMMR1
5563 023574 012760 001001 000024      ;.....
5564      MOV      #0,RMER1(R0) ;LOAD RMER1
5565      MOV      #0,RMER2(R0) ;LOAD RMER2
5566 023602 012760 000000 000014      MOV      #PACACK!GO,RMCS1(R0) ;LOAD RMCS1
5567 023610 012760 000000 000042      MOV      RMD5(R0), $BDDAT ;STORE RMD5 AT $BDDAT
5568 023616 012760 000023 000000      BIC      #^CVV,$BDDAT ;VOLUME VALID SHOULD BE SET
5569      BNE      10$
5570 023624 016037 000012 001142      MOV      R0,$BDADR ;SETUP ERROR MSG
5571 023632 042737 177677 001142      ADD      #RMD5,$BDADR
5572 023640 001021      MOV      #VV,$GDDAT
5573 023642 010037 001136      ADD      #2,(SP) ;WRITE ERROR NUMBER
5574 023646 062737 000012 001136      MOV      #100,a(SP)
5575 023654 012737 000100 001140      MOV      #PACACK,$TMP0
5576 023662 062716 000002      BR       60$
5577 023666 112776 000100 000000      10$:
5578 023674 012737 000022 001174      ;*****
5579 023702 000552      ;LOAD REGISTERS
5580 023704      MOV      RMDAO,RMDA(R0) ;LOAD RMDA
5581 023712 013760 001410 000006      MOV      RMDCO,RMDC(R0) ;LOAD RMDC
5582 023720 013760 001436 000034      MOV      RMOFO,RMOF(R0) ;LOAD RMOF
5583 023726 013760 001404 000002      MOV      RMWCO,RMWC(R0) ;LOAD RMWC
5584 023734 013760 001406 000004      MOV      RMBAO,RMBA(R0) ;LOAD RMBA
5585      ;*****
5586      ;ENABLE DEBUG CLOCK AND LOAD FUNCTION CODE
5587 023742 012760 041401 000024      MOV      #DMD!MUR!DBEN!MOC,RMMR1(R0) ;LOAD RMMR1
5588 023750 012760 000000 000014      MOV      #0,RMER1(R0) ;LOAD RMER1
5589 023756 012760 000000 000042      MOV      #0,RMER2(R0) ;LOAD RMER2
5590 023764 013760 001402 000000      MOV      RMCS10,RMCS1(R0) ;LOAD RMCS1
5591      ;*****
5592      ;WAIT FOR 'RUN AND GO' TO SET
5593 023772 012737 000310 001524      MOV      #200.,WATCH ;SET WATCHDOG TIMER VALUE
5594 024000 004777 155522      JSR      PC,@CLOCK ;START THE CLOCK
5595 024004      20$:
5600
5601
5602
5603
5604
5605
5606
5607
5608
5609
5610
```

```

5611 024004 016037 000024 001142      MOV      RMMR1(R0), $BDDAT      ;STORE RMMR1 AT $BDDAT
5612 024012 042737 137777 001142      BIC      #^CRG, $BDDAT
5613 024020 001023              BNE      30$
5614 024022 005737 001524      TST      WATCH      ;ANY TIME LEFT?
5615 024026 001366              BNE      20$      ;YES-WAIT
5616 024030 004777 155474      JSR      PC, @STOP      ;STOP THE CLOCK
5617 024034 012737 040000 001140      MOV      #RG, $GDDAT      ;SETUP ERROR MSG
5618 024042 010037 001136      MOV      R0, $BDADR
5619 024046 062737 000024 001136      ADD      #RMMR1, $BDADR
5620 024054 062716 000002      ADD      #2, (SP)      ;WRITE ERROR NUMBER IN
5621 024060 112776 000101 000000      MOVB     #101, @ (SP)      ;USER'S CALL -
5622
5623 024066 000460              BR      60$
5624 024070
5625 024070 004777 155434      JSR      PC, @STOP      ;STOP THE CLOCK
5626
5627      ;*****
5628 024074 012704 000021      ;STEP COMMAND SEQUENCER TO HEAD SEQUENCE AT LOCATION 156 (17 CLOCKS)
5629 024100      MOV      #17., R4      ;R4=CLOCK COUNT
5630
5631 024100 012760 141401 000024      MOV      #DMD!MUR!DBEN!MOC!DBCK, RMMR1(R0)      ;LOAD RMMR1
5632
5633 024106 012760 041401 000024      MOV      #DMD!MUR!DBEN!MOC, RMMR1(R0)      ;LOAD RMMR1
5634 024114 005304      DEC      R4
5635 024116 001370      BNE      40$
5636
5637      ;*****
5638      ;DROP ON CYLINDER TO RESET LATCH, THEN SET ON CYLINDER TO PASS
5639      ;TEST AT LOCATION 166
5640 024120 012760 041001 000024      MOV      #DMD!MUR!DBEN, RMMR1(R0) ;LOAD RMMR1
5641
5642 024126 012760 041401 000024      MOV      #DMD!MUR!DBEN!MOC, RMMR1(R0) ;LOAD RMMR1
5643
5644      ;*****
5645 024134 012704 000043      ;STEP SEQUENCER (35 CLOCKS) AND VERIFY SEARCH IS ENABLED
5646 024140      MOV      #35., R4      ;R4=CLOCK COUNT
5647
5648 024140 012760 151401 000024      MOV      #DMD!MUR!DBEN!MOC.DBCK.DTO, RMMR1(R0) ;LOAD RMMR1
5649
5650 024146 012760 051401 000024      MOV      #DMD.MUR!DBEN!MOC.DTO, RMMR1(R0) ;LOAD RMMR1
5651 024154 005304      DEC      R4
5652 024156 001370      BNE      50$
5653
5654 024160 016037 000024 001142      MOV      RMMR1(R0), $BDDAT      ;STORE RMMR1 AT $BDDAT
5655 024166 042737 173777 001142      BIC      #^CESRC, $BDDAT      ;SEARCH SHOULD BE ENABLED
5656 024174 001015              BNE      60$
5657 024176 010037 001136      MOV      R0, $BDADR      ;SETUP ERROR MESSAGE
5658 024202 062737 000024 001136      ADD      #RMMR1, $BDADR
5659 024210 012737 004000 001140      MOV      #ESRC, $GDDAT
5660 024216 062716 000002      ADD      #2, (SP)      ;WRITE ERROR NUMBER
5661 024222 112776 000102 000000      MOVB     #102, @ (SP)
5662
5663      60$:
5664      ;*****
5665 024230 000207      ;RETURN TO USER
                    RTS      PC

```

```
5666 .SBTTL SECTOR COMPARE SUBROUTINE
5667
5668 ;SECTOR COMPARE SUBROUTINE
5669
5670 ;THIS SUBROUTINE CONTINUES THE EXECUTION OF A DATA COMMAND
5671 ;FROM WHERE SEARCH HAS BEEN ENABLED TO WHERE SECTOR COMPARE
5672 ;IS SET.
5673
5674 024232 SCTCMP:
5675
5676 ;*****
5677 ;SET INDEX PULSE TO CLEAR FORMAT CHANGE FLOP
5678
5679 024232 012760 051405 000024      MOV      #DMD.MUR!DBEN!MOC!DTO!MI,RMMR1(R0)      ;LOAD RMMR1
5680
5681 024240 012760 051401 000024      MOV      #DMD!MUR!DBEN!MOC!DTO,RMMR1(R0) ;LOAD RMMR1
5682 ;WAIT AT LEAST 4 MS FOR 'RETURN TO CENTER LINE' ONE SHOT TO SET
5683 024246 012737 000006 001524      MOV      #6,WATCH      ;SET WATCHDOG TIMER VALUE
5684 024254 004777 155246              JSR      PC,@CLOCK      ;START THE CLOCK
5685 024260 005737 001524      10$:      TST      WATCH
5686 024264 001375              BNE      10$
5687 024266 004777 155236              JSR      PC,@STOP      ;STOP THE CLOCK
5688 ;DATA INPUT TO SEARCH ENABLE FLOP SHOULD BE ONE - CLOCK SECTOR PULSE TO
5689 ;SET FLOP
5690
5691 024272 012760 051441 000024      MOV      #DMD!MUR!DBEN!MOC!DTO!MS,RMMR1(R0)      ;LOAD RMMR1
5692
5693 024300 012760 051401 000024      MOV      #DMD!MUR!DBEN!MOC!DTO,RMMR1(R0) ;LOAD RMMR1
5694 ;WITH SECTOR COMPARE HIGH, CLOCK SECTOR PULSE TO SET SECTOR COMPARE FLOP
5695
5696 024306 012760 051403 000024      MOV      #DMD!MUR!DBEN!MOC!DTO!MSC,RMMR1(R0)      ;LOAD RMMR1
5697
5698 024314 012760 051443 000024      MOV      #DMD!MUR!DBEN!MOC!DTO!MSC!MS,RMMR1(R0) ;LOAD RMMR1
5699
5700 024322 012760 051403 000024      MOV      #DMD!MUR!DBEN!MOC!DTO!MSC,RMMR1(R0)      ;LOAD RMMR1
5701
5702 024330 012760 051401 000024      MOV      #DMD!MUR!DBEN!MOC!DTO,RMMR1(R0) ;LOAD RMMR1
5703
5704 ;*****
5705 ;RETURN TO USER
5706 024336 000207      RTS      PC
5707
5708 ;*****
5709 .SBTTL SET LOOKING FOR SYNC SUBROUTINE
5710 ;THIS SUBROUTINE WILL SETUP THE DATA TIMING SEQUENCER
5711 ;ASSUMING SEARCH IS ENABLED,TO THE POINT WHERE 'PLFS' IS ACTIVE
5712
5713 024340 SETLFS:
5714 ;PULSE BIT CLOCK UNTIL PROM STROBE SETS
5715 024340 10$:
5716
5717 024340 012760 055401 000024      MOV      #DMD!MUR.DBEN.MOC!DTO.MCLK,RMMR1(R0)      ;LOAD RMMR1
5718
5719 024346 012760 051401 000024      MOV      #DMD!MUR.DBEN!MOC!DTO,RMMR1(R0) ;LOAD RMMR1
5720
5721 024354 016005 000024      MOV      RMMR1(R0),R5      ;STORE RMMR1 AT R5
```

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SET LOOKING FOR SYNC SUBROUTINE

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5722 024360 032705 000040      BIT      #WC,R5
5723 024364 001765              BEQ      10$
5724              ;SET UP DATA SEQUENCER TO LOCATION 11. WHERE PLFS WILL SET
5725 024366 012704 000260      MOV      #176.,R4              ;MAX NUMBER OF BIT CLOCK
5726 024372              20$:
5727
5728 024372 012760 055401 000024      MOV      #DMD!MUR!DBEN!MOC!DIO!MCLK,RMMR1(R0) ;LOAD RMMR1
5729
5730 024400 012760 051401 000024      MOV      #DMD.MUR.DBEN!MOC!DIO,RMMR1(R0) ;LOAD RMMR1
5731
5732 024406 016005 000024      MOV      RMMR1(R0),R5 ;STORE RMMR1 AT R5
5733 024412 032705 002000      BIT      #PLFS,R5 ;EXIT IF PLFS IS SET
5734 024416 001010              BNE      30$
5735 024420 005304              DEC      R4 ;ERROR IF COUNT EXHAUSTED
5736 024422 001363              BNE      20$
5737 024424 062716 000002      ADD      #2,(SP) ;
5738 024430 112776 000035 000000      MOVSB  #35,a(SP) ;CANT SET PLFS
5739 024436 000430              BR       50$
5740 024440              30$:
5741              ;STEP THE MAIN REG CLOCK UNTIL THE TRAILING EDGE OF PROM STORBE
5742              ; IS DETECTED.
5743
5744 024440 016005 000024      MOV      RMMR1(R0),R5 ;STORE RMMR1 AT R5
5745 024444 032705 000040      BIT      #WC,R5
5746 024450 001007              BNE      40$
5747
5748 024452 012760 055401 000024      MOV      #MR1AAA.MCLK,RMMR1(R0) ;LOAD RMMR1
5749
5750 024460 012760 051401 000024      MOV      #MR1AAA,RMMR1(R0) ;LOAD RMMR1
5751 024466 000414              BR       50$
5752 024470              40$:
5753
5754 024470 016005 000024      MOV      RMMR1(R0),R5 ;STORE RMMR1 AT R5
5755 024474 032705 000040      BIT      #WC,R5
5756 024500 001407              BEQ      50$
5757
5758 024502 012760 055401 000024      MOV      #MR1AAA!MCLK,RMMR1(R0) ;LOAD RMMR1
5759
5760 024510 012760 051401 000024      MOV      #MR1AAA,RMMR1(R0) ;LOAD RMMR1
5761 024516 000764              BR       40$
5762 024520              50$:
5763 024520 000207              RTS      PC ;EXIT
5764
5765              .SBTTL  CLOCK SYNC SUBROUTINE
5766
5767              ;*****
5768
5769              ;THIS SUBROUTINE WILL SIMULATE THE HEADER AND DATA SYNC
5770              ;PATTERN BEING READ
5771
5772 024522      CLKSNC:
5773              ;VERIFY THAT 'PLFS' IS ON
5774
5775 024522 016004 000024      MOV      RMMR1(R0),R4 ;STORE RMMR1 AT R4
5776 024526 032704 002000      BIT      #PLFS,R4 ;LOOK FOR SYN SET ?
5777 024532 001023              BNE      10$ ;BRANCH IF SO
```

```

5778 024534 010437 001142      MOV    R4,$BDDAT      ;
5779 024540 042737 175777 001142 BIC    #^CPLFS,$BDDAT
5780 024546 012737 002000 001140 MOV    #PLFS,$GDDAT
5781 024554 010037 001136      MOV    R0,$BDADR
5782 024560 062737 000024 001136 ADD    #RMMR1,$BDADR
5783 024566 062716 000002      ADD    #2,(SP)
5784 024572 112776 000035 000000 MOVB   #35,a(SP)
5785 024600 000472      BR      60$
5786 024602 012705 000021      10$: MOV    #17.,R5      ;MAKE SURE PROM STROBE IS OFF
5787 024606 032704 000040      20$: BIT    #WC,R4
5788 024612 001434      BEQ    30$
5789
5790 024614 012760 055401 000024      MOV    #MR1AAA.MCLK,RMMR1(R0) ;LOAD RMMR1
5791
5792 024622 012760 051401 000024      MOV    #MR1AAA,RMMR1(R0)      ;LOAD RMMR1
5793
5794 024630 016004 000024      MOV    RMMR1(R0),R4      ;STORE RMMR1 AT R4
5795 024634 005305      DEC    R5
5796 024636 001363      BNE    20$
5797
5798 024640 010437 001142      ;      ERROR CAN'T RESET PROM STROBE WITH LFS ACTIVE
5799 024644 042737 177737 001142      MOV    R4,$BDDAT      ;SETUP ERROR FOR USER
5800 024652 005037 001140      BIC    #^CWC,$BDDAT
5801 024656 010037 001136      CLR    $GDDAT
5802 024662 062737 000024 001136 MOV    R0,$BDADR
5803 024670 062716 000002      ADD    #RMMR1,$BDADR
5804 024674 112776 000062 000000 ADD    #2,(SP)
5805 024702 000431      MOVB   #62,a(SP)
5806 024704      BR      60$
5807      30$:
5808      ;CLOCK THE SYNC PATTERN (00011001) THROUGH THE SHIFT REGISTER
5809 024704 012704 014400      MOV    #014400,R4
5810 024710 012737 000020 024770 MOV    #16.,70$      ;STROBE BIT COUNT
5811 024716 012705 051401      40$: MOV    #MR1AAA,R5      ;GENERATE REG VALUE
5812 024722 000241      CLC
5813 024724 006004      ROR    R4      ;WITH MAINTENANCE CLOCK ON
5814 024726 103002      BCC    50$
5815 024730 052705 002000      BIS    #MRD,R5      ;SET READ BIT PER PATTERN BIT
5816
5817      50$:
5818 024734 010560 000024      MOV    R5,RMMR1(R0)      ;LOAD RMMR1
5819 024740 052705 004000      BIS    #MCLK,R5
5820
5821 024744 010560 000024      MOV    R5,RMMR1(R0)      ;LOAD RMMR1
5822 024750 042705 004000      BIC    #MCLK,R5      ;CLOCK ONE BIT
5823
5824 024754 010560 000024      MOV    R5,RMMR1(R0)      ;LOAD RMMR1
5825 024760 005337 024770      DEC    70$
5826 024764 001354      BNE    40$
5827      ;CAN'T VERIFY SYNC CLOCK WAS DETECTED
5828      ;USER CAN DO SO BY STEPING
5829      ;BIT CLOCK AND VERIFY PROM STROBE SETS WITHIN ONE WORD TIME
5830 024766 000207      60$: RTS    PC
5831 024770 000000      70$: .WORD 0      ;TEMPORARY STORAGE
  
```

```
5832 .SBTTL SAVE AND RESTORE R0-R5 ROUTINES
5833
5834 ;*****
5835 ;*SAVE R0-R5
5836 ;*CALL:
5837 ;* SAVREG
5838 ;*UPON RETURN FROM $SAVREG THE STACK WILL LOOK LIKE:
5839 ;*
5840 ;*TOP---(+16)
5841 ;* +2---(+18)
5842 ;* +4---R5
5843 ;* +6---R4
5844 ;* +8---R3
5845 ;*+10---R2
5846 ;*+12---R1
5847 ;*+14---R0
5848
5849 024772 $SAVREG:
5850 024772 010046 MOV R0,-(SP) ;;PUSH R0 ON STACK
5851 024774 010146 MOV R1,-(SP) ;;PUSH R1 ON STACK
5852 024776 010246 MOV R2,-(SP) ;;PUSH R2 ON STACK
5853 025000 010346 MOV R3,-(SP) ;;PUSH R3 ON STACK
5854 025002 010446 MOV R4,-(SP) ;;PUSH R4 ON STACK
5855 025004 010546 MOV R5,-(SP) ;;PUSH R5 ON STACK
5856 025006 016646 000022 MOV 22(SP),-(SP) ;;SAVE PS OF MAIN FLOW
5857 025012 016646 000022 MOV 22(SP),-(SP) ;;SAVE PC OF MAIN FLOW
5858 025016 016646 000022 MOV 22(SP),-(SP) ;;SAVE PS OF CALL
5859 025022 016646 000022 MOV 22(SP),-(SP) ;;SAVE PC OF CALL
5860 025026 000002 RTI
5861
5862 ;*RESTORE R0-R5
5863 ;*CALL:
5864 ;* RESREG
5865 025030 $RESREG:
5866 025030 012666 000022 MOV (SP)+,22(SP) ;;RESTORE PC OF CALL
5867 025034 012666 000022 MOV (SP)+,22(SP) ;;RESTORE PS OF CALL
5868 025040 012666 000022 MOV (SP)+,22(SP) ;;RESTORE PC OF MAIN FLOW
5869 025044 012666 000022 MOV (SP)+,22(SP) ;;RESTORE PS OF MAIN FLOW
5870 025050 012605 MOV (SP)+,R5 ;;POP STACK INTO R5
5871 025052 012604 MOV (SP)+,R4 ;;POP STACK INTO R4
5872 025054 012603 MOV (SP)+,R3 ;;POP STACK INTO R3
5873 025056 012602 MOV (SP)+,R2 ;;POP STACK INTO R2
5874 025060 012601 MOV (SP)+,R1 ;;POP STACK INTO R1
5875 025062 012600 MOV (SP)+,R0 ;;POP STACK INTO R0
5876 025064 000002 RTI
5877 .SBTTL BINARY TO ASCII AND TYPE ROUTINE
5878
5879 ;*****
5880 ;*THIS ROUTINE IS USED TO CHANGE A 16-BIT BINARY NUMBER TO A 16-BIT
5881 ;*BINARY-ASCII NUMBER AND TYPE IT.
5882 ;*CALL:
5883 ;* MOV NUMBER,-(SP) ;;NUMBER TO BE TYPED
5884 ;* TYPBN ;;TYPE IT
5885
5886 025066 010146 $TYPBN: MOV R1,-(SP) ;;SAVE R1 ON THE STACK
5887 025070 016601 000006 MOV 6(SP),R1 ;;GET THE INPUT NUMBER
```

```
5888 025074 000261          SEC          ;;SET 'C' SO CAN KEEP TRACK OF THE NUMBER OF BITS
5889 025076 112737 000060 025140 1$:  MOVB  #'0,$BIN  ;;SET CHARACTER TO AN ASCII '0'.
5890 025104 006101          ROL  R1      ;;GET THIS BIT
5891 025106 001406          BEQ  2$      ;;DONE?
5892 025110 105537 025140      ADCB  $BIN  ;;NO--SET THE CHARACTER EQUAL TO THIS BIT
5893 025114 104401 025140      TYPE  , $BIN  ;;GO TYPE THIS BIT
5894 025120 000241          CLC          ;;CLEAR 'C' SO CAN KEEP TRACK OF BITS
5895 025122 000765          BR  1$      ;;GO DO THE NEXT BIT
5896 025124 012601          MOV  (SP)+,R1  ;;POP THE STACK INTO R1
5897 025126 016666 000002 000004 2$:  MOV  2(SP),4(SP)  ;;ADJUST THE STACK
5898 025134 012616          MOV  (SP)+,(SP)
5899 025136 000002          RTI          ;;RETURN TO USER
5900 025140 000 000  $BIN:  .BYTE  0,0  ;;STORAGE FOR ASCII CHAR. AND TERMINATOR
5901          .SBTTL  CONVERT BINARY TO DECIMAL AND TYPE ROUTINE
5902
5903          ;*****
5904          ;*THIS ROUTINE IS USED TO CHANGE A 16-BIT BINARY NUMBER TO A 5-DIGIT
5905          ;*SIGNED DECIMAL (ASCII) NUMBER AND TYPE IT. DEPENDING ON WHETHER THE
5906          ;*NUMBER IS POSITIVE OR NEGATIVE A SPACE OR A MINUS SIGN WILL BE TYPED
5907          ;*BEFORE THE FIRST DIGIT OF THE NUMBER. LEADING ZEROS WILL ALWAYS BE
5908          ;*REPLACED WITH SPACES.
5909          ;*CALL:
5910          ;*      MOV  NUM,-(SP)  ;;PUT THE BINARY NUMBER ON THE STACK
5911          ;*      TYPDS          ;;GO TO THE ROUTINE
5912
5913          $TYPDS:
5914          MOV  R0,-(SP)  ;;PUSH R0 ON STACK
5915          MOV  R1,-(SP)  ;;PUSH R1 ON STACK
5916          MOV  R2,-(SP)  ;;PUSH R2 ON STACK
5917          MOV  R3,-(SP)  ;;PUSH R3 ON STACK
5918          MOV  R5,-(SP)  ;;PUSH R5 ON STACK
5919          MOV  #20200,-(SP)  ;;SET BLANK SWITCH AND SIGN
5920          MOV  20(SP),R5  ;;GET THE INPUT NUMBER
5921          BPL  1$      ;;BR IF INPUT IS POS.
5922          NEG  R5      ;;MAKE THE BINARY NUMBER POS.
5923          MOV  #'-,1(SP)  ;;MAKE THE ASCII NUMBER NEG.
5924          CLR  R0      ;;ZERO THE CONSTANTS INDEX
5925          MOV  #$DBLK,R3  ;;SETUP THE OUTPUT POINTER
5926          MOV  #' ,(R3)+  ;;SET THE FIRST CHARACTER TO A BLANK
5927          CLR  R2      ;;CLEAR THE BCD NUMBER
5928          MOV  $DTBL(R0),R1  ;;GET THE CONSTANT
5929          SUB  R1,R5  ;;FORM THIS BCD DIGIT
5930          BLT  4$      ;;BR IF DONE
5931          INC  R2      ;;INCREASE THE BCD DIGIT BY 1
5932          BR  3$
5933          ADD  R1,R5  ;;ADD BACK THE CONSTANT
5934          TST  R2      ;;CHECK IF BCD DIGIT=0
5935          BNE  5$      ;;FALL THROUGH IF 0
5936          STB  (SP)  ;;STILL DOING LEADING 0'S?
5937          BMI  7$      ;;BR IF YES
5938          ASLB  (SP)  ;;MSD?
5939          BCC  6$      ;;BR IF NO
5940          MOV  1(SP),-1(R3)  ;;YES--SET THE SIGN
5941          BIS  #'0,R2  ;;MAKE THE BCD DIGIT ASCII
5942          BIS  #' ,R2  ;;MAKE IT A SPACE IF NOT ALREADY A DIGIT
5943          MOV  R2,(R3)+  ;;PUT THIS CHARACTER IN THE OUTPUT BUFFER
```

```
5944 025264 005720          TST      (R0)+          ;;JUST INCREMENTING
5945 025266 020027 000010    CMP      R0,#10        ;;CHECK THE TABLE INDEX
5946 025272 002746          BLT      2$           ;;GO DO THE NEXT DIGIT
5947 025274 003002          BGT      8$           ;;GO TO EXIT
5948 025276 010502          MOV      R5,R2          ;;GET THE LSD
5949 025300 000764          BR       6$           ;;GO CHANGE TO ASCII
5950 025302 105726          8$: TSTB      (SP)+          ;;WAS THE LSD THE FIRST NON-ZERO?
5951 025304 100003          BPL      9$           ;;BR IF NO
5952 025306 116663 177777 177776 MOVB    -1(SP),-2(R3) ;;YES--SET THE SIGN FOR TYPING
5953 025314 105013          9$: CLRB      (R3)          ;;SET THE TERMINATOR
5954 025316 012605          MOV      (SP)+,R5        ;;POP STACK INTO R5
5955 025320 012603          MOV      (SP)+,R3        ;;POP STACK INTO R3
5956 025322 012602          MOV      (SP)+,R2        ;;POP STACK INTO R2
5957 025324 012601          MOV      (SP)+,R1        ;;POP STACK INTO R1
5958 025326 012600          MOV      (SP)+,R0        ;;POP STACK INTO R0
5959 025330 104401 025356    TYPE      $DBLK        ;;NOW TYPE THE NUMBER
5960 025334 016666 000002 000004 MOV      2(SP),4(SP) ;;ADJUST THE STACK
5961 025342 012616          MOV      (SP)+,(SP)
5962 025344 000002          RTI                   ;;RETURN TO USER
5963 025346 023420          $DTBL: 10000.
5964 025350 001750          1000.
5965 025352 000144          100.
5966 025354 000012          10.
5967 025356 000004          $DBLK: .BLKW      4
5968                                .SBTTL  BINARY TO OCTAL (ASCII) AND TYPE
5969
5970          ;*****
5971          ;*THIS ROUTINE IS USED TO CHANGE A 16-BIT BINARY NUMBER TO A 6-DIGIT
5972          ;*OCTAL (ASCII) NUMBER AND TYPE IT.
5973          ;*$TYPOS---ENTER HERE TO SETUP SUPPRESS ZEROS AND NUMBER OF DIGITS TO TYPE
5974          ;*CALL:
5975          ;*      MOV      NUM,-(SP)          ;;NUMBER TO BE TYPED
5976          ;*      TYPOS          ;;CALL FOR TYPEOUT
5977          ;*      .BYTE      N              ;;N 1 TO 6 FOR NUMBER OF DIGITS TO TYPE
5978          ;*      .BYTE      M              ;;M=1 OR 0
5979          ;*                                  ;;1=TYPE LEADING ZEROS
5980          ;*                                  ;;0=SUPPRESS LEADING ZEROS
5981          ;*
5982          ;*$TYPON----ENTER HERE TO TYPE OUT WITH THE SAME PARAMETERS AS THE LAST
5983          ;*$TYPOS OR $TYPOC
5984          ;*CALL:
5985          ;*      MOV      NUM,-(SP)          ;;NUMBER TO BE TYPED
5986          ;*      TYPON          ;;CALL FOR TYPEOUT
5987          ;*
5988          ;*$TYPOC---ENTER HERE FOR TYPEOUT OF A 16 BIT NUMBER
5989          ;*CALL:
5990          ;*      MOV      NUM,-(SP)          ;;NUMBER TO BE TYPED
5991          ;*      TYPOC          ;;CALL FOR TYPEOUT
5992          ;*
5993 025366 017646 000000    $TYPOS: MOV      @ (SP),-(SP) ;;PICKUP THE MODE
5994 025372 116637 000001 025611 MOVB    1(SP),$OFILL ;;LOAD ZERO FILL SWITCH
5995 025400 112637 025613 MOVB    (SP)+,$OMODE+1 ;;NUMBER OF DIGITS TO TYPE
5996 025404 062716 000002 ADD      #2,(SP) ;;ADJUST RETURN ADDRESS
5997 025410 000406 BR       $TYPON
5998 025412 112737 000001 025611 $TYPOC: MOVB    #1,$OFILL ;;SET THE ZERO FILL SWITCH
5999 025420 112737 000006 025613 MOVB    #6,$OMODE+1 ;;SET FOR SIX(6) DIGITS
```

```

6000 025426 112737 000005 025610 $TYPON: MOVB #5,$OCNT ;;SET THE ITERATION COUNT
6001 025434 010346 MOV R3,-(SP) ;;SAVE R3
6002 025436 010446 MOV R4,-(SP) ;;SAVE R4
6003 025440 010546 MOV R5,-(SP) ;;SAVE R5
6004 025442 113704 025613 MOVB $OMODE+1,R4 ;;GET THE NUMBER OF DIGITS TO TYPE
6005 025446 005404 NEG R4
6006 025450 062704 000006 ADD #6,R4 ;;SUBTRACT IT FOR MAX. ALLOWED
6007 025454 110437 025612 MOVB $OMODE ;;SAVE IT FOR USE
6008 025460 113704 025611 MOVB $OFILL,R4 ;;GET THE ZERO FILL SWITCH
6009 025464 016605 000012 MOV 12(SP),R5 ;;PICKUP THE INPUT NUMBER
6010 025470 005003 CLR R3 ;;CLEAR THE OUTPUT WORD
6011 025472 006105 1$: ROL R5 ;;ROTATE MSB INTO 'C'
6012 025474 000404 BR 3$ ;;GO DO MSB
6013 025476 006105 2$: ROL R5 ;;FORM THIS DIGIT
6014 025500 006105 ROL R5
6015 025502 006105 ROL R5
6016 025504 010503 MOV R5,R3
6017 025506 006103 3$: ROL R3 ;;GET LSB OF THIS DIGIT
6018 025510 105337 025612 DECB $OMODE ;;TYPE THIS DIGIT?
6019 025514 100016 BPL 7$ ;;BR IF NO
6020 025516 042703 177770 BIC #177770,R3 ;;GET RID OF JUNK
6021 025522 001002 BNE 4$ ;;TEST FOR 0
6022 025524 005704 TST R4 ;;SUPPRESS THIS 0?
6023 025526 001403 BEQ 5$ ;;BR IF YES
6024 025530 005204 4$: INC R4 ;;DON'T SUPPRESS ANYMORE 0'S
6025 025532 052703 000060 BIS #'0,R3 ;;MAKE THIS DIGIT ASCII
6026 025536 052703 000040 5$: BIS #' ,R3 ;;MAKE ASCII IF NOT ALREADY
6027 025542 110337 025606 MOVB R3,8$ ;;SAVE FOR TYPING
6028 025546 104401 025606 TYPE ,8$ ;;GO TYPE THIS DIGIT
6029 025552 105337 025610 7$: DECB $OCNT ;;COUNT BY 1
6030 025556 003347 BGT 2$ ;;BR IF MORE TO DO
6031 025560 002402 BLT 6$ ;;BR IF DONE
6032 025562 005204 INC R4 ;;INSURE LAST DIGIT ISN'T A BLANK
6033 025564 000744 BR 2$ ;;GO DO THE LAST DIGIT
6034 025566 012605 6$: MOV (SP)+,R5 ;;RESTORE R5
6035 025570 012604 MOV (SP)+,R4 ;;RESTORE R4
6036 025572 012603 MOV (SP)+,R3 ;;RESTORE R3
6037 025574 016666 000002 000004 MOV 2(SP),4(SP) ;;SET THE STACK FOR RETURNING
6038 025602 012616 MOV (SP)+,(SP)
6039 025604 000002 RTI ;;RETURN
6040 025606 000 8$: .BYTE 0 ;;STORAGE FOR ASCII DIGIT
6041 025607 000 .BYTE 0 ;;TERMINATOR FOR TYPE ROUTINE
6042 025610 000 $OCNT: .BYTE 0 ;;OCTAL DIGIT COUNTER
6043 025611 000 $OFILL: .BYTE 0 ;;ZERO FILL SWITCH
6044 025612 000000 $OMODE: .WORD 0 ;;NUMBER OF DIGITS TO TYPE
6045 .SBTTL TYPE ROUTINE
6046
6047 *****
6048 *ROUTINE TO TYPE ASCII MESSAGE. MESSAGE MUST TERMINATE WITH A 0 BYTE.
6049 *THE ROUTINE WILL INSERT A NUMBER OF NULL CHARACTERS AFTER A LINE FEED.
6050 *NOTE1: $NULL CONTAINS THE CHARACTER TO BE USED AS THE FILLER CHARACTER.
6051 *NOTE2: $FILLS CONTAINS THE NUMBER OF FILLER CHARACTERS REQUIRED.
6052 *NOTE3: $FILLC CONTAINS THE CHARACTER TO FILL AFTER.
6053 *
6054 *CALL:
6055 *1) USING A TRAP INSTRUCTION

```

```
6056      ;*      TYPE      ,MESADR      ;;MESADR IS FIRST ADDRESS OF AN ASCIZ STRING
6057      ;*OR
6058      ;*      TYPE
6059      ;*      MESADR
6060      ;*
6061
6062 025614 105737 001173 $TYPE: TSTB $TFPLG      ;;IS THERE A TERMINAL?
6063 025620 100002      BPL 1$      ;;BR IF YES
6064 025622 000000      HALT      ;;HALT HERE IF NO TERMINAL
6065 025624 000430      BR 3$      ;;LEAVE
6066 025626 010046      1$: MOV R0,-(SP)      ;;SAVE R0
6067 025630 017600 000002 MOV @2(SP),R0      ;;GET ADDRESS OF ASCIZ STRING
6068 025634 122737 000001 001242 CMPB #APTENV,$ENV      ;;RUNNING IN APT MODE
6069 025642 001011      BNE 62$      ;;NO,GO CHECK FOR APT CONSOLE
6070 025644 132737 000100 001243 BITB #APTSPool,$ENVM      ;;SPOOL MESSAGE TO APT
6071 025652 001405      BEQ 62$      ;;NO,GO CHECK FOR CONSOLE
6072 025654 010037 025664      MOV R0,61$      ;;SETUP MESSAGE ADDRESS FOR APT
6073 025660 004737 030512      JSR PC,$ATY3      ;;SPOOL MESSAGE TO APT
6074 025664 000000      61$: .WORD 0      ;;MESSAGE ADDRESS
6075 025666 132737 000040 001243 62$: BITB #APTCsup,$ENVM      ;;APT CONSOLE SUPPRESSED
6076 025674 001003      BNE 60$      ;;YES,SKIP TYPE OUT
6077 025676 112046      2$: MOVB (R0)+,-(SP)      ;;PUSH CHARACTER TO BE TYPED ONTO STACK
6078 025700 001005      BNE 4$      ;;BR IF IT ISN'T THE TERMINATOR
6079 025702 005726      TST (SP)+      ;;IF TERMINATOR POP IT OFF THE STACK
6080 025704 012600      60$: MOV (SP)+,R0      ;;RESTORE R0
6081 025706 062716 000002      3$: ADD #2,(SP)      ;;ADJUST RETURN PC
6082 025712 000002      RTI      ;;RETURN
6083 025714 122716 000011      4$: CMPB #HT,(SP)      ;;BRANCH IF <HT>
6084 025720 001430      BEQ 8$      ;;BRANCH IF NOT <CRLF>
6085 025722 122716 000200      CMPB #CRLF,(SP)      ;;BRANCH IF NOT <CRLF>
6086 025726 001006      BNE 5$      ;;POP <CR><LF> EQUIV
6087 025730 005726      TST (SP)+      ;;TYPE A CR AND LF
6088 025732 104401      TYPE
6089 025734 001217      $CRLF
6090 025736 105037 026072      CLRB $CHARCNT      ;;CLEAR CHARACTER COUNT
6091 025742 000755      BR 2$      ;;GET NEXT CHARACTER
6092 025744 004737 026026      5$: JSR PC,$TYPEC      ;;GO TYPE THIS CHARACTER
6093 025750 123726 001172      6$: CMPB $FILLC,(SP)+      ;;IS IT TIME FOR FILLER CHARS.?
6094 025754 001350      BNE 2$      ;;IF NO GO GET NEXT CHAR.
6095 025756 013746 001170      MOV $NULL,-(SP)      ;;GET # OF FILLER CHARS. NEEDED
6096      ;;AND THE NULL CHAR.
6097 025762 105366 000001      7$: DECB 1(SP)      ;;DOES A NULL NEED TO BE TYPED?
6098 025766 002770      BLT 6$      ;;BR IF NO--GO POP THE NULL OFF OF STACK
6099 025770 004737 026026      JSR PC,$TYPEC      ;;GO TYPE A NULL
6100 025774 105337 026072      DECB $CHARCNT      ;;DO NOT COUNT AS A COUNT
6101 026000 000770      BR 7$      ;;LOOP
6102
6103      ;HORIZONTAL TAB PROCESSOR
6104
6105 026002 112716 000040      8$: MOVB #' ,(SP)      ;;REPLACE TAB WITH SPACE
6106 026006 004737 026026      9$: JSR PC,$TYPEC      ;;TYPE A SPACE
6107 026012 132737 000007 026072      BITB #7,$CHARCNT      ;;BRANCH IF NOT AT
6108 026020 001372      BNE 9$      ;;TAB STOP
6109 026022 005726      TST (SP)+      ;;POP SPACE OFF STACK
6110 026024 000724      BR 2$      ;;GET NEXT CHARACTER
6111 026026 105777 153132 $TYPEC: TSTB @ $TPS      ;;WAIT UNTIL PRINTER IS READY
```

```
6112 026032 100375      BPL      $TYPEC
6113 026034 116677 000002 153124  MOVB      2(SP),@STPB      ;;LOAD CHAR TO BE TYPED INTO DATA REG.
6114 026042 122766 000015 000002  CMPB      #CR,2(SP)      ;;IS CHARACTER A CARRIAGE RETURN?
6115 026050 001003      BNE      1$      ;;BRANCH IF NO
6116 026052 105037 026072  CLRB      $CHARCNT      ;;YES--CLEAR CHARACTER COUNT
6117 026056 000406      BR       $TYPEX      ;;EXIT
6118 026060 122766 000012 000002 1$:  CMPB      #LF,2(SP)      ;;IS CHARACTER A LINE FEED?
6119 026066 001402      BEQ      $TYPEX      ;;BRANCH IF YES
6120 026070 105227      INCB      (PC)+      ;;COUNT THE CHARACTER
6121 026072 000000      $CHARCNT: .WORD 0      ;;CHARACTER COUNT STORAGE
6122 026074 000207      $TYPEX: RTS      PC
6123
6124      .SBTTL  SCOPE HANDLER ROUTINE
6125
6126      ;;*****
6127      ;;THIS ROUTINE CONTROLS THE LOOPING OF SUBTESTS. IT WILL INCREMENT
6128      ;;AND LOAD THE TEST NUMBER($TSTNM) INTO THE DISPLAY REG.(DISPLAY<7:0>)
6129      ;;AND LOAD THE ERROR FLAG ($ERFLG) INTO DISPLAY<15:08>
6130      ;;THE SWITCH OPTIONS PROVIDED BY THIS ROUTINE ARE:
6131      ;;SW14=1      LOOP ON TEST
6132      ;;SW11=1      INHIBIT ITERATIONS
6133      ;;SW09=1      LOOP ON ERROR
6134      ;;SW08=1      LOOP ON TEST IN SWR<7:0>
6135      ;;CALL
6136      ;;*      SCOPE      ;;SCOPE=IOT
6137
6138      $SCOPE:
6139 026076 104410      CKSWR
6140 026100 032777 040000 153046 1$:  BIT      #BIT14,@SWR      ;;TEST FOR CHANGE IN SOFT-SWR
6141 026106 001131      BNE      $OVER      ;;LOOP ON PRESENT TEST?
6142      ;;*****START OF CODE FOR THE XOR TESTER*****      ;;YES IF SW14=1
6143 026110 000416      $XTSTR: BR      6$      ;;IF RUNNING ON THE 'XOR' TESTER CHANGE
6144      ;;THIS INSTRUCTION TO A 'NOP' (NOP 240)
6145 026112 013746 000004      MOV      @#ERRVEC,-(SP)      ;;SAVE THE CONTENTS OF THE ERROR VECTOR
6146 026116 012737 026136 000004      MOV      #5$,@#ERRVEC      ;;SET FOR TIMEOUT
6147 026124 005737 177060      TST      @#177060      ;;TIME OUT ON XOR?
6148 026130 012637 000004      MOV      (SP)+,@#ERRVEC      ;;RESTORE THE ERROR VECTOR
6149 026134 000500      BR       $SVLAD      ;;GO TO THE NEXT TEST
6150 026136 022626      5$:  CMP      (SP)+,(SP)+      ;;CLEAR THE STACK AFTER A TIME OUT
6151 026140 012637 000004      MOV      (SP)+,@#ERRVEC      ;;RESTORE THE ERROR VECTOR
6152 026144 000440      BR       7$      ;;LOOP ON THE PRESENT TEST
6153 026146      6$:;*****END OF CODE FOR THE XOR TESTER*****
6154 026146 032777 000400 153000      BIT      #BIT08,@SWR      ;;LOOP ON SPEC. TEST?
6155 026154 001421      BEQ      2$      ;;BR IF NO
6156 026156 005046      CLR      -(SP)      ;;CLEAR A TEMP. LOCATION
6157 026160 117716 152770      MOVB      @SWR,(SP)      ;;PICKUP THE DESIRED TEST NUMBER
6158 026164 001414      BEQ      8$      ;;BRANCH IF BAD TEST NUMBER IN SWR
6159 026166 022716 000024      CMP      #24,(SP)      ;;CHECK THE NUMBER IN THE SWR
6160 026172 002411      BLT      8$      ;;BRANCH IF TEST NUMBER IS OUT OF RANGE
6161 026174 011637 001116      MOV      (SP),$TSTNM      ;;UPDATE THE TEST NUMBER
6162 026200 005316      DEC      (SP)      ;;BACKUP BY ONE
6163 026202 006316      ASL      (SP)      ;;SCALE THE TEST NUMBER AS AN INDEX
6164 026204 062716 026410      ADD      #$$SW08TBL,(SP)      ;;FORM THE ADDRESS OF TEST POINTER
6165 026210 013637 001122      MOV      @($P)+,$LPADR      ;;SET LOOP ADDRESS TO DESIRED TEST
6166 026214 000466      BR       $OVER      ;;GO LOOP ON THE TEST
6167 026216 005726      8$:  TST      (SP)+      ;;CLEAN THE BAD TEST NUMBER OFF OF THE STACK
```

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6168 026220 105737 001117      2$:  TSTB  $ERFLG      ;;HAS AN ERROR OCCURRED?
6169 026224 001421              BEQ    3$          ;;BR IF NO
6170 026226 123737 001131 001117  CMPB  $ERMAX,$ERFLG  ;;MAX. ERRORS FOR THIS TEST OCCURRED?
6171 026234 101015              BHI    3$          ;;BR IF NO
6172 026236 032777 001000 152710  BIT   #BIT09,@SWR    ;;LOOP ON ERROR?
6173 026244 001404              BEQ    4$          ;;BR IF NO
6174 026246 013737 001124 001122  7$:  MOV   $LPERR,$LPADR  ;;SET LOOP ADDRESS TO LAST SCOPE
6175 026254 000446              BR     $OVER
6176 026256 105037 001117      4$:  CLRB  $ERFLG      ;;ZERO THE ERROR FLAG
6177 026262 005037 001206          CLR   $TIMES      ;;CLEAR THE NUMBER OF ITERATIONS TO MAKE
6178 026266 000415              BR     1$          ;;ESCAPE TO THE NEXT TEST
6179 026270 032777 004000 152656  3$:  BIT   #BIT11,@SWR    ;;INHIBIT ITERATIONS?
6180 026276 001011              PNE    1$          ;;BR IF YES
6181 026300 005737 001230          TST   $PASS      ;;IF FIRST PASS OF PROGRAM
6182 026304 001406              BEQ    1$          ;;      INHIBIT ITERATIONS
6183 026306 005237 001120          INC   $ICNT      ;;INCREMENT ITERATION COUNT
6184 026312 023737 001206 001120  CMP   $TIMES,$ICNT  ;;CHECK THE NUMBER OF ITERATIONS MADE
6185 026320 002024              BGE    $OVER      ;;BR IF MORE ITERATION REQUIRED
6186 026322 012737 000001 001120  1$:  MOV   #1,$ICNT    ;;REINITIALIZE THE ITERATION COUNTER
6187 026330 013737 026406 001206  MOV   $MXCNT,$TIMES  ;;SET NUMBER OF ITERATIONS TO DO
6188 026336 105237 001116          $SVLAD: INCB  $TSTNM    ;;COUNT TEST NUMBERS
6189 026342 113737 001116 001226  MOVB  $TSTNM,$TESTN  ;;SET TEST NUMBER IN APT MAILBOX
6190 026350 011637 001122          MOV   ( ),$LPADR    ;;SAVE SCOPE LOOP ADDRESS
6191 026354 011637 001124          MOV   ( ),$LPERR    ;;SAVE ERROR LOOP ADDRESS
6192 026360 005037 001210          CLR   $ESCAPE    ;;CLEAR THE ESCAPE FROM ERROR ADDRESS
6193 026364 112737 000001 001131  MOVB  #1,$ERMAX    ;;ONLY ALLOW ONE(1) ERROR ON NEXT TEST
6194 026372 013777 001116 152556  $OVER: MOV   $TSTNM,@DISPLAY  ;;DISPLAY TEST NUMBER
6195 026400 013716 001122          MOV   $LPADR,(SP)    ;;FUDGE RETURN ADDRESS
6196 026404 000002              RTI
6197 026406 000012          $MXCNT: 10.      ;;FIXES PS
6198 026410          $SW08TBL:      ;;MAX. NUMBER OF ITERATIONS
6199 026410 004432          .WORD  TST1+2      ;;STARTING ADDRESS OF TEST 1
6200 026412 005006          .WORD  TST2+2      ;;STARTING ADDRESS OF TEST 2
6201 026414 005226          .WORD  TST3+2      ;;STARTING ADDRESS OF TEST 3
6202 026416 005442          .WORD  TST4+2      ;;STARTING ADDRESS OF TEST 4
6203 026420 005630          .WORD  TST5+2      ;;STARTING ADDRESS OF TEST 5
6204 026422 006766          .WORD  TST6+2      ;;STARTING ADDRESS OF TEST 6
6205 026424 010146          .WORD  TST7+2      ;;STARTING ADDRESS OF TEST 7
6206 026426 010326          .WORD  TST10+2     ;;STARTING ADDRESS OF TEST 10
6207 026430 010450          .WORD  TST11+2     ;;STARTING ADDRESS OF TEST 11
6208 026432 010750          .WORD  TST12+2     ;;STARTING ADDRESS OF TEST 12
6209 026434 011336          .WORD  TST13+2     ;;STARTING ADDRESS OF TEST 13
6210 026436 011762          .WORD  TST14+2     ;;STARTING ADDRESS OF TEST 14
6211 026440 012346          .WORD  TST15+2     ;;STARTING ADDRESS OF TEST 15
6212 026442 013060          .WORD  TST16+2     ;;STARTING ADDRESS OF TEST 16
6213 026444 013534          .WORD  TST17+2     ;;STARTING ADDRESS OF TEST 17
6214 026446 014006          .WORD  TST20+2     ;;STARTING ADDRESS OF TEST 20
6215 026450 014530          .WORD  TST21+2     ;;STARTING ADDRESS OF TEST 21
6216 026452 015510          .WORD  TST22+2     ;;STARTING ADDRESS OF TEST 22
6217 026454 016760          .WORD  TST23+2     ;;STARTING ADDRESS OF TEST 23
6218 026456 020204          .WORD  TST24+2     ;;STARTING ADDRESS OF TEST 24
6219
6220      .SBTTL  ERROR HANDLER ROUTINE
6221
6222      ;*****
6223      ;*THIS ROUTINE WILL INCREMENT THE ERROR FLAG AND THE ERROR COUNT,
      ;*SAVE THE ERROR ITEM NUMBER AND THE ADDRESS OF THE ERROR CALL
```

```
6224      ;*AND GO TO ERRTP ON ERROR
6225      ;*THE SWITCH OPTIONS PROVIDED BY THIS ROUTINE ARE:
6226      ;*SW15=1      HALT ON ERROR
6227      ;*SW13=1      INHIBIT ERROR TYPEOUTS
6228      ;*SW10=1      BELL ON ERROR
6229      ;*SW09=1      LOOP ON ERROR
6230      ;*CALL
6231      ;*      ERROR      N      ;;ERROR=EMT AND N-ERROR ITEM NUMBER
6232
6233      $ERROR:
6234      026460      104410      001117      7$:      CKSWR      ;;TEST FOR CHANGE IN SOFT-SWR
6235      026460      105237      001117      7$:      INCB      $ERFLG      ;;SET THE ERROR FLAG
6236      026466      001775      001116      152460      BEQ      7$      ;;DON'T LET THE FLAG GO TO ZERO
6237      026470      013777      001116      152460      MOV      $TSTNM,@DISPLAY      ;;DISPLAY TEST NUMBER AND ERROR FLAG
6238      026476      032777      002000      152450      BIT      #BIT10,@SWR      ;;BELL ON ERROR?
6239      026504      001402      001212      152450      BEQ      1$      ;;NO - SKIP
6240      026506      104401      001212      152450      TYPE      $BELL      ;;RING BELL
6241      026512      005237      001126      152450      1$:      INC      $ERTTL      ;;COUNT THE NUMBER OF ERRORS
6242      026516      011637      001132      152450      MOV      (SP),$ERRPC      ;;GET ADDRESS OF ERROR INSTRUCTION
6243      026522      162737      000002      001132      SUB      #2,$ERRPC
6244      026530      117737      152376      001130      MOV      @ERRPC,$ITEMB      ;;STRIP AND SAVE THE ERROR ITEM CODE
6245      026536      032777      020000      152410      BIT      #BIT13,@SWR      ;;SKIP TYPEOUT IF SET
6246      026544      001004      021706      152410      BNE      20$      ;;SKIP TYPEOUTS
6247      026546      004737      021706      152410      JSR      PC,ERRTP      ;;GO TO USER ERROR ROUTINE
6248      026552      104401      001217      152410      TYPE      $CRLF
6249      026556      122737      000001      001242      20$:      CMPB      #APTENV,$ENV      ;;RUNNING IN APT MODE
6250      026556      001007      001130      026600      BNE      2$      ;;NO,SKIP APT ERROR REPORT
6251      026564      113737      001130      026600      MOV      $ITEMB,21$      ;;SET ITEM NUMBER AS ERROR NUMBER
6252      026566      004737      030522      026600      JSR      PC,$ATY4      ;;REPORT FATAL ERROR TO APT
6253      026574      000000      000000      026600      21$:      .BYTE      0
6254      026600      000000      000000      026600      .BYTE      0
6255      026601      000777      152344      026600      22$:      BR      22$      ;;APT ERROR LOOP
6256      026602      005777      152344      026600      2$:      TST      @SWR      ;;HALT ON ERROR
6257      026604      100002      000000      026600      BPL      3$      ;;SKIP IF CONTINUE
6258      026610      000000      000000      026600      HALT      ;;HALT ON ERROR!
6259      026612      104410      001000      152330      3$:      CKSWR      ;;TEST FOR CHANGE IN SOFT-SWR
6260      026614      032777      001000      152330      BIT      #BIT09,@SWR      ;;LOOP ON ERROR SWITCH SET?
6261      026616      001402      001124      152330      BEQ      4$      ;;BR IF NO
6262      026624      013716      001210      152330      MOV      $LPERR,(SP)      ;;FUDGE RETURN FOR LOOPING
6263      026626      005737      001210      152330      4$:      TST      $ESCAPE      ;;CHECK FOR AN ESCAPE ADDRESS
6264      026632      001402      001210      152330      BEQ      5$      ;;BR IF NONE
6265      026636      013716      001210      152330      MOV      $ESCAPE,(SP)      ;;FUDGE RETURN ADDRESS FOR ESCAPE
6266      026640      022737      021666      000042      5$:      CMP      #SENDAD,@#42      ;;ACT-11 AUTO-ACCEPT?
6267      026644      001001      000000      021666      BNE      6$      ;;BRANCH IF NO
6268      026652      000000      000000      021666      HALT      ;;YES
6269      026654      000000      000000      021666      6$:      RTI      ;;RETURN
6270      026656      000002      000000      021666      .SBTTL      TTY INPUT ROUTINE
6271      026656      000002      000000      021666      ;*****
6272      026656      000002      000000      021666      .ENABL      LSB
6273      026656      000002      000000      021666      $TKCNT: .WORD      0      ;;NUMBER OF ITEMS IN QUEUE
6274      026656      000002      000000      021666      $TKQIN: .WORD      0      ;;INPUT POINTER
6275      026656      000002      000000      021666      $TKQOUT: .WORD      0      ;;OUTPUT POINTER
6276
6277
6278
6279
```

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6280 026666 000001      $TKQSRT: .BLKB 1      ;;TTY KEYBOARD QUEUE
6281      026667      $TKQEND=.
6282      026670      .EVEN
6283
6284      ;*TK INITIALIZE ROUTINE
6285      ;*THIS ROUTINE WILL INITIALIZE THE TTY KEYBOARD INPUT QUEUE
6286      ;*SETUP THE INTERRUPT VECTOR AND TURN ON THE KEYBOARD INTERRUPT
6287      ;
6288      ;*CALL:
6289      ;*      JSR      PC,$TKINT
6290      ;*      RETURN
6291
6292 026670 005037 026660  $TKINT: CLR      $TKCNT      ;;CLEAR COUNT OF ITEMS IN QUEUE
6293 026674 012737 026666 026662  MOV      #$TKQSRT,$TKQIN ;;MOVE THE STARTING ADDRESS OF THE
6294 026702 013737 026662 026664  MOV      $TKQIN,$TKQOUT ;;QUEUE INTO THE INPUT & OUTPUT POINTERS.
6295 026710 012737 026740 000060  MOV      #$TKSRV,@$TKVEC ;;INITIALIZE THE KEYBOARD VECTOR
6296 026716 012737 000200 000062  MOV      #200,@$TKVEC+2 ;;'BR' LEVEL 4
6297 026724 005777 152232      TST      @$TKB      ;;CLEAR DONE FLAG
6298 026730 012777 000100 152222  MOV      #100,$TKS      ;;ENABLE TTY KEYBOARD INTERRUPT
6299 026736 000207      RTS      PC      ;;RETURN TO CALLER
6300
6301      ;*TK SERVICE ROUTINE
6302      ;*THIS ROUTINE WILL SERVICE THE TTY KEYBOARD INTERRUPT
6303      ;*BY READING THE CHARACTER FROM THE INPUT BUFFER AND PUTTING
6304      ;*IT IN THE QUEUE.
6305      ;*IF THE CHARACTER IS A 'CONTROL-C' (^C) $TKINT IS CALLED AND
6306      ;*UPON RETURN EXIT IS MADE TO THE 'CONTROL-C' RESTART ADDRESS (START)
6307      ;
6308 026740 117746 152216  $TKSRV: MOVB     @$TKB,-(SP)      ;;PICKUP THE CHARACTER
6309 026744 042716 177600      BIC      #^C177,(SP)      ;;STRIP THE JUNK
6310 026750 021627 000003      CMP      (SP),#3      ;;IS IT A CONTROL C?
6311 026754 001007      BNE      1$      ;;BRANCH IF NO
6312 026756 104401 030054      TYPE     ,SCNTLC      ;;TYPE A CONTROL-C (^C)
6313 026762 004737 026670      JSR      PC,$TKINT      ;;INIT THE KEYBOARD
6314 026766 005726      TST      (SP)+      ;;CLEAN UP STACK
6315 026770 000137 002632      JMP      START      ;;CONTROL C RESTART
6316 026774 021627 000007 1$:      CMP      (SP),#7      ;;IS IT A CONTROL G?
6317 027000 001004      BNE      2$      ;;BRANCH IF NO
6318 027002 022737 000176 001154      CMP      #SWREG,SWR      ;;IS SOFT-SWR SELECTED?
6319 027010 001500      BEQ      6$      ;;GO TO SWR CHANGE
6320
6321      2$:
6322 027012 022737 000001 026660      CMP      #1,$TKCNT      ;;IS THE QUEUE FULL?
6323 027020 001004      BNE      3$      ;;BRANCH IF NO
6324 027022 104401 001212      TYPE     ,SBELL      ;;RING THE TTY BELL
6325 027026 005726      TST      (SP)+      ;;CLEAN CHARACTER OFF OF STACK
6326 027030 000451      BR      5$      ;;EXIT
6327 027032 021627 000023 3$:      CMP      (SP),#23      ;;IS IT A CONTROL-S?
6328 027036 001021      BNE      32$      ;;BRANCH IF NO
6329 027040 005077 152114      CLR      @$TKS      ;;DISABLE TTY KEYBOARD INTERRUPTS
6330 027044 005726      TST      (SP)+      ;;CLEAN CHAR OFF STACK
6331 027046 105777 152106 31$:      TSTB     @$TKS      ;;WAIT FOR A CHAR
6332 027052 100375      BPL      31$      ;;LOOP UNTIL ITS THERE
6333 027054 117746 152102      MOVB     @$TKB,-(SP)      ;;GET THE CHARACTER
6334 027060 042716 177600      BIC      #^C177,(SP)      ;;MAKE IT 7-BIT ASCII
6335 027064 022627 000021      CMP      (SP)+,#21      ;;IS IT A CONTROL-Q?
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6336 027070 001366      BNE      31$      ;;BRANCH IF NO
6337 027072 012777 000100 152060      MOV      #100,@$TKS      ;;REENABLE TTY KEYBOARD INTERRUPTS
6338 027100 000002      RTI              ;;RETURN
6339 027102 005237 026660      32$: INC      $TKCNT      ;;COUNT THIS CHARACTER
6340 027106 021627 000140      CMP      (SP),#140      ;;IS IT UPPER CASE?
6341 027112 002405      BLT      4$      ;;BRANCH IF YES
6342 027114 021627 000175      CMP      (SP),#175      ;;IS IT A SPECIAL CHAR?
6343 027120 003002      BGT      4$      ;;BRANCH IF YES
6344 027122 042716 000040      BIC      #40,(SP)      ;;MAKE IT UPPER CASE
6345 027126 112677 177530      4$: MOVB    (SP)+,$$TKQIN      ;;AND PUT IT IN QUEUE
6346 027132 005237 026662      INC      $TKQIN      ;;UPDATE THE POINTER
6347 027136 023727 026662 026667      CMP      $TKQIN,$$TKQEND      ;;GO OFF THE END?
6348 027144 001003      BNE      5$      ;;BRANCH IF NO
6349 027146 012737 026666 026662      MOV      $$TKQSR,$$TKQIN      ;;RESET THE POINTER
6350 027154 000002      5$: RTI              ;;RETURN
6351
6352      ;;*****
6353      ;;*SOFTWARE SWITCH REGISTER CHANGE ROUTINE.
6354      ;;*ROUTINE IS ENTERED FROM THE TRAP HANDLER, AND WILL
6355      ;;*SERVICE THE TEST FOR CHANGE IN SOFTWARE SWITCH REGISTER TRAP
6356      ;;*CALL WHEN OPERATING IN TTY INTERRUPT MODE.
6357 027156 022737 000176 001154 $CKSWR: CMP      #SWREG,SWR      ;;IS THE SOFT-SWR SELECTED
6358 027164 001124      BNE      15$      ;;EXIT IF NOT
6359 027166 105777 151766      TSTB    @$TKS      ;;IS A CHAR WAITING?
6360 027172 100121      BPL      15$      ;;IF NOT, EXIT
6361 027174 117746 151762      MOVB    @$TKB,-(SP)      ;;YES
6362 027200 042716 177600      BIC      #^C177,(SP)      ;;MAKE IT 7-BIT ASCII
6363 027204 021627 000007      CMP      (SP),#7      ;;IS IT A CONTROL-G?
6364 027210 001300      BNE      2$      ;;IF NOT, PUT IT IN THE TTY QUEUE
6365      ;;AND EXIT
6366
6367      ;;*****
6368      ;;*CONTROL IS PASSED TO THIS POINT FROM EITHER THE TTY INTERRUPT SERVICE
6369      ;;*ROUTINE OR FROM THE SOFTWARE SWITCH REGISTER TRAP CALL, AS A RESULT OF A
6370      ;;*CONTROL-G BEING TYPED, AND THE SOFTWARE SWITCH REGISTER BEING SELECTED.
6371 027212 123727 001150 000001 6$: CMPB    $AUTOB,#1      ;;ARE WE RUNNING IN AUTO-MODE?
6372 027220 001674      BEQ      2$      ;;BRANCH IF YES
6373 027222 005726      TST      (SP)+      ;;CLEAR CONTROL-G OFF STACK
6374 027224 004737 026670      JSR      PC,$$TKINT      ;;FLUSH THE TTY INPUT QUEUE
6375 027230 005077 151724      CLR      @$TKS      ;;DISABLE TTY KEYBOARD INTERRUPTS
6376 027234 112737 000001 001151      MOVB    #1,$$INTAG      ;;SET INTERRUPT MODE INDICATOR
6377
6378 027242 104401 030066      $GTSWR: TYPE    $$CNTLG      ;;ECHO THE CONTROL-G (^G)
6379 027246 104401 030073      TYPE    $$MSWR      ;;TYPE CURRENT CONTENTS
6380 027252 013746 000176      MOV      SWREG,-(SP)      ;;SAVE SWREG FOR TYPEOUT
6381 027256 104402      TYPOC      ;;GO TYPE--OCTAL ASCII(ALL DIGITS)
6382 027260 104401 030104      TYPE    $$MNEW      ;;PROMPT FOR NEW SWR
6383 027264 005046      19$: CLR      -(SP)      ;;CLEAR COUNTER
6384 027266 005046      CLR      -(SP)      ;;THE NEW SWR
6385 027270 105777 151664      7$: TSTB    @$TKS      ;;CHAR THERE?
6386 027274 100375      BPL      7$      ;;IF NOT TRY AGAIN
6387
6388 027276 117746 151660      MOVB    @$TKB,-(SP)      ;;PICK UP CHAR
6389 027302 042716 177600      BIC      #^C177,(SP)      ;;MAKE IT 7-BIT ASCII
6390
6391 027306 021627 000003      CMP      (SP),#3      ;;IS IT A CONTROL-C?
  
```

```
6392 027312 001015      BNE      9$          ;;BRANCH IF NOT
6393 027314 104401 030054  TYPE      , $CNTLC      ;;YES, ECHO CONTROL-C (^C)
6394 027320 062706 000006  ADD      #6, SP      ;;CLEAN UP STACK
6395 027324 123727 001151 000001  CMPB     $INTAG, #1      ;;REENABLE TTY KEYBOARD INTERRUPTS?
6396 027332 001003      BNE      8$          ;;BRANCH IF NO
6397 027334 012777 000100 151616  MOV      #100, @ $TKS      ;;ALLOW TTY KEYBOARD INTERRUPTS
6398 027342 000137 002632      JMP      START      ;;CONTROL-C RESTART
6399
6400
6401 027346 021627 000025      9$:      CMP      (SP), #25      ;;IS IT A CONTROL-U?
6402 027352 001005      BNE      10$         ;;BRANCH IF NOT
6403 027354 104401 030061  TYPE      , $CNTLU      ;;YES, ECHO CONTROL-U (^U)
6404 027360 062706 000006 20$:      ADD      #6, SP      ;;IGNORE PREVIOUS INPUT
6405 027364 000737      BR       19$         ;;LET'S TRY IT AGAIN
6406
6407
6408 027366 021627 000015      10$:     CMP      (SP), #15      ;;IS IT A <CR>?
6409 027372 001022      BNE      16$         ;;BRANCH IF NO
6410 027374 005766 000004      TST      4(SP)      ;;YES, IS IT THE FIRST CHAR?
6411 027400 001403      BEQ      11$         ;;BRANCH IF YES
6412 027402 016677 000002 151544  MOV      2(SP), @ $SWR      ;;SAVE NEW SWR
6413 027410 062706 000006 11$:      ADD      #6, SP      ;;CLEAR UP STACK
6414 027414 104401 001217 14$:      TYPE      , $CRLF      ;;ECHO <CR> AND <LF>
6415 027420 123727 001151 000001  CMPB     $INTAG, #1      ;;RE-ENABLE TTY KBD INTERRUPTS?
6416 027426 001003      BNE      15$         ;;BRANCH IF NOT
6417 027430 012777 000100 151522  MOV      #100, @ $TKS      ;;RE-ENABLE TTY KBD INTERRUPTS
6418 027436 000002      RTI             ;;RETURN
6419 027440 004737 026026 16$:      JSR      PC, $TYPEPC      ;;ECHO CHAR
6420 027444 021627 000060      CMP      (SP), #60      ;;CHAR < 0?
6421 027450 002420      BLT      18$         ;;BRANCH IF YES
6422 027452 021627 000067      CMP      (SP), #67      ;;CHAR > 7?
6423 027456 003015      BGT      18$         ;;BRANCH IF YES
6424 027460 042726 000060      BIC      #60, (SP)+      ;;STRIP-OFF ASCII
6425 027464 005766 000002      TST      2(SP)      ;;IS THIS THE FIRST CHAR
6426 027470 001403      BEQ      17$         ;;BRANCH IF YES
6427 027472 006316      ASL      (SP)      ;;NO, SHIFT PRESENT
6428 027474 006316      ASL      (SP)      ;;CHAR OVER TO MAKE
6429 027476 006316      ASL      (SP)      ;;ROOM FOR NEW ONE.
6430 027500 005266 000002 17$:      INC      2(SP)      ;;KEEP COUNT OF CHAR
6431 027504 056616 177776      BIS      -2(SP), (SP)      ;;SET IN NEW CHAR
6432 027510 000667      BR       7$          ;;GET THE NEXT ONE
6433 027512 104401 001216 18$:      TYPE      , $QUES      ;;TYPE ?<CR><LF>
6434 027516 000720      BR       20$         ;;SIMULATE CONTROL-U
6435      .DSABL      LSB
6436
6437
6438      ;*****
6439      ;*THIS ROUTINE WILL INPUT A SINGLE CHARACTER FROM THE TTY
6440      ;*CALL:
6441      ;*      RDCHR          ;;GET A CHARACTER FROM THE QUEUE
6442      ;*      RETURN HERE    ;;CHARACTER IS ON THE STACK
6443      ;*                    ;;WITH PARITY BIT STRIPPED OFF
6444      ;*
6445      ;*
6446 027520 011646      $RDCHR: MOV      (SP), -(SP)      ;;PUSH DOWN THE PC AND
6447 027522 016666 000004 000002  MOV      4(SP), 2(SP)      ;;THE PS
```

```
6448 027530 005066 000004      CLR      4(SP)      ;;GET READY FOR A CHARACTER
6449 027534 005046              CLR      -(SP)      ;;PUT NEW PS ON STACK
6450 027536 012746 027544      MOV      #64$,-(SP)      ;;PUT NEW PC ON STACK
6451 027542 000002              RTI              ;;POP NEW PC AND PS
6452 027544              64$:
6453 027544 005737 026660      1$:      TST      $TKCNT      ;;WAIT ON A CHARACTER
6454 027550 001775              BEQ      1$
6455 027552 005337 026660      DEC      $TKCNT      ;;DECREMENT THE COUNTER
6456 027556 117766 177102 000004      MOV      @STKQOUT,4(SP)      ;;GET ONE CHARACTER
6457 027564 005237 026664      INC      $TKQOUT      ;;UPDATE THE POINTER
6458 027570 023727 026664 026667      CMP      $TKQOUT,$$TKQEND      ;;DID IT GO OFF OF THE END?
6459 027576 001003              BNE      2$      ;;BRANCH IF NO
6460 027600 012737 026666 026664      MOV      $$TKQSRT,$TKQOUT      ;;RESET THE POINTER
6461 027606 000002              RTI              ;;RETURN
6462
6463      *****
6464      *THIS ROUTINE WILL INPUT A STRING FROM THE TTY
6465      *CALL:
6466      *      RDLIN              ;;INPUT A STRING FROM THE TTY
6467      *      RETURN HERE      ;;ADDRESS OF FIRST CHARACTER WILL BE ON THE STACK
6468      *      ;;TERMINATOR WILL BE A BYTE OF ALL 0'S
6469
6469 027610 010346      $RDLIN: MOV      R3,-(SP)      ;;SAVE R3
6470 027612 005046      CLR      -(SP)      ;;CLEAR THE RUBOUT KEY
6471 027614 012703 030044      1$:      MOV      $$TTYIN,R3      ;;GET ADDRESS
6472 027620 022703 030054      2$:      CMP      $$TTYIN+8.,R3      ;;BUFFER FULL?
6473 027624 101456      BLOS      4$      ;;BR IF YES
6474 027626 104411      RDCHR      ;;GO READ ONE CHARACTER FROM THE TTY
6475 027630 112613      MOV      (SP)+,(R3)      ;;GET CHARACTER
6476 027632 122713 000177      10$:      CMP      #177,(R3)      ;;IS IT A RUBOUT
6477 027636 001022      BNE      5$      ;;BR IF NO
6478 027640 005716      TST      (SP)      ;;IS THIS THE FIRST RUBOUT?
6479 027642 001007      BNE      6$      ;;BR IF NO
6480 027644 112737 000134 030042      MOV      #'\\,9$      ;;TYPE A BACK SLASH
6481 027652 104401 030042      TYPE      ,9$
6482 027656 012716 177777      MOV      #-1,(SP)      ;;SET THE RUBOUT KEY
6483 027662 005303      6$:      DEC      R3      ;;BACKUP BY ONE
6484 027664 020327 030044      CMP      R3,$$TTYIN      ;;STACK EMPTY?
6485 027670 103434      BLO      4$      ;;BR IF YES
6486 027672 111337 030042      MOV      (R3),9$      ;;SETUP TO TYPEOUT THE DELETED CHAR.
6487 027676 104401 030042      TYPE      ,9$      ;;GO TYPE
6488 027702 000746      BR      2$      ;;GO READ ANOTHER CHAR.
6489 027704 005716      5$:      TST      (SP)      ;;RUBOUT KEY SET?
6490 027706 001406      BEQ      7$      ;;BR IF NO
6491 027710 112737 000134 030042      MOV      #'\\,9$      ;;TYPE A BACK SLASH
6492 027716 104401 030042      TYPE      ,9$
6493 027722 005016      CLR      (SP)      ;;CLEAR THE RUBOUT KEY
6494 027724 122713 000025      7$:      CMP      #25,(R3)      ;;IS CHARACTER A CTRL U?
6495 027730 001003      BNE      8$      ;;BR IF NO
6496 027732 104401 030061      TYPE      ,$$CNTLU      ;;TYPE A CONTROL 'U'
6497 027736 000726      BR      1$      ;;GO START OVER
6498 027740 122713 000022      8$:      CMP      #22,(R3)      ;;IS CHARACTER A '"R'?
6499 027744 001011      BNE      3$      ;;BRANCH IF NO
6500 027746 105013      CLRB      (R3)      ;;CLEAR THE CHARACTER
6501 027750 104401 001217      TYPE      ,$$CRLF      ;;TYPE A 'CR' & 'LF'
6502 027754 104401 030044      TYPE      ,$$TTYIN      ;;TYPE THE INPUT STRING
6503 027760 000717      BR      2$      ;;GO PICKUP ANOTHER CHACTER
```

```
6504 027762 104401 001216 4$: TYPE , $QUES ;; TYPE A '?'
6505 027766 000712 BR 1$ ;; CLEAR THE BUFFER AND LOOP
6506 027770 111337 030042 3$: MOVB (R3), 9$ ;; ECHO THE CHARACTER
6507 027774 104401 030042 TYPE , 9$
6508 030000 122723 000015 CMPB #15, (R3)+ ;; CHECK FOR RETURN
6509 030004 001305 BNE 2$ ;; LOOP IF NOT RETURN
6510 030006 105063 177777 CLRB -1(R3) ;; CLEAR RETURN (THE 15)
6511 030012 104401 001220 TYPE , $LF ;; TYPE A LINE FEED
6512 030016 005726 TST (SP)+ ;; CLEAN RUBOUT KEY FROM THE STACK
6513 030020 012603 MOV (SP)+, R3 ;; RESTORE R3
6514 030022 011646 MOV (SP), -(SP) ;; ADJUST THE STACK AND PUT ADDRESS OF THE
6515 030024 016666 000004 000002 MOV 4(SP), 2(SP) ;; FIRST ASCII CHARACTER ON IT
6516 030032 012766 030044 000004 MOV # $TTYIN, 4(SP)
6517 030040 000002 RTI ;; RETURN
6518 030042 000 9$: .BYTE 0 ;; STORAGE FOR ASCII CHAR. TO TYPE
6519 030043 000 .BYTE 0 ;; TERMINATOR
6520 030044 000010 $TTYIN: .BLKB 8. ;; RESERVE 8 BYTES FOR TTY INPUT
6521 030054 041536 005015 000 $CNTLC: .ASCIZ / ^C / <15> <12> ;; CONTROL 'C'
6522 030061 136 006525 000012 $CNTLU: .ASCIZ / ^U / <15> <12> ;; CONTROL 'U'
6523 030066 043536 005015 000 $CNTLG: .ASCIZ / ^G / <15> <12> ;; CONTROL 'G'
6524 030073 015 051412 051127 $MSWR: .ASCIZ <15> <12> / SWR = /
6525 030100 036440 000040
6526 030104 020040 042516 020127 $MNEW: .ASCIZ / NEW = /
6527 030112 020075 000
6528 730116 .EVEN
6529 .SBTTL READ AN OCTAL NUMBER FROM THE TTY
6530
6531 *****
6532 *THIS ROUTINE WILL READ AN OCTAL (ASCII) NUMBER FROM THE TTY AND
6533 *CHANGE IT TO BINARY.
6534 *CALL:
6535 * RDOCT ;; READ AN OCTAL NUMBER
6536 * RETURN HERE ;; LOW ORDER BITS ARE ON TOP OF THE STACK
6537 * ;; HIGH ORDER BITS ARE IN $HIOCT
6538
6539 030116 011646 000004 000002 $RDOCT: MOV (SP), -(SP) ;; PROVIDE SPACE FOR THE
6540 030120 016666 MOV 4(SP), 2(SP) ;; INPUT NUMBER
6541 030126 010046 MOV R0, -(SP) ;; PUSH R0 ON STACK
6542 030130 010146 MOV R1, -(SP) ;; PUSH R1 ON STACK
6543 030132 010246 MOV R2, -(SP) ;; PUSH R2 ON STACK
6544 030134 104412 1$: RDLIN ;; READ AN ASCII LINE
6545 030136 012600 MOV (SP)+, R0 ;; GET ADDRESS OF 1ST CHARACTER
6546 030140 005001 CLR R1 ;; CLEAR DATA WORD
6547 030142 005002 CLR R2
6548 030144 112046 2$: MOVB (R0)+, -(SP) ;; PICKUP THIS CHARACTER
6549 030146 001412 BEQ 3$ ;; IF ZERO GET OUT
6550 030150 006301 ASL R1 ;; *2
6551 030152 006102 ROL R2
6552 030154 006301 ASL R1 ;; *4
6553 030156 006102 ROL R2
6554 030160 006301 ASL R1 ;; *8
6555 030162 006102 ROL R2
6556 030164 042716 177770 BIC # ^C, (SP) ;; STRIP THE ASCII JUNK
6557 030170 062601 ADD (SP)+, R1 ;; ADD IN THIS DIGIT
6558 030172 000764 BR 2$ ;; LOOP
6559 030174 005726 3$: TST (SP)+ ;; CLEAN TERMINATOR FROM STACK
```

6560 030176 010166 000012  
6561 030202 010237 030216  
6562 030206 012602  
6563 030210 012601  
6564 030212 012600  
6565 030214 000002  
6566 030216 000000

MOV R1,12(SP) ;;SAVE THE RESULT  
MOV R2,\$HIOCT  
MOV (SP)+,R2 ;;POP STACK INTO R2  
MOV (SP)+,R1 ;;POP STACK INTO R1  
MOV (SP)+,R0 ;;POP STACK INTO R0  
RTI ;;RETURN  
\$HIOCT: .WORD 0 ;;HIGH ORDER BITS GO HERE  
.SBTTL TRAP DECODER

6567  
6568  
6569  
6570  
6571  
6572  
6573  
6574  
6575 030220 016646 000002  
6576 030224 042716 000020  
6577 030230 012746 030236  
6578 030234 000002  
6579 030236 010046  
6580 030240 016600 000002  
6581 030244 005740  
6582 030246 111000  
6583 030250 006300  
6584 030252 016000 030272  
6585 030256 000200  
6586  
6587  
6588  
6589  
6590 030260 011646  
6591 030262 016666 000004 000002  
6592 030270 000002  
6593  
6594  
6595  
6596  
6597  
6598  
6599  
6600

;;\*\*\*\*\*  
;;\*THIS ROUTINE WILL PICKUP THE LOWER BYTE OF THE 'TRAP' INSTRUCTION  
;;\*AND USE IT TO INDEX THROUGH THE TRAP TABLE FOR THE STARTING ADDRESS  
;;\*OF THE DESIRED ROUTINE. THEN USING THE ADDRESS OBTAINED IT WILL  
;;\*GO TO THAT ROUTINE.  
\$TRAP: MOV 2(SP),-(SP) ;;ASSUME THE STATUS OF  
BIC #20,(SP) ;; THE CALLER--DO NOT ALLOW  
MOV #1\$,-(SP) ;; T-BIT TRAPS  
RTI ;;SET THE NEW STATUS  
1\$: MOV R0,-(SP) ;;SAVE R0  
MOV 2(SP),R0 ;;GET TRAP ADDRESS  
TST -(R0) ;;BACKUP BY 2  
MOVB (R0),R0 ;;GET RIGHT BYTE OF TRAP  
ASL R0 ;;POSITION FOR INDEXING  
MOV \$TRPAD(R0),R0 ;;INDEX TO TABLE  
RTS R0 ;;GO TO ROUTINE

;;THIS IS USE TO HANDLE THE 'GETPRI' MACRO

\$TRAP2: MOV (SP),-(SP) ;;MOVE THE PC DOWN  
MOV 4(SP),2(SP) ;;MOVE THE PSW DOWN  
RTI ;;RESTORE THE PSW

.SBTTL TRAP TABLE

;;\*THIS TABLE CONTAINS THE STARTING ADDRESSES OF THE ROUTINES CALLED  
;;\*BY THE 'TRAP' INSTRUCTION.

ROUTINE  
-----  
\$TRPAD: .WORD \$TRAP2  
\$TYPE ;;CALL=TYPE TRAP+1(104401) TTY TYPEOUT ROUTINE  
\$TYPOC ;;CALL=TYPOC TRAP+2(104402) TYPE OCTAL NUMBER (WITH LEADING ZEROS)  
\$TYPOS ;;CALL=TYPOS TRAP+3(104403) TYPE OCTAL NUMBER (NO LEADING ZEROS)  
\$TYPON ;;CALL=TYPON TRAP+4(104404) TYPE OCTAL NUMBER (AS PER LAST CALL)  
\$TYPDS ;;CALL=TYPDS TRAP+5(104405) TYPE DECIMAL NUMBER (WITH SIGN)  
\$TYPBN ;;CALL=TYPBN TRAP+6(104406) TYPE BINARY (ASCII) NUMBER  
\$GTSWR ;;CALL=GTSWR TRAP+7(104407) GET SOFT-SWR SETTING  
\$CKSWR ;;CALL=CKSWR TRAP+10(104410) TEST FOR CHANGE IN SOFT-SWR  
\$RDCHR ;;CALL=RDCHR TRAP+11(104411) TTY TYPEIN CHARACTER ROUTINE  
\$RDLIN ;;CALL=RDLIN TRAP+12(104412) TTY TYPEIN STRING ROUTINE  
\$RDOCT ;;CALL=RDOCT TRAP+13(104413) READ AN OCTAL NUMBER FROM TTY  
\$SAVREG ;;CALL=SAVREG TRAP+14(104414) SAVE R0-R5 ROUTINE

```
6616 030324 025030          $RESREG ;;CALL=RESREG TRAP+15(104415) RESTORE R0-R5 ROUTINE
6617          .SBTTL POWER DOWN AND UP ROUTINES
6618
6619          ;*****
6620          ;POWER DOWN ROUTINE
6621 030326 012737 030466 000024 $PWRDN: MOV    $SILLUP,@#PWRVEC ;;SET FOR FAST UP
6622 030334 012737 000340 000026      MOV    #340,@#PWRVEC+2 ;;PRIO:7
6623 030342 010046          MOV    R0,-(SP) ;;PUSH R0 ON STACK
6624 030344 010146          MOV    R1,-(SP) ;;PUSH R1 ON STACK
6625 030346 010246          MOV    R2,-(SP) ;;PUSH R2 ON STACK
6626 030350 010346          MOV    R3,-(SP) ;;PUSH R3 ON STACK
6627 030352 010446          MOV    R4,-(SP) ;;PUSH R4 ON STACK
6628 030354 010546          MOV    R5,-(SP) ;;PUSH R5 ON STACK
6629 030356 017746 150572      MOV    @SWR,-(SP) ;;PUSH @SWR ON STACK
6630 030362 010637 030472      MOV    SP,$SAVR6 ;;SAVE SP
6631 030366 012737 030400 000024      MOV    $PWRUP,@#PWRVEC ;;SET UP VECTOR
6632 030374 000000          HALT
6633 030376 000776          BR      -2          ;;HANG UP
6634
6635          ;*****
6636          ;POWER UP ROUTINE
6637 030400 012737 030466 000024 $PWRUP: MOV    $SILLUP,@#PWRVEC ;;SET FOR FAST DOWN
6638 030406 013706 030472          MOV    $SAVR6,SP ;;GET SP
6639 030412 005037 030472          CLR    $SAVR6 ;;WAIT LOOP FOR THE TTY
6640 030416 005237 030472      1$: INC    $SAVR6 ;;WAIT FOR THE INC
6641 030422 001375          BNE    1$      ;;OF WORD
6642 030424 012677 150524      MOV    (SP)+,@SWR ;;POP STACK INTO @SWR
6643 030430 012605          MOV    (SP)+,R5 ;;POP STACK INTO R5
6644 030432 012604          MOV    (SP)+,R4 ;;POP STACK INTO R4
6645 030434 012603          MOV    (SP)+,R3 ;;POP STACK INTO R3
6646 030436 012602          MOV    (SP)+,R2 ;;POP STACK INTO R2
6647 030440 012601          MOV    (SP)+,R1 ;;POP STACK INTO R1
6648 030442 012600          MOV    (SP)+,R0 ;;POP STACK INTO R0
6649 030444 012737 030326 000024      MOV    $PWRDN,@#PWRVEC ;;SET UP THE POWER DOWN VECTOR
6650 030452 012737 000340 000026      MOV    #340,@#PWRVEC+2 ;;PRIO:7
6651 030460 104401          TYPE    ;;REPORT THE POWER FAILURE
6652 030462 030474          $PWRMG: .WORD $POWER ;;POWER FAIL MESSAGE POINTER
6653 030464 000002          RTI
6654 030466 000000          $SILLUP: HALT ;;THE POWER UP SEQUENCE WAS STARTED
6655 030470 000776          BR      -2          ;; BEFORE THE POWER DOWN WAS COMPLETE
6656 030472 000000          $SAVR6: 0 ;;PUT THE SP HERE
6657 030474 005015 047520 042527 $POWER: .ASCIZ <15><12>'POWER'
6658 030502 000122          .EVEN
6659
6660          .SBTTL APT COMMUNICATIONS ROUTINE
6661
6662          ;*****
6663 030504 112737 000001 030750 $ATY1: MOVB    #1,$FFLG ;;TO REPORT FATAL ERROR
6664 030512 112737 000001 030746 $ATY3: MOVB    #1,$MFLG ;;TO TYPE A MESSAGE
6665 030520 000403          BR      $ATYC
6666 030522 112737 000001 030750 $ATY4: MOVB    #1,$FFLG ;;TO ONLY REPORT FATAL ERROR
6667 030530          $ATYC:
6668 030530 010046          MOV    R0,-(SP) ;;PUSH R0 ON STACK
6669 030532 010146          MOV    R1,-(SP) ;;PUSH R1 ON STACK
6670 030534 105737 030746          TSTB   $MFLG ;;SHOULD TYPE A MESSAGE?
6671 030540 001450          BEQ     5$      ;;IF NOT: BR
```

```
6672 030542 122737 000001 001242      CMPB    #APTENV,$ENV      ;;OPERATING UNDER APT?
6673 030550 001031                BNE     3$                ;;IF NOT: BR
6674 030552 132737 000100 001243      BITB    #APTPOOL,$ENVM    ;;SHOULD SPOOL MESSAGES?
6675 030560 001425                BEQ     3$                ;;IF NOT: BR
6676 030562 017600 000004                MOV     @4(SP),R0        ;;GET MESSAGE ADDR.
6677 030566 062766 000002 000004      ADD     #2,4(SP)        ;;BUMP RETURN ADDR.
6678 030574 005737 001222      1$:    TST     $MSGTYPE        ;;SEE IF DONE W/ LAST XMISSION?
6679 030600 001375                BNE     1$                ;;IF NOT: WAIT
6680 030602 010037 001236                MOV     R0,$MSGAD        ;;PUT ADDR IN MAILBOX
6681 030606 105720      2$:    TSTB    (R0)+        ;;FIND END OF MESSAGE
6682 030610 001376                BNE     2$                ;;
6683 030612 163700 001236                SUB     $MSGAD,R0        ;;SUB START OF MESSAGE
6684 030616 006200                ASR     R0                ;;GET MESSAGE LGTH IN WORDS
6685 030620 010037 001240                MOV     R0,$MSGGLT        ;;PUT LENGTH IN MAILBOX
6686 030624 012737 000004 001222      MOV     #4,$MSGTYPE        ;;TELL APT TO TAKE MSG.
6687 030632 000413                BR      5$
6688 030634 017637 000004 030660 3$:    MOV     @4(SP),4$        ;;PUT MSG ADDR IN JSR LINKAGE
6689 030642 062766 000002 000004      ADD     #2,4(SP)        ;;BUMP RETURN ADDRESS
6690 030650 013746 177776                MOV     177776,-(SP)    ;;PUSH 177776 ON STACK
6691 030654 004737 025614                JSR     PC,$TYPE        ;;CALL TYPE MACRO
6692 030660 000000      4$:    .WORD    0
6693 030662      5$:
6694 030662 105737 030750      10$:   TSTB    $FFLG        ;;SHOULD REPORT FATAL ERROR?
6695 030666 001416                BEQ     12$        ;;IF NOT: BR
6696 030670 005737 001242                TST     $ENV          ;;RUNNING UNDER APT?
6697 030674 001413                BEQ     12$        ;;IF NOT: BR
6698 030676 005737 001222      11$:   TST     $MSGTYPE        ;;FINISHED LAST MESSAGE?
6699 030702 001375                BNE     11$        ;;IF NOT: WAIT
6700 030704 017637 000004 001224      MOV     @4(SP),$FATAL    ;;GET ERROR #
6701 030712 062766 000002 000004      ADD     #2,4(SP)        ;;BUMP RETURN ADDR.
6702 030720 005237 001222                INC     $MSGTYPE        ;;TELL APT TO TAKE ERROR
6703 030724 105037 030750      12$:   CLRB    $FFLG        ;;CLEAR FATAL FLAG
6704 030730 105037 030747                CLRB    $LFLG        ;;CLEAR LOG FLAG
6705 030734 105037 030746                CLRB    $MFLG        ;;CLEAR MESSAGE FLAG
6706 030740 012601                MOV     (SP)+,R1        ;;POP STACK INTO R1
6707 030742 012600                MOV     (SP)+,R0        ;;POP STACK INTO R0
6708 030744 000207                RTS     PC                ;;RETURN
6709 030746      000      $MFLG: .BYTE    0                ;;MESSG. FLAG
6710 030747      000      $LFLG: .BYTE    0                ;;LOG FLAG
6711 030750      000      $FFLG: .BYTE    0                ;;FATAL FLAG
6712      030752      .EVEN
6713      000200      APTSIZE=200
6714      000001      APTENV=001
6715      000100      APTPOOL=100
6716      000040      APTCSUP=040
6717
```

6718  
6719  
6720

.SBTTL CONSOLE MESSAGES

|        |        |        |        |                                                                               |
|--------|--------|--------|--------|-------------------------------------------------------------------------------|
| 030752 | 051    |        |        | .NLIST BEX                                                                    |
| 030753 | 075    | 000    |        | CLSPRN: .ASCII @)@                                                            |
| 030755 | 015    | 025012 | 000    | EQUALS: .ASCIZ @-@                                                            |
| 030761 | 077    | 000    |        | PROMPT: .ASCIZ <CR><LF>@*@                                                    |
| 030763 |        |        |        | QSTMRK: .ASCIZ @?@                                                            |
| 030763 | 015    | 052012 | 050131 | HELPQST:                                                                      |
| 031017 |        |        |        | .ASCIZ <CR><LF>@TYPE HELP TEXT (Y OR N)??@                                    |
| 031017 | 015    | 041412 | 040510 | UBUSQST:                                                                      |
| 031116 | 005015 | 051525 | 020105 | .ASCIZ <CR><LF>@CHANGE RM03 UNIBUS ADDRESS OR VECTOR ADDRESS (Y OR N)<CR> ??@ |
| 031155 | 015    | 051012 | 030115 | CNSL00: .ASCIZ <CR><LF>@USE SAME DEVICES (Y OR N) ??@                         |
| 031202 | 005015 | 047105 | 051124 | CNSL01: .ASCIZ <CR><LF>@RM03 BUS ADDRESS (@                                   |
| 031231 | 015    | 040412 | 042104 | CNSL02: .ASCII <CR><LF>@ENTRY NOT IN I/O PAGE@                                |
| 031263 | 015    | 051012 | 030115 | .ASCIZ <CR><LF>@ADDRESS MUST BE >160000@                                      |
| 031313 | 015    | 042412 | 052116 | CNSL03: .ASCIZ <CR><LF>@RM03 VECTOR ADDRESS (@                                |
| 031337 | 015    | 040412 | 042104 | CNSL04: .ASCII <CR><LF>@ENTRY OUT OF RANGE@                                   |
| 031367 | 015    | 051012 | 030115 | .ASCIZ <CR><LF>@ADDRESS MUST BE <1000@                                        |
| 031423 | 015    | 042412 | 052116 | CNSL05: .ASCIZ <CR><LF>@RM03 INTERRUPT PRIORITY (@                            |
| 031450 |        |        |        | CNSL06: .ASCIZ <CR><LF>@ENTRY OUT OF RANGE@                                   |
| 031450 | 005015 | 054524 | 042520 | CNSL07:                                                                       |
| 031526 | 047040 | 046525 | 042502 | .ASCII <CR><LF>@TYPE (A) TO TEST ALL DEVICES, OR TYPE DEVICE@                 |
| 031540 | 005015 | 042524 | 046522 | .ASCII @ NUMBER(S)@                                                           |
| 031607 | 015    | 047012 | 052117 | .ASCIZ <CR><LF>@TERMINATE INPUT WITH CARRIAGE RETURN@                         |
|        |        |        |        | NOTEX: .ASCIZ <CR><LF>/NOT EXIST DRIVE /                                      |

.LIST BEX

6721  
6722

031634

.EVEN

CZ  
CZ

|      |        |        |                                   |  |                              |
|------|--------|--------|-----------------------------------|--|------------------------------|
| 6723 |        |        |                                   |  |                              |
| 6724 | 031634 |        | FNCDTB:                           |  | :FUNCTION CODE TABLE         |
| 6725 |        |        |                                   |  |                              |
| 6726 | 031634 | 020000 | .WORD OPI                         |  | :NOP                         |
| 6727 | 031636 | 130001 | .WORD OPI!ATA!ILF!IVC             |  | :ILLEGAL FUNCTION (2)        |
| 6728 | 031640 | 132000 | .WORD ATA!OPI!IVC!IAE             |  | :SEEK                        |
| 6729 | 031642 | 130000 | .WORD ATA!OPI!IVC                 |  | :RECALIBRATE                 |
| 6730 | 031644 | 020000 | .WORD OPI                         |  | :DRIVE CLEAR                 |
| 6731 | 031646 | 030000 | .WORD OPI!IVC                     |  | :RELEASE                     |
| 6732 | 031650 | 130000 | .WORD OPI!ATA!IVC                 |  | :OFFSET                      |
| 6733 | 031652 | 130000 | .WORD OPI!ATA!IVC                 |  | :RETURN TO CENTERLINE        |
| 6734 | 031654 | 020000 | .WORD OPI                         |  | :READ IN PRESET              |
| 6735 | 031656 | 020000 | .WORD OPI                         |  | :PACK ACKNOWLEDGE            |
| 6736 | 031660 | 130001 | .WORD OPI!ATA!ILF!IVC             |  | :ILLEGAL FUNCTION (24)       |
| 6737 | 031662 | 130001 | .WORD OPI!ATA!ILF!IVC             |  | :ILLEGAL FUNCTION (26)       |
| 6738 | 031664 | 132000 | .WORD ATA!OPI!IVC!IAE             |  | :SEARCH                      |
| 6739 | 031666 | 130001 | .WORD OPI!ATA!ILF!IVC             |  | :ILLEGAL FUNCTION (32)       |
| 6740 | 031670 | 130001 | .WORD OPI!ATA!ILF!IVC             |  | :ILLEGAL FUNCTION (34)       |
| 6741 | 031672 | 130001 | .WORD OPI!ATA!ILF!IVC             |  | :ILLEGAL FUNCTION (36)       |
| 6742 | 031674 | 130001 | .WORD OPI!ATA!ILF!IVC             |  | :ILLEGAL FUNCTION (40)       |
| 6743 | 031676 | 130001 | .WORD OPI!ATA!ILF!IVC             |  | :ILLEGAL FUNCTION (42)       |
| 6744 | 031700 | 130001 | .WORD OPI!ATA!ILF!IVC             |  | :ILLEGAL FUNCTION (44)       |
| 6745 | 031702 | 130001 | .WORD OPI!ATA!ILF!IVC             |  | :ILLEGAL FUNCTION (46)       |
| 6746 | 031704 | 073300 | .WORD WCE!OPI!IVC!IAE!AOE!HCE!ECH |  | :WRITE CHECK DATA            |
| 6747 | 031706 | 073300 | .WORD WCE!OPI!IVC!IAE!AOE!HCE!ECH |  | :WRITE CHECK HEADER AND DATA |
| 6748 | 031710 | 130001 | .WORD OPI!ATA!ILF!IVC             |  | :ILLEGAL FUNCTION (54)       |
| 6749 | 031712 | 130001 | .WORD OPI!ATA!ILF!IVC             |  | :ILLEGAL FUNCTION (56)       |
| 6750 | 031714 | 037200 | .WORD OPI!IVC!WLE!IAE!AOE!HCE     |  | :WRITE DATA                  |
| 6751 | 031716 | 037000 | .WORD OPI!IVC!WLE!IAE!AOE         |  | :WRITE HEADER AND DATA       |
| 6752 | 031720 | 130001 | .WORD OPI!ATA!ILF!IVC             |  | :ILLEGAL FUNCTION (64)       |
| 6753 | 031722 | 130001 | .WORD OPI!ATA!ILF!IVC             |  | :ILLEGAL FUNCTION (66)       |
| 6754 | 031724 | 033300 | .WORD OPI!IVC!IAE!AOE!HCE!ECH     |  | :READ DATA                   |
| 6755 | 031726 | 033300 | .WORD OPI!IVC!IAE!AOE!HCE!ECH     |  | :READ HEADER AND DATA        |
| 6756 | 031730 | 130001 | .WORD OPI!ATA!ILF!IVC             |  | :ILLEGAL FUNCTION (74)       |
| 6757 | 031732 | 130001 | .WORD OPI!ATA!ILF!IVC             |  | :ILLEGAL FUNCTION (76)       |
| 6758 |        |        |                                   |  |                              |
| 6759 | 031734 | 001    | ATNTBL: .BYTE 1.                  |  |                              |
| 6760 | 031735 | 002    | .BYTE 2.                          |  |                              |
| 6761 | 031736 | 004    | .BYTE 4.                          |  |                              |
| 6762 | 031737 | 010    | .BYTE 8.                          |  |                              |
| 6763 | 031740 | 020    | .BYTE 16.                         |  |                              |
| 6764 | 031741 | 040    | .BYTE 32.                         |  |                              |
| 6765 | 031742 | 100    | .BYTE 64.                         |  |                              |
| 6766 | 031743 | 200    | .BYTE 128.                        |  |                              |
| 6767 |        |        |                                   |  |                              |

6768 .EVEN  
6769  
6770 031744 046454 040042 000000 EMT1: .WORD EMS300,EMS1,0  
6771 031752 046472 046515 046542 EMT2: .WORD EMS301,EMS302,EMS303,EMS1,EMS304  
6772 031760 040042 046553  
6773 031764 051724 051145 051305 .WORD EMS511,EMS500,EMS501,EMS502,EMS503,0  
6774 031772 051332 051401 000000  
6775 032000 046472 046562 046515 EMT3: .WORD EMS301,EMS306,EMS302  
6776 032006 051724 051451 051305 .WORD EMS511,EMS505,EMS501,EMS502,0  
6777 032014 051332 000000  
6778 032020 046454 046515 046576 EMT4: .WORD EMS300,EMS302,EMS307,EMS2  
6779 032026 040113  
6780 032030 051724 051332 051305 .WORD EMS511,EMS502,EMS501,EMS503,0  
6781 032036 051401 000000  
6782 032042 046472 046637 046654 EMT5: .WORD EMS301,EMS310,EMS311  
6783 032050 051724 051332 051305 .WORD EMS511,EMS502,EMS501,EMS503,EMS504  
6784 032056 051401 051425  
6785 032062 046720 000000 .WORD EMS312,0  
6786 032066 046472 046562 046654 EMT6: .WORD EMS301,EMS306,EMS311  
6787 032074 051724 051332 051305 .WORD EMS511,EMS502,EMS501,EMS503,EMS504,0  
6788 032102 051401 051425 000000  
6789 032110 046472 046756 046515 EMT7: .WORD EMS301,EMS313,EMS302  
6790 032116 051724 051305 051332 .WORD EMS511,EMS501,EMS502,EMS504,EMS503,0  
6791 032124 051425 051401 000000  
6792 032132 047064 047105 047007 EMT10: .WORD EMS316,EMS317,EMS314  
6793 032140 051724 051305 051332 .WORD EMS511,EMS501,EMS502,0  
6794 032146 000000  
6795 032150 047064 047105 047036 EMT11: .WORD EMS316,EMS317,EMS315  
6796 032156 051724 051305 051332 .WORD EMS511,EMS501,EMS502,0  
6797 032164 000000  
6798 032166 047064 047125 047007 EMT12: .WORD EMS316,EMS320,EMS314  
6799 032174 051724 051305 051332 .WORD EMS511,EMS501,EMS502,0  
6800 032202 000000  
6801 032204 047064 047125 047036 EMT13: .WORD EMS316,EMS320,EMS315  
6802 032212 051724 051305 051332 .WORD EMS511,EMS501,EMS502,0  
6803 032220 000000  
6804 032222 047064 047145 047007 EMT14: .WORD EMS316,EMS321,EMS314  
6805 032230 051724 051305 051332 .WORD EMS511,EMS501,EMS502,0  
6806 032236 000000  
6807 032240 047064 047145 047036 EMT15: .WORD EMS316,EMS321,EMS315  
6808 032246 051724 051305 051332 .WORD EMS511,EMS501,EMS502,0  
6809 032254 000000  
6810 032256 047064 047165 047007 EMT16: .WORD EMS316,EMS322,EMS314  
6811 032264 051724 051305 051332 .WORD EMS511,EMS501,EMS502,0  
6812 032272 000000  
6813 032274 047064 047165 047036 EMT17: .WORD EMS316,EMS322,EMS315  
6814 032302 051724 051305 051332 .WORD EMS511,EMS501,EMS502,0  
6815 032310 000000  
6816 032312 044446 047404 047462 EMT20: .WORD EMS71,EMS335,EMS340,EMS72,EMS377,EMS372  
6817 032320 044525 050504 050365  
6818 032326 051724 051401 000000 .WORD EMS511,EMS503,0  
6819 032334 044446 047427 047462 EMT21: .WORD EMS71,EMS336,EMS340,EMS72,EMS400,EMS372  
6820 032342 044525 050515 050365  
6821 032350 051724 051401 000000 .WORD EMS511,EMS503,0  
6822 032356 044602 047707 044652 EMT22: .WORD EMS73,EMS352,EMS74,EMS402,EMS70,EMS406  
6823 032364 050547 044400 050646

|      |        |        |        |        |        |       |                                           |
|------|--------|--------|--------|--------|--------|-------|-------------------------------------------|
| 6824 | 032372 | 051724 | 051401 | 051425 |        | .WORD | EMS511,EMS503,EMS504,0                    |
| 6825 | 032400 | 000000 |        |        |        |       |                                           |
| 6826 | 032402 | 044602 | 047707 | 044725 | EMT23: | .WORD | EMS73,EMS352,EMS75,EMS402,EMS77,EMS406    |
| 6827 | 032410 | 050547 | 045042 | 050646 |        |       |                                           |
| 6828 | 032416 | 051724 | 051401 | 051425 |        | .WORD | EMS511,EMS503,EMS504,0                    |
| 6829 | 032424 | 000000 |        |        |        |       |                                           |
| 6830 | 032426 | 044602 | 050024 | 044725 | EMT24: | .WORD | EMS73,EMS356,EMS75,EMS402,EMS77,EMS377    |
| 6831 | 032434 | 050547 | 045042 | 050504 |        |       |                                           |
| 6832 | 032442 | 051724 | 051401 | 051425 |        | .WORD | EMS511,EMS503,EMS504,0                    |
| 6833 | 032450 | 000000 |        |        |        |       |                                           |
| 6834 | 032452 | 044602 | 047404 | 047462 | EMT25: | .WORD | EMS73,EMS335,EMS340,EMS76,EMS411          |
| 6835 | 032460 | 045001 | 050710 |        |        |       |                                           |
| 6836 | 032464 | 051724 | 051401 | 000000 |        | .WORD | EMS511,EMS503,0                           |
| 6837 | 032472 | 046472 | 046562 | 046044 | EMT26: | .WORD | EMS301,EMS306,EMS252,EMS253,EMS327,EMS254 |
| 6838 | 032500 | 046077 | 047265 | 046132 |        |       |                                           |
| 6839 | 032506 | 051724 | 051401 | 051305 |        | .WORD | EMS511,EMS503,EMS501,EMS502               |
| 6840 | 032514 | 051332 |        |        |        |       |                                           |
| 6841 | 032516 | 047273 | 047007 | 000000 |        | .WORD | EMS330,EMS314,0                           |
| 6842 | 032524 | 047446 | 044602 | 050701 | EMT27: | .WORD | EMS337,EMS73,EMS410,EMS76,EMS411          |
| 6843 | 032532 | 045001 | 050710 |        |        |       |                                           |
| 6844 | 032536 | 051724 | 051401 | 000000 |        | .WORD | EMS511,EMS503,0                           |
| 6845 | 032544 | 047446 | 045105 | 047473 | EMT30: | .WORD | EMS337,EMS100,EMS341,EMS101               |
| 6846 | 032552 | 045145 |        |        |        |       |                                           |
| 6847 | 032554 | 051724 | 051401 | 051425 |        | .WORD | EMS511,EMS503,EMS504,0                    |
| 6848 | 032562 | 000000 |        |        |        |       |                                           |
| 6849 | 032564 | 046454 | 046044 |        | EMT31: | .WORD | EMS300,EMS252                             |
| 6850 | 032570 | 051724 | 051305 | 051401 |        | .WORD | EMS511,EMS501,EMS503,0                    |
| 6851 | 032576 | 000000 |        |        |        |       |                                           |
| 6852 | 032600 | 045105 | 050321 |        | EMT32: | .WORD | EMS100,EMS370                             |
| 6853 | 032604 | 051724 | 051425 | 000000 |        | .WORD | EMS511,EMS504,0                           |
| 6854 | 032612 | 045105 | 050726 |        | EMT33: | .WORD | EMS100,EMS412                             |
| 6855 | 032616 | 051724 | 051425 | 000000 |        | .WORD | EMS511,EMS504,0                           |
| 6856 | 032624 | 045221 | 050726 |        | EMT34: | .WORD | EMS102,EMS412                             |
| 6857 | 032630 | 051724 | 051401 | 000000 |        | .WORD | EMS511,EMS503,0                           |
| 6858 | 032636 | 045221 | 047427 |        | EMT35: | .WORD | EMS102,EMS336                             |
| 6859 | 032642 | 051724 | 051401 | 000000 |        | .WORD | EMS511,EMS503,0                           |
| 6860 | 032650 | 045105 | 047404 | 047462 | EMT36: | .WORD | EMS100,EMS335,EMS340,EMS102,EMS334        |
| 6861 | 032656 | 045221 | 047374 |        |        |       |                                           |
| 6862 | 032662 | 051724 | 051425 | 000000 |        | .WORD | EMS511,EMS504,0                           |
| 6863 | 032670 | 045105 | 047404 | 047462 | EMT37: | .WORD | EMS100,EMS335,EMS340,EMS102,EMS377,EMS365 |
| 6864 | 032676 | 045221 | 050504 | 050221 |        |       |                                           |
| 6865 | 032704 | 050742 | 045327 | 050776 |        | .WORD | EMS413,EMS104,EMS415                      |
| 6866 | 032712 | 051724 | 051425 | 000000 |        | .WORD | EMS511,EMS504,0                           |
| 6867 | 032720 | 045105 | 047427 | 047462 | EMT40: | .WORD | EMS100,EMS336,EMS340,EMS416,EMS104,EMS415 |
| 6868 | 032726 | 051016 | 045327 | 050776 |        |       |                                           |
| 6869 | 032734 | 051724 | 051425 | 000000 |        | .WORD | EMS511,EMS504,0                           |
| 6870 | 032742 | 045105 | 047427 | 047462 | EMT41: | .WORD | EMS100,EMS336,EMS340,EMS73,EMS415,EMS402  |
| 6871 | 032750 | 044602 | 050776 | 050547 |        |       |                                           |
| 6872 | 032756 | 045221 | 050515 |        |        | .WORD | EMS102,EMS400                             |
| 6873 | 032762 | 051724 | 051425 | 000000 |        | .WORD | EMS511,EMS504,0                           |
| 6874 | 032770 | 045267 | 050532 | 047265 | EMT42: | .WORD | EMS103,EMS401,EMS327,EMS370               |
| 6875 | 032776 | 050321 |        |        |        |       |                                           |
| 6876 | 033000 | 051724 | 051401 | 000000 |        | .WORD | EMS511,EMS503,0                           |
| 6877 | 033006 | 050756 | 045327 | 051030 | EMT43: | .WORD | EMS414,EMS104,EMS417                      |
| 6878 | 033014 | 051724 | 051425 | 000000 |        | .WORD | EMS511,EMS504,0                           |
| 6879 | 033022 | 045354 | 050532 | 047265 | EMT44: | .WORD | EMS105,EMS401,EMS327,EMS370               |

6880 033030 050321  
6881 033032 051724 051401 000000  
6882 033040 046454 046077 EMT45: .WORD EMS511,EMS503,0  
6883 033044 051724 051305 051401 .WORD EMS300,EMS253  
6884 033052 000000 .WORD EMS511,EMS501,EMS503,0  
6885 033054 045415 050532 051030 EMT46: .WORD EMS106,EMS401,EMS417  
6886 033062 051724 051401 000000 .WORD EMS511,EMS503,0  
6887 033070 050742 045462 051047 EMT47: .WORD EMS413,EMS107,EMS420,EMS417  
6888 033076 051030  
6889 033100 051724 051425 000000 .WORD EMS511,EMS504,0  
6890 033106 045472 050742 050636 EMT50: .WORD EMS110,EMS413,EMS405,EMS107  
6891 033114 045462  
6892 033116 051724 051401 000000 .WORD EMS511,EMS503,0  
6893 033124 047534 045531 051062 EMT51: .WORD EMS343,EMS111,EMS421  
6894 033132 051724 051425 000000 .WORD EMS511,EMS504,0  
6895 033140 050756 051016 045462 EMT52: .WORD EMS414,EMS416,EMS107,EMS421  
6896 033146 051062  
6897 033150 051724 051425 000000 .WORD EMS511,EMS504,0  
6898 033156 047312 040227 046235 EMT53: .WORD EMS331,EMS4,EMS256  
6899 033164 051724 051305 000000 .WORD EMS511,EMS501,0  
6900 033172 045547 050742 050636 EMT54: .WORD EMS112,EMS413,EMS405,EMS607  
6901 033200 052240  
6902 033202 051724 051401 000000 .WORD EMS511,EMS503,0  
6903 033210 045605 050532 047265 EMT55: .WORD EMS113,EMS401,EMS327,EMS370  
6904 033216 050321  
6905 033220 051724 051401 000000 .WORD EMS511,EMS503,0  
6906 033226 045644 050532 051030 EMT56: .WORD EMS114,EMS401,EMS417  
6907 033234 051724 051401 000000 .WORD EMS511,EMS503,0  
6908  
6909 033242 046265 047342 EMT57: .WORD EMS257,EMS332  
6910 033246 051724 051524 051305 .WORD EMS511,EMS506,EMS501,0  
6911 033254 000000  
6912  
6913 033256 040260 047360 EMT60: .WORD EMS5,EMS333  
6914 033262 051724 051561 051305 .WORD EMS511,EMS507,EMS501,0  
6915 033270 000000  
6916  
6917 033272 050742 045712 051047 EMT61: .WORD EMS413,EMS115,EMS420,EMS417  
6918 033300 051030  
6919 033302 051724 051425 000000 .WORD EMS511,EMS504,0  
6920 033310 047625 045105 047473 EMT62: .WORD EMS346,EMS100,EMS341,EMS101  
6921 033316 045145  
6922 033320 051724 051425 000000 .WORD EMS511,EMS504,0  
6923 033326 045605 050336 EMT63: .WORD EMS113,EMS371  
6924 033332 051724 051401 000000 .WORD EMS511,EMS503,0  
6925 033340 050742 045727 047723 EMT64: .WORD EMS413,EMS116,EMS353  
6926 033346 051724 051425 000000 .WORD EMS511,EMS504,0  
6927 033354 051077 047723 EMT65: .WORD EMS422,EMS353  
6928 033360 051724 051425 000000 .WORD EMS511,EMS504,0  
6929  
6930 033366 040601 047427 047502 EMT66: .WORD EMS12,EMS336,EMS342  
6931 033374 051724 051305 000000 .WORD EMS511,EMS501,0  
6932  
6933 033402 046454 040330 EMT67: .WORD EMS300,EMS6  
6934 033406 051724 051305 .WORD EMS511,EMS501  
6935 033412 040374 047360 000000 .WORD EMS7,EMS333,0

|      |        |        |        |        |         |       |                                        |
|------|--------|--------|--------|--------|---------|-------|----------------------------------------|
| 6936 |        |        |        |        |         |       |                                        |
| 6937 | 033420 | 046454 | 040330 | 047265 | EMT70:  | .WORD | EMS300,EMS6,EMS327,EMS7                |
| 6938 | 033426 | 040374 |        |        |         |       |                                        |
| 6939 | 033430 | 051724 | 051305 | 051425 |         | .WORD | EMS511,EMS501,EMS504,0                 |
| 6940 | 033436 | 000000 |        |        |         |       |                                        |
| 6941 |        |        |        |        |         |       |                                        |
| 6942 | 033440 | 040330 | 047404 | 047462 | EMT71:  | .WORD | EMS6,EMS335,EMS340,EMS10,EMS333,EMS342 |
| 6943 | 033446 | 040445 | 047360 | 047502 |         |       |                                        |
| 6944 | 033454 | 051724 | 051305 | 051332 |         | .WORD | EMS511,EMS501,EMS502,0                 |
| 6945 | 033462 | 000000 |        |        |         |       |                                        |
| 6946 |        |        |        |        |         |       |                                        |
| 6947 | 033464 | 040330 | 047427 | 047462 | EMT72:  | .WORD | EMS6,EMS336,EMS340,EMS10,EMS334,EMS342 |
| 6948 | 033472 | 040445 | 047374 | 047502 |         |       |                                        |
| 6949 | 033500 | 051724 | 051305 | 051332 |         | .WORD | EMS511,EMS501,EMS502,0                 |
| 6950 | 033506 | 000000 |        |        |         |       |                                        |
| 6951 |        |        |        |        |         |       |                                        |
| 6952 | 033510 | 046472 | 046321 | 046542 | EMT73:  | .WORD | EMS301,EMS260,EMS303,EMS11             |
| 6953 | 033516 | 040510 |        |        |         |       |                                        |
| 6954 | 033520 | 051724 | 051305 | 051332 |         | .WORD | EMS511,EMS501,EMS502,0                 |
| 6955 | 033526 | 000000 |        |        |         |       |                                        |
| 6956 |        |        |        |        |         |       |                                        |
| 6957 | 033530 | 047534 | 047550 | 047502 | EMT74:  | .WORD | EMS343,EMS344,EMS342,0                 |
| 6958 | 033536 | 000000 |        |        |         |       |                                        |
| 6959 |        |        |        |        |         |       |                                        |
| 6960 | 033540 | 046454 | 040657 |        | EMT75:  | .WORD | EMS300,EMS13                           |
| 6961 | 033544 | 051724 | 051401 | 000000 |         | .WORD | EMS511,EMS503,0                        |
| 6962 |        |        |        |        |         |       |                                        |
| 6963 | 033552 | 047625 | 040657 | 047577 | EMT76:  | .WORD | EMS346,EMS13,EMS345                    |
| 6964 | 033560 | 051724 | 051401 | 000000 |         | .WORD | EMS511,EMS503,0                        |
| 6965 |        |        |        |        |         |       |                                        |
| 6966 | 033566 | 047446 | 040657 | 047577 | EMT77:  | .WORD | EMS337,EMS13,EMS345                    |
| 6967 | 033574 | 051724 | 051401 | 000000 |         | .WORD | EMS511,EMS503,0                        |
| 6968 |        |        |        |        |         |       |                                        |
| 6969 | 033602 | 046472 | 046756 | 046132 | EMT100: | .WORD | EMS301,EMS313,EMS254,EMS347,EMS13      |
| 6970 | 033610 | 047643 | 040657 |        |         |       |                                        |
| 6971 | 033614 | 051724 | 051401 | 000000 |         | .WORD | EMS511,EMS503,0                        |
| 6972 |        |        |        |        |         |       |                                        |
| 6973 | 033622 | 047625 | 040726 | 047473 | EMT101: | .WORD | EMS346,EMS14,EMS341,EMS15              |
| 6974 | 033630 | 040773 |        |        |         |       |                                        |
| 6975 | 033632 | 051724 | 051401 | 051305 |         | .WORD | EMS511,EMS503,EMS501,0                 |
| 6976 | 033640 | 000000 |        |        |         |       |                                        |
| 6977 |        |        |        |        |         |       |                                        |
| 6978 | 033642 | 047446 | 044400 |        | EMT102: | .WORD | EMS337,EMS70                           |
| 6979 | 033646 | 051724 | 051401 | 000000 |         | .WORD | EMS511,EMS503,0                        |
| 6980 | 033654 | 046472 | 046756 | 046132 | EMT103: | .WORD | EMS301,EMS313,EMS254,EMS347,EMS15      |
| 6981 | 033662 | 047643 | 040773 |        |         |       |                                        |
| 6982 | 033666 | 051724 | 051401 |        |         | .WORD | EMS511,EMS503                          |
| 6983 | 033672 | 040726 | 047342 | 000000 |         | .WORD | EMS14,EMS332,0                         |
| 6984 |        |        |        |        |         |       |                                        |
| 6985 | 033700 | 047625 | 041132 | 047473 | EMT104: | .WORD | EMS346,EMS17,EMS341,EMS16              |
| 6986 | 033706 | 041051 |        |        |         |       |                                        |
| 6987 | 033710 | 051724 | 051401 | 051305 |         | .WORD | EMS511,EMS503,EMS501,0                 |
| 6988 | 033716 | 000000 |        |        |         |       |                                        |
| 6989 |        |        |        |        |         |       |                                        |
| 6990 | 033720 | 047446 | 041132 | 047473 | EMT105: | .WORD | EMS337,EMS17,EMS341,EMS16              |
| 6991 | 033726 | 041051 |        |        |         |       |                                        |

|      |        |        |        |        |               |                                               |
|------|--------|--------|--------|--------|---------------|-----------------------------------------------|
| 6992 | 033730 | 051724 | 051401 | 051305 | .WORD         | EMS511,EMS503,EMS501,0                        |
| 6993 | 033736 | 000000 |        |        |               |                                               |
| 6994 |        |        |        |        |               |                                               |
| 6995 | 033740 | 046472 | 046756 | 046132 | EMT106: .WORD | EMS301,EMS313,EMS254,EMS347,EMS16             |
| 6996 | 033746 | 047643 | 041051 |        |               |                                               |
| 6997 | 033752 | 051724 | 051401 |        | .WORD         | EMS511,EMS503                                 |
| 6998 | 033756 | 041132 | 047342 | 000000 | .WORD         | EMS17,EMS332,0                                |
| 6999 |        |        |        |        |               |                                               |
| 7000 | 033764 | 047625 | 041173 | 047473 | EMT107: .WORD | EMS346,EMS20,EMS341,EMS21                     |
| 7001 | 033772 | 041237 |        |        |               |                                               |
| 7002 | 033774 | 051724 | 051401 | 051305 | .WORD         | EMS511,EMS503,EMS501,0                        |
| 7003 | 034002 | 000000 |        |        |               |                                               |
| 7004 |        |        |        |        |               |                                               |
| 7005 | 034004 | 041173 | 047671 | 041237 | EMT110: .WORD | EMS20,EMS351,EMS21,EMS350,EMS22,EMS315        |
| 7006 | 034012 | 047664 | 041316 | 047036 |               |                                               |
| 7007 | 034020 | 051724 | 051305 | 000000 | .WORD         | EMS511,EMS501,0                               |
| 7008 |        |        |        |        |               |                                               |
| 7009 | 034026 | 041173 | 047374 | 047664 | EMT111: .WORD | EMS20,EMS334,EMS350,EMS22,EMS333              |
| 7010 | 034034 | 041316 | 047360 |        |               |                                               |
| 7011 | 034040 | 051724 | 051305 | 000000 | .WORD         | EMS511,EMS501,0                               |
| 7012 |        |        |        |        |               |                                               |
| 7013 | 034046 | 047446 | 041173 | 047473 | EMT112: .WORD | EMS337,EMS20,EMS341,EMS21                     |
| 7014 | 034054 | 041237 |        |        |               |                                               |
| 7015 | 034056 | 051724 | 051401 | 051305 | .WORD         | EMS511,EMS503,EMS501,0                        |
| 7016 | 034064 | 000000 |        |        |               |                                               |
| 7017 |        |        |        |        |               |                                               |
| 7018 | 034066 | 047446 | 041173 | 047473 | EMT113: .WORD | EMS337,EMS20,EMS341,EMS21,EMS350,EMS22,EMS334 |
| 7019 | 034074 | 041237 | 047664 | 041316 |               |                                               |
| 7020 | 034102 | 047374 |        |        |               |                                               |
| 7021 | 034104 | 051724 | 051305 | 000000 | .WORD         | EMS511,EMS501,0                               |
| 7022 |        |        |        |        |               |                                               |
| 7023 | 034112 | 041173 | 047707 | 041237 | EMT114: .WORD | EMS20,EMS352,EMS21,EMS350,EMS22,EMS333        |
| 7024 | 034120 | 047664 | 041316 | 047360 |               |                                               |
| 7025 | 034126 | 051724 | 051305 | 000000 | .WORD         | EMS511,EMS501,0                               |
| 7026 |        |        |        |        |               |                                               |
| 7027 | 034134 | 046472 | 046756 | 046132 | EMT115: .WORD | EMS301,EMS313,EMS254,EMS347,EMS21             |
| 7028 | 034142 | 047643 | 041237 |        |               |                                               |
| 7029 | 034146 | 051724 | 051401 |        | .WORD         | EMS511,EMS503                                 |
| 7030 | 034152 | 041173 | 047342 | 000000 | .WORD         | EMS20,EMS332,0                                |
| 7031 |        |        |        |        |               |                                               |
| 7032 | 034160 | 047625 | 041363 | 047473 | EMT116: .WORD | EMS346,EMS23,EMS341,EMS24                     |
| 7033 | 034166 | 041441 |        |        |               |                                               |
| 7034 | 034170 | 051724 | 051401 | 051305 | .WORD         | EMS511,EMS503,EMS501,0                        |
| 7035 | 034176 | 000000 |        |        |               |                                               |
| 7036 |        |        |        |        |               |                                               |
| 7037 | 034200 | 047446 | 041363 | 047473 | EMT117: .WORD | EMS337,EMS23,EMS341,EMS24                     |
| 7038 | 034206 | 041441 |        |        |               |                                               |
| 7039 | 034210 | 051724 | 051401 | 051305 | .WORD         | EMS511,EMS503,EMS501,0                        |
| 7040 | 034216 | 000000 |        |        |               |                                               |
| 7041 |        |        |        |        |               |                                               |
| 7042 | 034220 | 046472 | 046756 | 046132 | EMT120: .WORD | EMS301,EMS313,EMS254,EMS347,EMS24             |
| 7043 | 034226 | 047643 | 041441 |        |               |                                               |
| 7044 | 034232 | 051724 | 051401 |        | .WORD         | EMS511,EMS503                                 |
| 7045 | 034236 | 041363 | 047342 | 000000 | .WORD         | EMS23,EMS332,0                                |
| 7046 |        |        |        |        |               |                                               |
| 7047 | 034244 | 047625 | 041520 | 047473 | EMT121: .WORD | EMS346,EMS25,EMS341,EMS26                     |

|      |        |        |        |        |               |                                   |
|------|--------|--------|--------|--------|---------------|-----------------------------------|
| 7048 | 034252 | 041576 |        |        |               |                                   |
| 7049 | 034254 | 051724 | 051401 | 051305 | .WORD         | EMS511,EMS503,EMS501,0            |
| 7050 | 034262 | 000000 |        |        |               |                                   |
| 7051 |        |        |        |        |               |                                   |
| 7052 | 034264 | 047446 | 041520 | 047473 | EMT122: .WORD | EMS337,EMS25,EMS341,EMS26         |
| 7053 | 034272 | 041576 |        |        |               |                                   |
| 7054 | 034274 | 051724 | 051401 | 051305 | .WORD         | EMS511,EMS503,EMS501,0            |
| 7055 | 034302 | 000000 |        |        |               |                                   |
| 7056 |        |        |        |        |               |                                   |
| 7057 | 034304 | 046472 | 046756 | 046132 | EMT123: .WORD | EMS301,EMS313,EMS254,EMS347,EMS26 |
| 7058 | 034312 | 047643 | 041576 |        |               |                                   |
| 7059 | 034316 | 051724 | 051401 |        | .WORD         | EMS511,EMS503                     |
| 7060 | 034322 | 041520 | 047342 | 000000 | .WORD         | EMS25,EMS332,0                    |
| 7061 |        |        |        |        |               |                                   |
| 7062 | 034330 | 046454 | 041655 | 046576 | EMT124: .WORD | EMS300,EMS27,EMS307,EMS2          |
| 7063 | 034336 | 040113 |        |        |               |                                   |
| 7064 | 034340 | 051724 | 051401 | 000000 | .WORD         | EMS511,EMS503,0                   |
| 7065 |        |        |        |        |               |                                   |
| 7066 | 034346 | 047312 | 041655 | 047723 | EMT125: .WORD | EMS331,EMS27,EMS353               |
| 7067 | 034354 | 051724 | 051401 |        | .WORD         | EMS511,EMS503                     |
| 7068 | 034360 | 041721 | 047036 | 000000 | .WORD         | EMS30,EMS315,0                    |
| 7069 |        |        |        |        |               |                                   |
| 7070 | 034366 | 047446 | 041655 | 047473 | EMT126: .WORD | EMS337,EMS27,EMS341,EMS30         |
| 7071 | 034374 | 041721 |        |        |               |                                   |
| 7072 | 034376 | 051724 | 051401 | 000000 | .WORD         | EMS511,EMS503,0                   |
| 7073 |        |        |        |        |               |                                   |
| 7074 | 034404 | 046472 | 046756 | 046132 | EMT127: .WORD | EMS301,EMS313,EMS254,EMS347,EMS30 |
| 7075 | 034412 | 047643 | 041721 |        |               |                                   |
| 7076 | 034416 | 051724 | 051401 |        | .WORD         | EMS511,EMS503                     |
| 7077 | 034422 | 041655 | 047342 | 000000 | .WORD         | EMS27,EMS332,0                    |
| 7078 |        |        |        |        |               |                                   |
| 7079 | 034430 | 042001 | 047747 | 045742 | EMT130: .WORD | EMS31,EMS354,EMS250               |
| 7080 | 034436 | 051724 | 051425 | 051401 | .WORD         | EMS511,EMS504,EMS503,0            |
| 7081 | 034444 | 000000 |        |        |               |                                   |
| 7082 |        |        |        |        |               |                                   |
| 7083 | 034446 | 042052 | 047747 | 045742 | EMT131: .WORD | EMS32,EMS354,EMS250               |
| 7084 | 034454 | 051724 | 051425 | 051401 | .WORD         | EMS511,EMS504,EMS503,0            |
| 7085 | 034462 | 000000 |        |        |               |                                   |
| 7086 |        |        |        |        |               |                                   |
| 7087 | 034464 | 050002 | 042132 | 045742 | EMT132: .WORD | EMS355,EMS33,EMS250,EMS341,EMS30  |
| 7088 | 034472 | 047473 | 041721 |        |               |                                   |
| 7089 | 034476 | 051724 | 051425 | 000000 | .WORD         | EMS511,EMS504,0                   |
| 7090 |        |        |        |        |               |                                   |
| 7091 | 034504 | 050002 | 042171 | 045742 | EMT133: .WORD | EMS355,EMS34,EMS250,EMS341,EMS30  |
| 7092 | 034512 | 047473 | 041721 |        |               |                                   |
| 7093 | 034516 | 051724 | 051425 | 000000 | .WORD         | EMS511,EMS504,0                   |
| 7094 |        |        |        |        |               |                                   |
| 7095 | 034524 | 047312 | 040227 | 046173 | EMT134: .WORD | EMS331,EMS4,EMS255                |
| 7096 | 034532 | 051724 | 051425 | 000000 | .WORD         | EMS511,EMS504,0                   |
| 7097 |        |        |        |        |               |                                   |
| 7098 | 034540 | 042227 | 050044 | 050066 | EMT135: .WORD | EMS35,EMS357,EMS360,EMS15         |
| 7099 | 034546 | 040773 |        |        |               |                                   |
| 7100 | 034550 | 051724 | 051305 | 000000 | .WORD         | EMS511,EMS501,0                   |
| 7101 |        |        |        |        |               |                                   |
| 7102 | 034556 | 046352 | 050142 |        | EMT136: .WORD | EMS261,EMS362                     |
| 7103 | 034562 | 051724 | 051401 | 000000 | .WORD         | EMS511,EMS503,0                   |

|      |        |        |        |        |               |                                          |
|------|--------|--------|--------|--------|---------------|------------------------------------------|
| 7104 |        |        |        |        |               |                                          |
| 7105 | 034570 | 046454 | 042271 | 046576 | EMT137: .WORD | EMS300,EMS36,EMS307,EMS2                 |
| 7106 | 034576 | 040113 |        |        |               |                                          |
| 7107 | 034600 | 051724 | 051305 | 000000 | .WORD         | EMS511,EMS501,0                          |
| 7108 |        |        |        |        |               |                                          |
| 7109 | 034606 | 050002 | 042321 | 046173 | EMT140: .WORD | EMS355,EMS37,EMS255,EMS341,EMS30         |
| 7110 | 034614 | 047473 | 041721 |        |               |                                          |
| 7111 | 034620 | 051724 | 051425 | 000000 | .WORD         | EMS511,EMS504,0                          |
| 7112 |        |        |        |        |               |                                          |
| 7113 | 034626 | 047625 | 042361 | 047577 | EMT141: .WORD | EMS346,EMS40,EMS345                      |
| 7114 | 034634 | 051724 | 051425 | 000000 | .WORD         | EMS511,EMS504,0                          |
| 7115 |        |        |        |        |               |                                          |
| 7116 | 034642 | 047446 | 042361 | 047473 | EMT142: .WORD | EMS337,EMS40,EMS341,EMS30                |
| 7117 | 034650 | 041721 |        |        |               |                                          |
| 7118 | 034652 | 051724 | 051425 | 000000 | .WORD         | EMS511,EMS504,0                          |
| 7119 |        |        |        |        |               |                                          |
| 7120 | 034660 | 050163 | 046637 | 042437 | EMT143: .WORD | EMS363,EMS310,EMS41                      |
| 7121 | 034666 | 051724 | 051305 | 000000 | .WORD         | EMS511,EMS501,0                          |
| 7122 |        |        |        |        |               |                                          |
| 7123 | 034674 | 047446 | 042437 | 047473 | EMI144: .WORD | EMS337,EMS41,EMS341,EMS252,EMS327,EMS253 |
| 7124 | 034702 | 046044 | 047265 | 046077 |               |                                          |
| 7125 | 034710 | 051724 | 051305 | 000000 | .WORD         | EMS511,EMS501,0                          |
| 7126 |        |        |        |        |               |                                          |
| 7127 | 034716 | 042437 | 047747 | 050200 | EMT145: .WORD | EMS41,EMS354,EMS364,EMS252,EMS365,EMS253 |
| 7128 | 034724 | 046044 | 050221 | 046077 |               |                                          |
| 7129 | 034732 | 051724 | 051305 | 000000 | .WORD         | EMS511,EMS501,0                          |
| 7130 |        |        |        |        |               |                                          |
| 7131 | 034740 | 046472 | 046562 | 042271 | EMT146: .WORD | EMS301,EMS306,EMS36                      |
| 7132 | 034746 | 051724 | 051305 | 051401 | .WORD         | EMS511,EMS501,EMS503,0                   |
| 7133 | 034754 | 000000 |        |        |               |                                          |
| 7134 |        |        |        |        |               |                                          |
| 7135 | 034756 | 050226 | 042505 |        | EMT147: .WORD | EMS366,EMS42                             |
| 7136 | 034762 | 051724 | 051401 | 000000 | .WORD         | EMS511,EMS503,0                          |
| 7137 |        |        |        |        |               |                                          |
| 7138 | 034770 | 050251 | 047723 | 050221 | EMT150: .WORD | EMS367,EMS353,EMS365,EMS42,EMS354,EMS3   |
| 7139 | 034776 | 042505 | 047747 | 040162 |               |                                          |
| 7140 | 035004 | 051724 | 051401 | 000000 | .WORD         | EMS511,EMS503,0                          |
| 7141 |        |        |        |        |               |                                          |
| 7142 | 035012 | 047446 | 042271 |        | EMT151: .WORD | EMS337,EMS36                             |
| 7143 | 035016 | 051724 | 051305 | 000000 | .WORD         | EMS511,EMS501,0                          |
| 7144 |        |        |        |        |               |                                          |
| 7145 | 035024 | 042567 | 047747 | 042271 | EMT152: .WORD | EMS43,EMS354,EMS36                       |
| 7146 | 035032 | 051724 | 051305 | 000000 | .WORD         | EMS511,EMS501,0                          |
| 7147 |        |        |        |        |               |                                          |
| 7148 | 035040 | 050251 | 047723 | 050221 | EMT153: .WORD | EMS367,EMS353,EMS365,EMS36,EMS370        |
| 7149 | 035046 | 042271 | 050321 |        |               |                                          |
| 7150 | 035052 | 051724 | 051401 | 000000 | .WORD         | EMS511,EMS503,0                          |
| 7151 |        |        |        |        |               |                                          |
| 7152 | 035060 | 050251 | 047723 | 050221 | EMT154: .WORD | EMS367,EMS353,EMS365,EMS36,EMS371        |
| 7153 | 035066 | 042271 | 050336 |        |               |                                          |
| 7154 | 035072 | 051724 | 051401 | 000000 | .WORD         | EMS511,EMS503,0                          |
| 7155 |        |        |        |        |               |                                          |
| 7156 | 035100 | 046454 | 042640 | 046576 | EMT155: .WORD | EMS300,EMS44,EMS307,EMS2                 |
| 7157 | 035106 | 040113 |        |        |               |                                          |
| 7158 | 035110 | 051724 | 051401 | 000000 | .WORD         | EMS511,EMS503,0                          |
| 7159 |        |        |        |        |               |                                          |

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|------|--------|--------|--------|--------|---------------|----------------------------------------|
| 7160 | 035116 | 050251 | 047723 | 050221 | EMT156: .WORD | EMS367,EMS353,EMS365,EMS44,EMS354,EMS3 |
| 7161 | 035124 | 042640 | 047747 | 040162 |               |                                        |
| 7162 | 035132 | 051724 | 051401 | 000000 | .WORD         | EMS511,EMS503,0                        |
| 7163 |        |        |        |        |               |                                        |
| 7164 | 035140 | 046454 | 042701 | 046576 | EMT157: .WORD | EMS300,EMS45,EMS307,EMS2               |
| 7165 | 035146 | 040113 |        |        |               |                                        |
| 7166 | 035150 | 051724 | 051401 | 000000 | .WORD         | EMS511,EMS503,0                        |
| 7167 |        |        |        |        |               |                                        |
| 7168 | 035156 | 050251 | 047723 | 050221 | EMT160: .WORD | EMS367,EMS353,EMS365,EMS45,EMS354,EMS3 |
| 7169 | 035164 | 042701 | 047747 | 040162 |               |                                        |

7170 035172 051724 051401 051305 .WORD EMS511,EMS503,EMS501  
7171 035200 042227 047360 000000 .WORD EMS35,EMS333,0  
7172  
7173 035206 046454 042756 046576 EMT161: .WORD EMS300,EMS46,EMS307,EMS2  
7174 035214 040113  
7175 035216 051724 051401 000000 .WORD EMS511,EMS503,0  
7176  
7177 035224 047446 042756 047723 EMT162: .WORD EMS337,EMS46,EMS353  
7178 035232 051724 051401 051305 .WORD EMS511,EMS503,EMS501,0  
7179 035240 000000  
7180  
7181 035242 042227 047404 047446 EMT163: .WORD EMS35,EMS335,EMS337,EMS41,EMS334,EMS372  
7182 035250 042437 047374 050365  
7183 035256 051724 051305 000000 .WORD EMS511,EMS501,0  
7184  
7185 035264 043040 047404 047446 EMT164: .WORD EMS47,EMS335,EMS337,EMS41,EMS335,EMS372  
7186 035272 042437 047404 050365  
7187 035300 051724 051305 000000 .WORD EMS511,EMS501,0  
7188  
7189 035306 047446 042227 047265 EMT165: .WORD EMS337,EMS35,EMS327,EMS47  
7190 035314 043040  
7191 035316 051724 051305 .WORD EMS511,EMS501  
7192 035322 042437 047360 050365 .WORD EMS41,EMS333,EMS372,0  
7193 035330 000000  
7194  
7195 035332 046454 043040 046576 EMT166: .WORD EMS300,EMS47,EMS307,EMS2  
7196 035340 040113  
7197 035342 051724 051305 051401 .WORD EMS511,EMS501,EMS503,0  
7198 035350 000000  
7199  
7200 035352 043100 047404 047462 EMT167: .WORD EMS50,EMS335,EMS340,EMS36,EMS333  
7201 035360 042271 047360  
7202 035364 051724 051305 051401 .WORD EMS511,EMS501,EMS503,0  
7203 035372 000000  
7204  
7205 035374 047446 042227 EMT170: .WORD EMS337,EMS35  
7206 035400 051724 051305 000000 .WORD EMS511,EMS501,0  
7207  
7208 035406 043100 042171 040162 EMT171: .WORD EMS50,EMS34,EMS3  
7209 035414 051724 051305 000000 .WORD EMS511,EMS501,0  
7210  
7211 035422 046472 046562 043147 EMT172: .WORD EMS301,EMS306,EMS5  
7212 035430 051724 051305 051425 .WORD EMS511,EMS501,EMS504,0  
7213 035436 000000  
7214  
7215 035440 050251 047723 050221 EMT173: .WORD EMS367,EMS353,EMS365,EMS47,EMS354,EMS3  
7216 035446 043040 047747 040162  
7217 035454 051724 051305 000000 .WORD EMS511,EMS501,0  
7218  
7219 035462 046454 045742 047265 EMT174: .WORD EMS300,EMS250,EMS327,EMS255,EMS327,EMS256  
7220 035470 046173 047265 046235  
7221 035476 047473 052023 .WORD EMS341,EMS600  
7222 035502 051724 051305 000000 .WORD EMS511,EMS501,0  
7223  
7224 035510 046454 046235 047473 EMT175: .WORD EMS300,EMS256,EMS341,EMS600  
7225 035516 052023

|      |        |        |        |        |               |                                          |
|------|--------|--------|--------|--------|---------------|------------------------------------------|
| 7226 | 035520 | 051724 | 051305 | 000000 | .WORD         | EMS511,EMS501,0                          |
| 7227 |        |        |        |        |               |                                          |
| 7228 | 035526 | 046454 | 045742 | 047473 | EMT176: .WORD | EMS300,EMS250,EMS341,EMS600              |
| 7229 | 035534 | 052023 |        |        |               |                                          |
| 7230 | 035536 | 051724 | 051425 | 000000 | .WORD         | EMS511,EMS504,0                          |
| 7231 |        |        |        |        |               |                                          |
| 7232 | 035544 | 046454 | 046173 | 047473 | EMT177: .WORD | EMS300,EMS255,EMS341,EMS600              |
| 7233 | 035552 | 052023 |        |        |               |                                          |
| 7234 | 035554 | 051724 | 051425 | 000000 | .WORD         | EMS511,EMS504,0                          |
| 7235 |        |        |        |        |               |                                          |
| 7236 | 035562 | 047446 | 043216 | 047473 | EMT200: .WORD | EMS337,EMS52,EMS341,EMS601               |
| 7237 | 035570 | 052053 |        |        |               |                                          |
| 7238 | 035572 | 051724 | 051305 | 000000 | .WORD         | EMS511,EMS501,0                          |
| 7239 |        |        |        |        |               |                                          |
| 7240 | 035600 | 047625 | 043216 | 047473 | EMT201: .WORD | EMS346,EMS52,EMS341,EMS602               |
| 7241 | 035606 | 052073 |        |        |               |                                          |
| 7242 | 035610 | 051724 | 051305 | 000000 | .WORD         | EMS511,EMS501,0                          |
| 7243 |        |        |        |        |               |                                          |
| 7244 | 035616 | 047625 | 043147 | 047473 | EMT202: .WORD | EMS346,EMS51,EMS341,EMS602               |
| 7245 | 035624 | 052073 |        |        |               |                                          |
| 7246 | 035626 | 051724 | 051305 | 000000 | .WORD         | EMS511,EMS501,0                          |
| 7247 |        |        |        |        |               |                                          |
| 7248 | 035634 | 047625 | 043216 | 047577 | EMT203: .WORD | EMS346,EMS52,EMS345,EMS373,EMS255        |
| 7249 | 035642 | 050417 | 046173 |        |               |                                          |
| 7250 | 035646 | 051724 | 051425 | 051305 | .WORD         | EMS511,EMS504,EMS501,0                   |
| 7251 | 035654 | 000000 |        |        |               |                                          |
| 7252 |        |        |        |        |               |                                          |
| 7253 | 035656 | 047625 | 043216 | 047473 | EMT204: .WORD | EMS346,EMS52,EMS341,EMS27                |
| 7254 | 035664 | 041655 |        |        |               |                                          |
| 7255 | 035666 | 051724 | 051425 | 051305 | .WORD         | EMS511,EMS504,EMS501,0                   |
| 7256 | 035674 | 000000 |        |        |               |                                          |
| 7257 |        |        |        |        |               |                                          |
| 7258 | 035676 | 043257 | 047747 | 040162 | EMT205: .WORD | EMS53,EMS354,EMS3                        |
| 7259 | 035704 | 051724 | 051401 | 051332 | .WORD         | EMS511,EMS503,EMS502,EMS510,0            |
| 7260 | 035712 | 051651 | 000000 |        |               |                                          |
| 7261 |        |        |        |        |               |                                          |
| 7262 | 035716 | 047446 | 043320 | 050423 | EMT206: .WORD | EMS337,EMS54,EMS374,EMS250,EMS327,EMS255 |
| 7263 | 035724 | 045742 | 047265 | 046173 |               |                                          |
| 7264 | 035732 | 047265 | 040162 |        | .WORD         | EMS327,EMS3                              |
| 7265 | 035736 | 051724 | 051425 | 051305 | .WORD         | EMS511,EMS504,EMS501,0                   |
| 7266 | 035744 | 000000 |        |        |               |                                          |
| 7267 |        |        |        |        |               |                                          |
| 7268 | 035746 | 043320 | 047747 | 040162 | EMT207: .WORD | EMS54,EMS354,EMS3                        |
| 7269 | 035754 | 051724 | 051305 | 000000 | .WORD         | EMS511,EMS501,0                          |
| 7270 |        |        |        |        |               |                                          |
| 7271 | 035762 | 043320 | 047747 | 050200 | EMT210: .WORD | EMS54,EMS354,EMS364,EMS250               |
| 7272 | 035770 | 045742 |        |        |               |                                          |
| 7273 | 035772 | 051724 | 051425 | 000000 | .WORD         | EMS511,EMS504,0                          |
| 7274 |        |        |        |        |               |                                          |
| 7275 | 036000 | 043320 | 047747 | 050200 | EMT211: .WORD | EMS54,EMS354,EMS364,EMS255               |
| 7276 | 036006 | 046173 |        |        |               |                                          |
| 7277 | 036010 | 051724 | 051425 | 000000 | .WORD         | EMS511,EMS504,0                          |
| 7278 |        |        |        |        |               |                                          |
| 7279 | 036016 | 047446 | 043375 |        | EMT212: .WORD | EMS337,EMS55                             |
| 7280 | 036022 | 051724 | 051425 | 000000 | .WORD         | EMS511,EMS504,0                          |
| 7281 |        |        |        |        |               |                                          |

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|------|--------|--------|--------|--------|---------|-------|-------------------------------------------------|
| 7282 | 036030 | 043453 | 047374 | 047577 | EMT213: | .WORD | EMS56,EMS334,EMS345,EMS373,EMS262,EMS327,EMS251 |
| 7283 | 036036 | 050417 | 046411 | 047265 |         |       |                                                 |
| 7284 | 036044 | 046000 |        |        |         |       |                                                 |
| 7285 | 036046 | 051724 | 051305 |        |         | .WORD | EMS511,EMS501                                   |
| 7286 | 036052 | 043453 | 047404 | 000000 |         | .WORD | EMS56,EMS335,0                                  |
| 7287 |        |        |        |        |         |       |                                                 |
| 7288 | 036060 | 047446 | 043453 |        | EMT214: | .WORD | EMS337,EMS56                                    |
| 7289 | 036064 | 051724 | 051305 | 000000 |         | .WORD | EMS511,EMS501,0                                 |
| 7290 |        |        |        |        |         |       |                                                 |
| 7291 | 036072 | 043546 | 047360 | 047664 | EMT215: | .WORD | EMS57,EMS333,EMS350,EMS60,EMS334                |
| 7292 | 036100 | 043632 | 047374 |        |         |       |                                                 |
| 7293 | 036104 | 051724 | 051305 | 000000 |         | .WORD | EMS511,EMS501,0                                 |
| 7294 |        |        |        |        |         |       |                                                 |
| 7295 | 036112 | 050163 | 046562 | 040260 | EMT216: | .WORD | EMS363,EMS306,EMS5                              |
| 7296 | 036120 | 051724 | 051305 | 000000 |         | .WORD | EMS511,EMS501,0                                 |
| 7297 |        |        |        |        |         |       |                                                 |
| 7298 | 036126 | 050163 | 046562 | 043704 | EMT217: | .WORD | EMS363,EMS306,EMS61                             |
| 7299 | 036134 | 051724 | 051305 | 000000 |         | .WORD | EMS511,EMS501,0                                 |
| 7300 |        |        |        |        |         |       |                                                 |
| 7301 | 036142 | 043757 | 047360 | 050454 | EMT220: | .WORD | EMS62,EMS333,EMS375,EMS251                      |
| 7302 | 036150 | 046000 |        |        |         |       |                                                 |
| 7303 | 036152 | 051724 | 051305 | 000000 |         | .WORD | EMS511,EMS501,0                                 |
| 7304 |        |        |        |        |         |       |                                                 |
| 7305 | 036160 | 043757 | 047360 | 050470 | EMT221: | .WORD | EMS62,EMS333,EMS376,EMS262                      |
| 7306 | 036166 | 046411 |        |        |         |       |                                                 |
| 7307 | 036170 | 051724 | 051305 | 000000 |         | .WORD | EMS511,EMS501,0                                 |
| 7308 |        |        |        |        |         |       |                                                 |
| 7309 | 036176 | 043757 | 047360 | 050470 | EMT222: | .WORD | EMS62,EMS333,EMS376,EMS250                      |
| 7310 | 036204 | 045742 |        |        |         |       |                                                 |
| 7311 | 036206 | 051724 | 051305 | 000000 |         | .WORD | EMS511,EMS501,0                                 |
| 7312 |        |        |        |        |         |       |                                                 |
| 7313 | 036214 | 047625 | 043757 | 047473 | EMT223: | .WORD | EMS346,EMS62,EMS341,EMS603                      |
| 7314 | 036222 | 052134 |        |        |         |       |                                                 |
| 7315 | 036224 | 051724 | 051305 | 000000 |         | .WORD | EMS511,EMS501,0                                 |
| 7316 |        |        |        |        |         |       |                                                 |
| 7317 | 036232 | 047625 | 044040 | 050470 | EMT224: | .WORD | EMS346,EMS63,EMS376,EMS262                      |
| 7318 | 036240 | 046411 |        |        |         |       |                                                 |
| 7319 | 036242 | 051724 | 051305 | 051401 |         | .WORD | EMS511,EMS501,EMS503,0                          |
| 7320 | 036250 | 000000 |        |        |         |       |                                                 |
| 7321 |        |        |        |        |         |       |                                                 |
| 7322 | 036252 | 044040 | 047360 | 047664 | EMT225: | .WORD | EMS63,EMS333,EMS350,EMS363,EMS310,EMS262        |
| 7323 | 036260 | 050163 | 046637 | 046411 |         |       |                                                 |
| 7324 | 036266 | 051724 | 051305 | 000000 |         | .WORD | EMS511,EMS501,0                                 |
| 7325 |        |        |        |        |         |       |                                                 |
| 7326 | 036274 | 044040 | 050044 | 042271 | EMT226: | .WORD | EMS63,EMS357,EMS36,EMS372                       |
| 7327 | 036302 | 050365 |        |        |         |       |                                                 |
| 7328 | 036304 | 051724 | 051305 | 000000 |         | .WORD | EMS511,EMS501,0                                 |
| 7329 |        |        |        |        |         |       |                                                 |
| 7330 | 036312 | 044040 | 050024 | 050066 | EMT227: | .WORD | EMS63,EMS356,EMS360,EMS15                       |
| 7331 | 036320 | 040773 |        |        |         |       |                                                 |
| 7332 | 036322 | 051724 | 051305 | 000000 |         | .WORD | EMS511,EMS501,0                                 |
| 7333 |        |        |        |        |         |       |                                                 |

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|      |        |        |        |        |               |                                              |
|------|--------|--------|--------|--------|---------------|----------------------------------------------|
| 7334 | 036330 | 044040 | 050024 | 050114 | EMT230: .WORD | EMS63,EMS356,EMS361,EMS15                    |
| 7335 | 036336 | 040773 |        |        |               |                                              |
| 7336 | 036340 | 051724 | 051305 | 000000 | .WORD         | EMS511,EMS501,0                              |
| 7337 |        |        |        |        |               |                                              |
| 7338 | 036346 | 044040 | 050024 | 042437 | EMT231: .WORD | EMS63,EMS356,EMS41                           |
| 7339 | 036354 | 051724 | 051305 | 000000 | .WORD         | EMS511,EMS501,0                              |
| 7340 |        |        |        |        |               |                                              |
| 7341 | 036362 | 042437 | 050504 | 047502 | EMT232: .WORD | EMS41,EMS377,EMS342,EMS365,EMS63,EMS332      |
| 7342 | 036370 | 050221 | 044040 | 047342 |               |                                              |
| 7343 | 036376 | 051724 | 051305 | 000000 | .WORD         | EMS511,EMS501,0                              |
| 7344 |        |        |        |        |               |                                              |
| 7345 | 036404 | 050251 | 047723 | 050221 | EMT233: .WORD | EMS367,EMS353,EMS365,EMS63,EMS401            |
| 7346 | 036412 | 044040 | 050532 |        |               |                                              |
| 7347 | 036416 | 051724 | 051401 | 051305 | .WORD         | EMS511,EMS503,EMS501,0                       |
| 7348 | 036424 | 000000 |        |        |               |                                              |
| 7349 |        |        |        |        |               |                                              |
| 7350 | 036426 | 041051 | 050504 | 050365 | EMT234: .WORD | EMS16,EMS377,EMS372,EMS365,EMS64,EMS354,EMS3 |
| 7351 | 036434 | 050221 | 044100 | 047747 |               |                                              |
| 7352 | 036442 | 040162 |        |        |               |                                              |
| 7353 | 036444 | 051724 | 051401 | 051305 | .WORD         | EMS511,EMS503,EMS501,0                       |
| 7354 | 036452 | 000000 |        |        |               |                                              |
| 7355 |        |        |        |        |               |                                              |
| 7356 | 036454 | 046454 | 044150 | 046576 | FMT235: .WORD | EMS300,EMS65,FMS307,EMS2                     |
| 7357 | 036462 | 040113 |        |        |               |                                              |
| 7358 | 036464 | 051724 | 051332 | 051401 | .WORD         | EMS511,EMS502,EMS503,0                       |
| 7359 | 036472 | 000000 |        |        |               |                                              |
| 7360 |        |        |        |        |               |                                              |
| 7361 | 036474 | 043453 | 050504 | 050470 | EMT236: .WORD | EMS56,EMS377,EMS376,EMS252,EMS372,EMS350     |
| 7362 | 036502 | 046044 | 050365 | 047664 |               |                                              |
| 7363 | 036510 | 044150 | 050532 |        | .WORD         | EMS65,EMS401                                 |
| 7364 | 036514 | 051724 | 051332 | 051401 | .WORD         | EMS511,EMS502,EMS503,EMS501,0                |
| 7365 | 036522 | 051305 | 000000 |        |               |                                              |
| 7366 |        |        |        |        |               |                                              |
| 7367 | 036526 | 046454 | 044211 | 046576 | EMT237: .WORD | EMS300,EMS66,EMS307,EMS2                     |
| 7368 | 036534 | 040113 |        |        |               |                                              |

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| 7369 | 036536 | 051724 | 051305 | 051401 |         | .WORD | EMS511,EMS501,EMS503,0                         |
| 7370 | 036544 | 000000 |        |        |         |       |                                                |
| 7371 |        |        |        |        |         |       |                                                |
| 7372 | 036546 | 040773 | 050515 | 050365 | EMT240: | .WORD | EMS15,EMS400,EMS372,EMS350,EMS66,EMS401        |
| 7373 | 036554 | 047664 | 044211 | 050532 |         |       |                                                |
| 7374 | 036562 | 051724 | 051401 | 051305 |         | .WORD | EMS511,EMS503,EMS501,0                         |
| 7375 | 036570 | 000000 |        |        |         |       |                                                |
| 7376 |        |        |        |        |         |       |                                                |
| 7377 | 036572 | 044211 | 047427 | 047462 | EMT241: | .WORD | EMS66,EMS336,EMS340,EMS15,EMS406,EMS405,EMS604 |
| 7378 | 036600 | 040773 | 050646 | 050636 |         |       |                                                |
| 7379 | 036606 | 052155 |        |        |         |       |                                                |
| 7380 | 036610 | 051724 | 051401 | 000000 |         | .WORD | EMS511,EMS503,0                                |
| 7381 |        |        |        |        |         |       |                                                |
| 7382 | 036616 | 050556 | 052155 | 050547 | EMT242: | .WORD | EMS403,EMS604,EMS402,EMS21,EMS377              |
| 7383 | 036624 | 041237 | 050504 |        |         |       |                                                |
| 7384 | 036630 | 051724 | 051401 |        |         | .WORD | EMS511,EMS503                                  |
| 7385 | 036634 | 042271 | 047404 | 000000 |         | .WORD | EMS36,EMS335,0                                 |
| 7386 |        |        |        |        |         |       |                                                |
| 7387 | 036642 | 044211 | 047427 | 047462 | EMT243: | .WORD | EMS66,EMS336,EMS340,EMS26,EMS404,EMS405,EMS604 |
| 7388 | 036650 | 041576 | 050617 | 050636 |         |       |                                                |
| 7389 | 036656 | 052155 |        |        |         |       |                                                |
| 7390 | 036660 | 051724 | 051401 | 000000 |         | .WORD | EMS511,EMS503,0                                |
| 7391 |        |        |        |        |         |       |                                                |
| 7392 | 036666 | 044040 | 050532 | 050636 | EMT244: | .WORD | EMS63,EMS401,EMS405,EMS604                     |
| 7393 | 036674 | 052155 |        |        |         |       |                                                |
| 7394 | 036676 | 051724 | 051401 | 000000 |         | .WORD | EMS511,EMS503,0                                |
| 7395 |        |        |        |        |         |       |                                                |
| 7396 | 036704 | 042271 | 050321 | 050636 | EMT245: | .WORD | EMS36,EMS370,EMS405,EMS604                     |
| 7397 | 036712 | 052155 |        |        |         |       |                                                |
| 7398 | 036714 | 051724 | 051401 | 000000 |         | .WORD | EMS511,EMS503,0                                |
| 7399 |        |        |        |        |         |       |                                                |
| 7400 | 036722 | 050556 | 052155 | 050547 | EMT246: | .WORD | EMS403,EMS604,EMS402,EMS24,EMS377              |
| 7401 | 036730 | 041441 | 050504 |        |         |       |                                                |
| 7402 | 036734 | 051724 | 051401 |        |         | .WORD | EMS511,EMS503                                  |
| 7403 | 036740 | 042271 | 047404 | 000000 |         | .WORD | EMS36,EMS335,0                                 |
| 7404 |        |        |        |        |         |       |                                                |
| 7405 | 036746 | 044266 | 047342 | 050636 | EMT247: | .WORD | EMS67,EMS332,EMS405,EMS604                     |
| 7406 | 036754 | 052155 |        |        |         |       |                                                |
| 7407 | 036756 | 051724 | 051401 | 000000 |         | .WORD | EMS511,EMS503,0                                |
| 7408 |        |        |        |        |         |       |                                                |
| 7409 | 036764 | 044211 | 047427 | 047462 | EMT250: | .WORD | EMS66,EMS336,EMS340,EMS15,EMS406,EMS405,EMS605 |
| 7410 | 036772 | 040773 | 050646 | 050636 |         |       |                                                |
| 7411 | 037000 | 052202 |        |        |         |       |                                                |
| 7412 | 037002 | 051724 | 051401 | 000000 |         | .WORD | EMS511,EMS503,0                                |
| 7413 |        |        |        |        |         |       |                                                |
| 7414 | 037010 | 050556 | 052202 | 050547 | EMT251: | .WORD | EMS403,EMS605,EMS402,EMS21,EMS377              |
| 7415 | 037016 | 041237 | 050504 |        |         |       |                                                |
| 7416 | 037022 | 051724 | 051401 |        |         | .WORD | EMS511,EMS503                                  |
| 7417 | 037026 | 042271 | 047404 | 000000 |         | .WORD | EMS36,EMS335,0                                 |
| 7418 |        |        |        |        |         |       |                                                |
| 7419 | 037034 | 044211 | 047427 | 047462 | EMT252: | .WORD | EMS66,EMS336,EMS340,EMS26,EMS404,EMS405,EMS605 |
| 7420 | 037042 | 041576 | 050617 | 050636 |         |       |                                                |
| 7421 | 037050 | 052202 |        |        |         |       |                                                |
| 7422 | 037052 | 051724 | 051401 | 000000 |         | .WORD | EMS511,EMS503,0                                |
| 7423 |        |        |        |        |         |       |                                                |
| 7424 | 037060 | 044040 | 050532 | 050636 | EMT253: | .WORD | EMS63,EMS401,EMS405,EMS605                     |

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|      |        |        |        |        |               |                                                |
|------|--------|--------|--------|--------|---------------|------------------------------------------------|
| 7481 | 037410 | 040773 | 050646 | 050636 |               |                                                |
| 7482 | 037416 | 052240 |        |        |               |                                                |
| 7483 | 037420 | 051724 | 051401 | 000000 | .WORD         | EMS511,EMS503,0                                |
| 7484 |        |        |        |        |               |                                                |
| 7485 | 037426 | 050556 | 052240 | 050547 | EMT271: .WORD | EMS403,EMS607,EMS402,EMS21,EMS377              |
| 7486 | 037434 | 041237 | 050504 |        |               |                                                |
| 7487 | 037440 | 051724 | 051401 |        | .WORD         | EMS511,EMS503                                  |
| 7488 | 037444 | 041655 | 047427 | 000000 | .WORD         | EMS27,EMS336,0                                 |
| 7489 |        |        |        |        |               |                                                |
| 7490 | 037452 | 041655 | 050321 | 050636 | EMT272: .WORD | EMS27,EMS370,EMS405,EMS607                     |
| 7491 | 037460 | 052240 |        |        |               |                                                |
| 7492 | 037462 | 051724 | 051401 | 000000 | .WORD         | EMS511,EMS503,0                                |
| 7493 |        |        |        |        |               |                                                |
| 7494 | 037470 | 041655 | 050336 | 050636 | EMT273: .WORD | EMS27,EMS371,EMS405,EMS607                     |
| 7495 | 037476 | 052240 |        |        |               |                                                |
| 7496 | 037500 | 051724 | 051401 | 000000 | .WORD         | EMS511,EMS503,0                                |
| 7497 |        |        |        |        |               |                                                |
| 7498 | 037506 | 042271 | 050617 | 050636 | EMT274: .WORD | EMS36,EMS404,EMS405,EMS607                     |
| 7499 | 037514 | 052240 |        |        |               |                                                |
| 7500 | 037516 | 051724 | 051401 | 000000 | .WORD         | EMS511,EMS503,0                                |
| 7501 |        |        |        |        |               |                                                |
| 7502 | 037524 | 043257 | 050532 | 050636 | EMT275: .WORD | EMS53,EMS401,EMS405,EMS607                     |
| 7503 | 037532 | 052240 |        |        |               |                                                |
| 7504 | 037534 | 051724 | 051401 | 051332 | .WORD         | EMS511,EMS503,EMS502,0                         |
| 7505 | 037542 | 000000 |        |        |               |                                                |
| 7506 |        |        |        |        |               |                                                |
| 7507 | 037544 | 044266 | 047342 | 050636 | EMT276: .WORD | EMS67,EMS332,EMS405,EMS607                     |
| 7508 | 037552 | 052240 |        |        |               |                                                |
| 7509 | 037554 | 051724 | 051401 | 000000 | .WORD         | EMS511,EMS503,0                                |
| 7510 |        |        |        |        |               |                                                |
| 7511 | 037562 | 044211 | 047427 | 047462 | EMT277: .WORD | EMS66,EMS336,EMS340,EMS26,EMS404,EMS405,EMS607 |
| 7512 | 037570 | 041576 | 050617 | 050636 |               |                                                |
| 7513 | 037576 | 052240 |        |        |               |                                                |
| 7514 | 037600 | 051724 | 051401 | 000000 | .WORD         | EMS511,EMS503,0                                |
| 7515 |        |        |        |        |               |                                                |
| 7516 | 037606 | 050556 | 052240 | 050547 | EMT300: .WORD | EMS403,EMS607,EMS402,EMS24,EMS377              |
| 7517 | 037614 | 041441 | 050504 |        |               |                                                |
| 7518 | 037620 | 051724 | 051401 |        | .WORD         | EMS511,EMS503                                  |
| 7519 | 037624 | 041655 | 047427 | 000000 | .WORD         | EMS27,EMS336,0                                 |
| 7520 |        |        |        |        |               |                                                |
| 7521 | 037632 | 044400 | 050532 | 050636 | EMT301: .WORD | EMS70,EMS401,EMS405,EMS607                     |
| 7522 | 037640 | 052240 |        |        |               |                                                |
| 7523 | 037642 | 051724 | 051401 | 000000 | .WORD         | EMS511,EMS503,0                                |
| 7524 |        |        |        |        |               |                                                |
| 7525 | 037650 | 052256 | 000000 |        | EHT1: .WORD   | EH1,0                                          |
| 7526 | 037654 | 052335 | 000000 |        | EHT2: .WORD   | EH2,0                                          |
| 7527 | 037660 | 052353 | 000000 |        | EHT5: .WORD   | EH5,0                                          |
| 7528 | 037664 | 052412 | 000000 |        | EHT7: .WORD   | EH7,0                                          |
| 7529 | 037670 | 052431 | 000000 |        | EHT47: .WORD  | EH47,0                                         |
| 7530 | 037674 | 052457 | 000000 |        | EHT52: .WORD  | EH52,0                                         |
| 7531 | 037700 | 052556 | 000000 |        | EHT57: .WORD  | EH57,0                                         |
| 7532 | 037704 | 052655 | 000000 |        | EHT61: .WORD  | EH61,0                                         |
| 7533 | 037710 | 052713 | 000000 |        | EHT65: .WORD  | EH65,0                                         |
| 7534 | 037714 | 052770 | 000000 |        | EHT71: .WORD  | EH71,0                                         |
| 7535 | 037720 | 052344 | 000000 |        | EHT74: .WORD  | EH3,0                                          |
| 7536 | 037724 | 053046 | 000000 |        | EHT115: .WORD | EH115,0                                        |

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CONSOLE MESSAGES

SEQ 0150

EHT1: .WORD EH1,0  
EHT2: .WORD EH2,0  
EHT5: .WORD EH5,0  
EHT7: .WORD EH7,0  
EHT47: .WORD EH47,0  
EHT52: .WORD EH52,0  
EHT57: .WORD EH57,0  
EHT61: .WORD EH61,0  
EHT65: .WORD EH65,0  
EHT71: .WORD EH71,0  
EHT74: .WORD EH3,0  
EHT115: .WORD EH115,0

|      |        |        |        |         |       |         |
|------|--------|--------|--------|---------|-------|---------|
| 7537 | 037730 | 053144 | 000000 | EHT130: | .WORD | EH130,0 |
| 7538 | 037734 | 053263 | 000000 | EHT132: | .WORD | EH132,0 |
| 7539 | 037740 | 053362 | 000000 | EHT145: | .WORD | EH145,0 |
| 7540 | 037744 | 053500 | 000000 | EHT150: | .WORD | EH150,0 |
| 7541 | 037750 | 053577 | 000000 | EHT213: | .WORD | EH213,0 |
| 7542 | 037754 | 053675 | 000000 | EHT220: | .WORD | EH220,0 |
| 7543 |        |        |        |         |       |         |
| 7544 | 037760 | 053734 |        | EDT1:   | .WORD | ED1     |
| 7545 | 037762 | 053744 |        | EDT2:   | .WORD | ED2     |
| 7546 | 037764 | 053750 |        | EDT5:   | .WORD | ED5     |
| 7547 | 037766 | 053756 |        | EDT47:  | .WORD | ED47    |
| 7548 | 037770 | 053766 |        | EDT52:  | .WORD | ED52    |
| 7549 | 037772 | 054000 |        | EDT57:  | .WORD | ED57    |
| 7550 | 037774 | 054012 |        | EDT61:  | .WORD | ED61    |
| 7551 | 037776 | 054024 |        | EDT65:  | .WORD | ED65    |
| 7552 | 040000 | 054034 |        | EDT71:  | .WORD | ED71    |
| 7553 | 040002 | 053744 |        | EDT74:  | .WORD | ED2     |
| 7554 | 040004 | 054044 |        | EDT115: | .WORD | ED115   |
| 7555 | 040006 | 054056 |        | EDT130: | .WORD | ED130   |
| 7556 | 040010 | 054044 |        | EDT132: | .WORD | ED115   |
| 7557 | 040012 | 054072 |        | EDT220: | .WORD | ED220   |
| 7558 |        |        |        |         |       |         |
| 7559 | 040014 | 054076 |        | EFT1:   | .WORD | EF1     |
| 7560 | 040016 | 054101 |        | EFT2:   | .WORD | EF2     |
| 7561 | 040020 | 054102 |        | EFT5:   | .WORD | EF5     |
| 7562 | 040022 | 054104 |        | EFT57:  | .WORD | EF57    |
| 7563 | 040024 | 054076 |        | EFT65:  | .WORD | EF1     |
| 7564 | 040026 | 054076 |        | EFT71:  | .WORD | EF1     |
| 7565 | 040030 | 054101 |        | EFT74:  | .WORD | EF2     |
| 7566 | 040032 | 054104 |        | EFT115: | .WORD | EF57    |
| 7567 | 040034 | 054110 |        | EFT130: | .WORD | EF130   |
| 7568 | 040036 | 054104 |        | EFT132: | .WORD | EF57    |
| 7569 | 040040 | 054102 |        | EFT220: | .WORD | EF5     |
| 7570 |        |        |        |         |       |         |
| 7571 |        |        |        |         |       |         |

|        |        |        |        |        |        |                                                    |
|--------|--------|--------|--------|--------|--------|----------------------------------------------------|
| 040042 | 047516 | 042516 | 044530 | .NLIST | BEX    |                                                    |
| 040113 | 103    | 047117 | 051124 | EMS1:  | .ASCIZ | @NONEXISTENT DEVICE 'NED' (RMCS2,BIT 12) @         |
| 040162 | 052506 | 041516 | 044524 | EMS2:  | .ASCIZ | @CONTROLLER CLEAR 'CLR' (RMCS2,BIT 05) @           |
| 040227 | 125    | 052516 | 042523 | EMS3:  | .ASCIZ | @FUNCTION CODE (RMCS1, BITS 01 - 05) @             |
| 040260 | 042504 | 044526 | 042503 | EMS4:  | .ASCIZ | @UNUSED BIT POSITIONS OF @                         |
| 040330 | 040520 | 052122 | 054511 | EMS5:  | .ASCIZ | @DEVICE AVAILABLE 'DVA' (RMCS1, BIT 11) @          |
| 040374 | 040504 | 040524 | 050040 | EMS6:  | .ASCIZ | @PARTIY ERROR 'PAR' (RMER1, BIT 03) @              |
| 040445 | 120    | 051101 | 052111 | EMS7:  | .ASCIZ | @DATA PARITY ERROR 'DPE' (RMER2, BIT 03) @         |
| 040510 | 040515 | 051523 | 052502 | EMS10: | .ASCIZ | @PARITY TEST 'PAT' (RMCS2, BIT 04) @               |
| 040560 | 051050 | 041515 | 030523 | EMS11: | .ASCIZ | @MASSBUS CONTROL BUS PARITY ERROR 'MCPE' @         |
| 040601 | 111    | 046114 | 043505 |        |        | @(RMCS1, BIT 13) @                                 |
| 040657 | 104    | 040511 | 047107 | EMS12: | .ASCIZ | @ILLEGAL REGISTER ERROR 'ILR' (RMER1, BIT 01) @    |
| 040726 | 042515 | 044504 | 046525 | EMS13: | .ASCIZ | @DIAGNOSTIC MODE 'DMD' (RMMR1, BIT 00) @           |
| 040773 | 115    | 044501 | 052116 | EMS14: | .ASCIZ | @MEDIUM ON LINE 'MOL' (RMDS, BIT 12) @             |
| 041051 | 115    | 044501 | 052116 | EMS15: | .ASCIZ | @MAINTENANCE UNIT READY 'MUR' (RMMR1, BIT 09) @    |
| 041132 | 051127 | 052111 | 020105 | EMS16: | .ASCIZ | @MAINTENANCE WRITE PROTECT 'MWP' (RMMR1, BIT 03) @ |
| 041173 | 104    | 053105 | 041511 | EMS17: | .ASCIZ | @WRITE LOCK 'WRL' (RMDS, BIT 11) @                 |
| 041237 | 115    | 044501 | 052116 | EMS20: | .ASCIZ | @DEVICE CHECK 'DVC' (RMER2, BIT 07) @              |
| 041316 | 047125 | 040523 | 042506 | EMS21: | .ASCIZ | @MAINTENANCE DRIVE FAULT 'MDF' (RMMR1, BIT 06) @   |
| 041363 | 123    | 042505 | 020113 | EMS22: | .ASCIZ | @UNSAFE STATUS 'UNS' (RMER1, BIT 14) @             |
| 041441 | 115    | 044501 | 052116 | EMS23: | .ASCIZ | @SEEK INCOMPLETE STATUS 'SKI' (RMER2, BIT 14) @    |
|        |        |        |        | EMS24: | .ASCIZ | @MAINTENANCE SEEK ERROR 'MSER' (RMMR1, BIT 07) @   |

|        |        |        |        |        |         |                                                     |
|--------|--------|--------|--------|--------|---------|-----------------------------------------------------|
| 041520 | 047520 | 044523 | 044524 | EMS25: | .ASCIIZ | @POSITIONING IN PROGRESS 'PIP' (RMD5, BIT 13) @     |
| 041576 | 040515 | 047111 | 042524 | EMS26: | .ASCIIZ | @MAINTENANCE ON CYLINDER 'MOC' (RMMR1, BIT 08) @    |
| 041655 | 105    | 042116 | 047440 | EMS27: | .ASCIIZ | @END OF BLOCK 'EBL' (RMMR1, BIT 13) @               |
| 041721 | 104    | 040511 | 047107 | EMS30: | .ASCIIZ | @DIAGNOSTIC END OF BLOCK 'DEBL' (RMMR1, BIT 13) @   |
| 042001 | 114    | 051501 | 020124 | EMS31: | .ASCIIZ | @LAST SECTOR STATUS 'LS' (RMMR1, BIT 02) @          |
| 042052 | 040514 | 052123 | 051440 | EMS32: | .ASCIIZ | @LAST SECTOR/TRACK STATUS 'LST' (RMMR1, BIT 01) @   |
| 042132 | 042523 | 052103 | 051117 | EMS33: | .ASCIIZ | @SECTOR ADDRESS, BITS 00-04 OF @                    |
| 042171 | 124    | 040522 | 045503 | EMS34: | .ASCIIZ | @TRACK ADDRESS, BITS 08-10 OF @                     |
| 042227 | 126    | 046117 | 046525 | EMS35: | .ASCIIZ | @VOLUME VALID 'VV' (RMD5, BIT 06) @                 |
| 042271 | 107    | 020117 | 044502 | EMS36: | .ASCIIZ | @GO BIT (RMCS1, BIT 00) @                           |
| 042321 | 103    | 046131 | 047111 | EMS37: | .ASCIIZ | @CYLINDER ADDRESS, BIT 00-09 OF @                   |
| 042361 | 114    | 051501 | 020124 | EMS40: | .ASCIIZ | @LAST BLOCK TAKEN STATUS 'LBT' (RMD5, BIT 10) @     |
| 042437 | 103    | 046517 | 047520 | EMS41: | .ASCIIZ | @COMPOSITE ERROR 'ERR' (RMD5, BIT 14) @             |
| 042505 | 103    | 046517 | 040515 | EMS42: | .ASCIIZ | @COMMAND SEQUENCER TEST BIT 'TST' (RMMR2, BIT 12) @ |

|        |        |        |        |         |         |                                                       |
|--------|--------|--------|--------|---------|---------|-------------------------------------------------------|
| 042567 | 104    | 044522 | 042526 | EMS43:  | .ASCIIZ | @DRIVE READY STATUS 'DRY' (RMDS, BIT 07) a            |
| 042640 | 047503 | 052116 | 047111 | EMS44:  | .ASCIIZ | @CONTINUE 'CONT' (RMMR1, BIT 06) a                    |
| 042701 | 111    | 053116 | 046101 | EMS45:  | .ASCIIZ | @INVALID COMMAND ERROR 'IVC' (RMER2, BIT 12) a        |
| 042756 | 047514 | 051523 | 047440 | EMS46:  | .ASCIIZ | @LOSS OF SYSTEM CLOCK ERROR 'LSC' (RMER2, BIT 11) a   |
| 043040 | 041517 | 052503 | 044520 | EMS47:  | .ASCIIZ | @OCCUPIED 'OCC' (RMMR1, BIT 15) a                     |
| 043100 | 046111 | 042514 | 040507 | EMS50:  | .ASCIIZ | @ILLEGAL FUNCTION 'ILF' (RMER1, BIT 0) a              |
| 043147 | 117    | 043106 | 042523 | EMS51:  | .ASCIIZ | @OFFSET DIRECTION 'OFD' (RMOF, BIT 07) a              |
| 043216 | 043117 | 051506 | 052105 | EMS52:  | .ASCIIZ | @OFFSET MODE 'OM' (RMDS, BIT 00) a                    |
| 043257 | 122    | 047125 | 040440 | EMS53:  | .ASCIIZ | @RUN AND GO 'RG' (RMMR1, BIT 14) a                    |
| 043320 | 047111 | 040526 | 044514 | EMS54:  | .ASCIIZ | @INVALID ADDRESS ERROR 'IAE' (RMER1, BIT 10) a        |
| 043375 | 101    | 042104 | 042522 | EMS55:  | .ASCIIZ | @ADDRESS OVERFLOW ERROR 'AOE' (RMER1, BIT 09) a       |
| 043453 | 122    | 043505 | 051511 | EMS56:  | .ASCII  | @REGISTER MODIFICATION REFUSED ERROR a                |
| 043517 | 042    | 046522 | 021122 |         | .ASCIIZ | @'RMR' (RMER1, BIT 02) a                              |
| 043546 | 051104 | 053111 | 020105 | EMS57:  | .ASCIIZ | @DRIVE REQUEST REQUIRED STATUS 'DRQ' (RMDT, BIT 11) a |
| 043632 | 051120 | 043517 | 040522 | EMS60:  | .ASCIIZ | @PROGRAMMABLE STATUS 'PGM' (RMDS, BIT 09) a           |
| 043704 | 051104 | 053111 | 020105 | EMS61:  | .ASCIIZ | @DRIVE PRESENT STATUS 'DPR' (RMDS, BIT 08) a          |
| 043757 | 120    | 051117 | 020124 | EMS62:  | .ASCIIZ | @PORT REQUEST FLOP 'RQA,RQB' (RMMR2, BITS 15,14) a    |
| 044040 | 052101 | 042524 | 052116 | EMS63:  | .ASCIIZ | @ATTENTION 'ATA' (RMDS, BIT 15) a                     |
| 044100 | 051127 | 052111 | 020105 | EMS64:  | .ASCIIZ | @WRITE LOCK ERROR 'WLE' (RMER1, BIT 11) a             |
| 044150 | 054105 | 042503 | 052120 | EMS65:  | .ASCIIZ | @EXCEPTION 'REX' (RMMR1, BIT 12) a                    |
| 044211 | 111    | 053116 | 046101 | EMS66:  | .ASCIIZ | @INVALID COMMAND ERROR 'IVC' (RMER2, BIT 12) a        |
| 044266 | 040524 | 020107 | 052502 | EMS67:  | .ASCIIZ | @TAG BUS (RMMR2, BITS 00-09) OR TAG CONTROL a         |
| 044342 | 044514 | 042516 | 020123 |         | .ASCIIZ | @LINES (RMMR2, BITS 10,11,13) a                       |
| 044400 | 042523 | 051101 | 044103 | EMS70:  | .ASCIIZ | @SEARCH ENABLE 'ESRC' (RMMR1, BIT 11) a               |
| 044446 | 050117 | 051105 | 052101 | EMS71:  | .ASCIIZ | @OPERATION IMCOMPLETE ERROR 'DPI' (RMER1 BIT13) a     |
| 044525 | 104    | 051511 | 041101 | EMS72:  | .ASCIIZ | @DISABLE SEARCH TIMEOUT 'DTO' (RMMR1 BIT 12) a        |
| 044602 | 051104 | 053111 | 020105 | EMS73:  | .ASCIIZ | @DRIVE TIMING ERROR 'DTE' (RMER1, BIT 12) a           |
| 044652 | 040515 | 047111 | 042524 | EMS74:  | .ASCIIZ | @MAINTENANCE INDEX PULSE 'MI' (RMMR1 BIT 2) a         |
| 044725 | 115    | 044501 | 052116 | EMS75:  | .ASCIIZ | @MAINTENANCE SECTOR PULSE 'MS' (RMMR1 BIT 5) a        |
| 045001 | 106    | 051117 | 040515 | EMS76:  | .ASCIIZ | @FORMAT BIT 'FMT16' (RMOF, BIT12) a                   |
| 045042 | 042523 | 052103 | 051117 | EMS77:  | .ASCIIZ | @SECTOR COMPARE 'MSC' (RMMR1 BIT 1) a                 |
| 045105 | 120    | 047522 | 020115 | EMS100: | .ASCIIZ | @PROM STROBE 'WC' (RMMR1 BIT 5) a                     |
| 045145 | 115    | 044501 | 052116 | EMS101: | .ASCIIZ | @MAINTENANCE BIT CLOCK 'MCLK' (RMMR1 BIT11) a         |
| 045221 | 114    | 047517 | 044513 | EMS102: | .ASCIIZ | @LOOKING FOR SYNC 'PLFS' (RMMR1, BIT10) a             |
| 045267 | 127    | 044522 | 042524 | EMS103: | .ASCIIZ | @WRITE GATE 'BB00' (RMMR2 BIT0) a                     |
| 045327 | 110    | 040505 | 042504 | EMS104: | .ASCIIZ | @HEADER SYNC PATTERN a                                |
| 045354 | 042510 | 042101 | 051105 | EMS105: | .ASCIIZ | @HEADER AREA 'PHA' (RMMR1 BIT 7) a                    |
| 045415 | 105    | 040516 | 046102 | EMS106: | .ASCIIZ | @ENABLE CRC OUT 'ECRC' (RMMR1 BIT 9) a                |
| 045462 | 042510 | 042101 | 051105 | EMS107: | .ASCIIZ | @HEADER a                                             |
| 045472 | 042522 | 042101 | 043440 | EMS110: | .ASCIIZ | @READ GATE 'BB01' (RMMR2 BIT 1) a                     |
| 045531 | 110    | 040505 | 042504 | EMS111: | .ASCIIZ | @HEADER ERROR a                                       |
| 045547 | 104    | 052101 | 020101 | EMS112: | .ASCIIZ | @DATA TIMING SEQUENCER OUTPUT a                       |
| 045605 | 104    | 052101 | 020101 | EMS113: | .ASCIIZ | @DATA AREA 'PDA' (RMMR1 BIT 8) a                      |
| 045644 | 047105 | 041101 | 042514 | EMS114: | .ASCIIZ | @ENABLE ECC OUT 'EECC' (RMMR1, BIT 4) a               |
| 045712 | 041505 | 020103 | 040520 | EMS115: | .ASCIIZ | @ECC PATTERN a                                        |
| 045727 | 105    | 041503 | 042440 | EMS116: | .ASCIIZ | @ECC ERROR a                                          |
| 045742 | 044504 | 045523 | 040440 | EMS250: | .ASCIIZ | @DISK ADDRESS REGISTER (RMDA) a                       |
| 046000 | 047503 | 052116 | 047522 | EMS251: | .ASCIIZ | @CONTROL STATUS REGISTER #1 (RMCS1) a                 |
| 046044 |        |        |        |         |         |                                                       |

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| 046352 | 042523 | 044522 | 046101 | EMS261: | .ASCII2 | @SERIAL NUMBER REGISTER (RMSN) @      |
|--------|--------|--------|--------|---------|---------|---------------------------------------|
| 046411 | 101    | 052124 | 047105 | EMS262: | .ASCII2 | @ATTENTION SUMMARY REGISTER (RMAS) @  |
| 046454 | 040503 | 047116 | 052117 | EMS300: | .ASCII2 | @CANNOT CLEAR @                       |
| 046472 | 040503 | 047116 | 052117 | EMS301: | .ASCII2 | @CANNOT WRITE/READ @                  |
| 046515 | 101    | 054516 | 042040 | EMS302: | .ASCII2 | @ANY DEVICE REGISTER @                |
| 046542 | 044527 | 044124 | 052517 | EMS303: | .ASCII2 | @WITHOUT @                            |
| 046553 | 105    | 051122 | 051117 | EMS304: | .ASCII2 | @ERROR @                              |
| 046562 | 020101 | 047117 | 020105 | EMS306: | .ASCII2 | @A ONE FROM @                         |
| 046576 | 051525 | 047111 | 020107 | EMS307: | .ASCII2 | @USING MASSBUS INITIALIZE, I.E., @    |
| 046637 | 101    | 055040 | 051105 | EMS310: | .ASCII2 | @A ZERO FROM @                        |
| 046654 | 053105 | 051105 | 020131 | EMS311: | .ASCII2 | @EVERY DEVICE REGISTER BIT POSITION @ |
| 046720 | 044124 | 020105 | 047506 | EMS312: | .ASCII2 | @THE FOLLOWING BITS ARE STUCK @       |
| 046756 | 020101 | 044123 | 043111 | EMS313: | .ASCII2 | @A SHIFTING ONE BIT FROM @            |
| 047007 | 101    | 050120 | 040505 | EMS314: | .ASCII2 | @APPEARS STUCK AT ZERO @              |
| 047036 | 050101 | 042520 | 051101 | EMS315: | .ASCII2 | @APPEARS STUCK AT ONE @               |
| 047064 | 042522 | 044507 | 052123 | EMS316: | .ASCII2 | @REGISTER SELECT @                    |
| 047105 | 061    | 024040 | 026061 | EMS317: | .ASCII2 | @1 (1,2,4,8,16) @                     |
| 047125 | 062    | 024040 | 026061 | EMS320: | .ASCII2 | @2 (1,2,4,8,16) @                     |
| 047145 | 064    | 024040 | 026061 | EMS321: | .ASCII2 | @4 (1,2,4,8,16) @                     |
| 047165 | 070    | 024040 | 026061 | EMS322: | .ASCII2 | @8 (1,2,4,8,16) @                     |
| 047205 | 101    | 046114 | 047440 | EMS323: | .ASCII2 | @ALL ONES FROM @                      |
| 047224 | 046101 | 020114 | 042532 | EMS324: | .ASCII2 | @ALL ZEROS FROM @                     |
| 047244 | 052101 | 055040 | 051105 | EMS325: | .ASCII2 | @AT ZERO @                            |
| 047255 | 101    | 020124 | 047117 | EMS326: | .ASCII2 | @AT ONE @                             |
| 047265 | 054    | 047440 | 020122 | EMS327: | .ASCII2 | @, OR @                               |
| 047273 | 015    | 041412 | 020123 | EMS330: | .ASCII2 | <CR><LF>@CS MBA CLRL @                |
| 047312 | 040503 | 047116 | 052117 | EMS331: | .ASCII2 | @CANNOT READ ZEROS FROM @             |
| 047342 | 051511 | 044440 | 041516 | EMS332: | .ASCII2 | @IS INCORRECT @                       |
| 047360 | 051511 | 047040 | 052117 | EMS333: | .ASCII2 | @IS NOT SET @                         |
| 047374 | 051511 | 051440 | 052105 | EMS334: | .ASCII2 | @IS SET @                             |
| 047404 | 044123 | 052517 | 042114 | EMS335: | .ASCII2 | @SHOULD NOT BE SET @                  |
| 047427 | 123    | 047510 | 046125 | EMS336: | .ASCII2 | @SHOULD BE SET @                      |
| 047446 | 040503 | 047116 | 052117 | EMS337: | .ASCII2 | @CANNOT SET @                         |
| 047462 | 042502 | 040503 | 051525 | EMS340: | .ASCII2 | @BECAUSE @                            |
| 047473 | 125    | 044523 | 043516 | EMS341: | .ASCII2 | @USING @                              |
| 047502 | 052504 | 044522 | 043516 | EMS342: | .ASCII2 | @DURING REGISTER TRANSFER @           |
| 047534 | 047125 | 054105 | 042520 | EMS343: | .ASCII2 | @UNEXPECTED @                         |
| 047550 | 052502 | 020123 | 044524 | EMS344: | .ASCII2 | @BUS TIMEOUT (04 TRAP) @              |
| 047577 | 102    | 020131 | 042522 | EMS345: | .ASCII2 | @BY REGISTER TRANSFER @               |
| 047625 | 103    | 047101 | 047516 | EMS346: | .ASCII2 | @CANNOT RESET @                       |
| 047643 | 127    | 052111 | 047510 | EMS347: | .ASCII2 | @WITHOUT SETTING @                    |
| 047664 | 052502 | 020124 | 000    | EMS350: | .ASCII2 | @BUT @                                |
| 047671 | 127    | 051501 | 051040 | EMS351: | .ASCII2 | @WAS RESET BY @                       |
| 047707 | 127    | 051501 | 051440 | EMS352: | .ASCII2 | @WAS SET BY @                         |
| 047723 | 111    | 020116 | 044504 | EMS353: | .ASCII2 | @IN DIAGNOSTIC MODE @                 |
| 047747 | 111    | 020123 | 047111 | EMS354: | .ASCII2 | @IS INCORRECT ACCORDING TO @          |
| 050002 | 040503 | 047116 | 052117 | EMS355: | .ASCII2 | @CANNOT INCREMENT @                   |
| 050024 | 040527 | 020123 | 047516 | EMS356: | .ASCII2 | @WAS NOT SET BY @                     |
| 050044 | 040527 | 020123 | 047516 | EMS357: | .ASCII2 | @WAS NOT RESET BY @                   |
| 050066 | 020060 | 047524 | 030440 | EMS360: | .ASCII2 | @0 TO 1 TRANSITION OF @               |
| 050114 | 020061 | 047524 | 030040 | EMS361: | .ASCII2 | @1 TO 0 TRANSITION OF @               |
| 050142 | 051511 | 044440 | 041516 | EMS362: | .ASCII2 | @IS INCONSISTENT @                    |
| 050163 | 103    | 047101 | 047516 | EMS363: | .ASCII2 | @CANNOT READ @                        |
| 050200 | 042524 | 052123 | 050040 | EMS364: |         |                                       |

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SEQ 0156

|        |        |        |        |         |         |                                         |                                                               |
|--------|--------|--------|--------|---------|---------|-----------------------------------------|---------------------------------------------------------------|
| 050321 | 122    | 051505 | 052105 | EMS370: | .ASCIIZ | @RESET EARLY @                          |                                                               |
| 050336 | 044504 | 020104 | 047516 | EMS371: | .ASCIIZ | @DID NOT RESET ON TIME @                |                                                               |
| 050365 | 104    | 051125 | 047111 | EMS372: | .ASCIIZ | @DURING COMMAND EXECUTION @             |                                                               |
| 050417 | 124    | 020117 | 000    | EMS373: | .ASCIIZ | @TO @                                   |                                                               |
| 050423 | 127    | 052111 | 020110 | EMS374: | .ASCIIZ | @WITH ANY COMBINATION OF @              |                                                               |
| 050454 | 054502 | 051040 | 040505 | EMS375: | .ASCIIZ | @BY READING @                           |                                                               |
| 050470 | 054502 | 053440 | 044522 | EMS376: | .ASCIIZ | @BY WRITING @                           |                                                               |
| 050504 | 040527 | 020123 | 042523 | EMS377: | .ASCIIZ | @WAS SET @                              |                                                               |
| 050515 | 127    | 051501 | 047040 | EMS400: | .ASCIIZ | @WAS NOT SET @                          |                                                               |
| 050532 | 044504 | 020104 | 047516 | EMS401: | .ASCIIZ | @DID NOT SET @                          |                                                               |
| 050547 | 127    | 044510 | 042514 | EMS402: | .ASCIIZ | @WHILE @                                |                                                               |
| 050556 | 047503 | 046515 | 047101 | EMS403: | .ASCIIZ | @COMMAND SEQUENCER DID NOT ABORT @      |                                                               |
| 050617 | 127    | 051501 | 047040 | EMS404: | .ASCIIZ | @WAS NOT RESET @                        |                                                               |
| 050636 | 052504 | 044522 | 043516 | EMS405: | .ASCIIZ | @DURING @                               |                                                               |
| 050646 | 040527 | 020123 | 042522 | EMS406: | .ASCIIZ | @WAS RESET @                            |                                                               |
| 050661 | 123    | 040505 | 041522 | EMS407: | .ASCIIZ | @SEARCH TIMEOUT @                       |                                                               |
| 050701 | 101    | 052106 | 051105 | EMS410: | .ASCIIZ | @AFTER @                                |                                                               |
| 050710 | 053440 | 051501 | 041440 | EMS411: | .ASCIIZ | @ WAS CHANGED @                         |                                                               |
| 050726 | 051440 | 052105 | 042440 | EMS412: | .ASCIIZ | @ SET EARLY @                           |                                                               |
| 050742 | 044440 | 041516 | 051117 | EMS413: | .ASCIIZ | @ INCORRECT @                           |                                                               |
| 050756 | 041440 | 047101 | 047516 | EMS414: | .ASCIIZ | @ CANNOT DETECT @                       |                                                               |
| 050776 | 053440 | 051501 | 051440 | EMS415: | .ASCIIZ | @ WAS SIMULATED @                       |                                                               |
| 051016 | 041440 | 051117 | 042522 | EMS416: | .ASCIIZ | @ CORRECT @                             |                                                               |
| 051030 | 042040 | 051125 | 047111 | EMS417: | .ASCIIZ | @ DURING WRITE @                        |                                                               |
| 051047 | 107    | 047105 | 051105 | EMS420: | .ASCIIZ | @GENERATED @                            |                                                               |
| 051062 | 052504 | 044522 | 043516 | EMS421: | .ASCIIZ | @DURING READ @                          |                                                               |
| 051077 | 111    | 041516 | 051117 | EMS422: | .ASCIIZ | @INCORRECT DATA TRANSFERRED TO MEMORY @ |                                                               |
| 051145 | 011    | 042504 | 044526 | EMS500: | .ASCII  | @                                       | DEVICE IS NONEXISTENT,@<CR><LF>                               |
| 051176 | 042011 | 053105 | 041511 |         | .ASCII  | @                                       | DEVICE IS SWITCHED TO OTHER PORT@<CR><LF>                     |
| 051241 | 011    | 051124 | 047101 |         | .ASCIIZ | @                                       | TRANSCEIVER ENABLE SWITCH IS OFF@<CR><LF>                     |
| 051305 | 011    | 043111 | 046440 | EMS501: | .ASCIIZ | @                                       | IF MODULE, M7686,@<CR><LF>                                    |
| 051332 | 046411 | 051501 | 041123 | EMS502: | .ASCIIZ | @                                       | MASSBUS TRANSCEIVER,M5922 OR M5923 @<CR><LF>                  |
| 051401 | 011    | 051503 | 046440 | EMS503: | .ASCIIZ | @                                       | CS MODULE,M7684,@<CR><LF>                                     |
| 051425 | 011    | 051504 | 046440 | EMS504: | .ASCIIZ | @                                       | DS MODULE,M7685,@<CR><LF>                                     |
| 051451 | 011    | 042504 | 044526 | EMS505: | .ASCIIZ | @                                       | DEVICE IS SWITCHED TO A/B PORT POSITION@<CR><LF>              |
| 051524 | 042011 | 053105 | 041511 | EMS506: | .ASCIIZ | @                                       | DEVICE IS NOT AN RM03, OR@<CR><LF>                            |
| 051561 | 011    | 042504 | 044526 | EMS507: | .ASCIIZ | @                                       | DEVICE IS SWITCHED TO PROGRAMMABLE PORT POSITION, OR@<CR><LF> |
| 051651 | 011    | 051501 | 052523 | EMS510: | .ASCIIZ | @                                       | ASSUMING THE RH CONTROLLER HAS NO FAULT@<CR><LF>              |
| 051724 | 005015 | 050011 | 047522 | EMS511: | .ASCII  | <CR><LF>@                               | PROBABLE FAULT(S):@<CR><LF>                                   |
| 051753 | 011    | 047050 | 052117 |         | .ASCIIZ | @                                       | (NOT INCLUDING CABLES OR CONNECTORS)@<CR><LF>                 |
| 052023 | 122    | 040505 | 020104 | EMS600: | .ASCIIZ | @READ IN PRESET COMMAND @               |                                                               |
| 052053 | 117    | 043106 | 042523 | EMS601: | .ASCIIZ | @OFFSET COMMAND @                       |                                                               |
| 052073 | 122    | 052105 | 051125 | EMS602: | .ASCIIZ | @RETURN TO CENTER CENTER COMMAND @      |                                                               |
| 052134 | 042522 | 042514 | 051501 | EMS603: | .ASCIIZ | @RELEASE COMMAND @                      |                                                               |
| 052155 | 122    | 041505 | 046101 | EMS604: | .ASCIIZ | @RECALIBRATE COMMAND @                  |                                                               |
| 052202 | 042523 | 045505 | 041440 | EMS605: | .ASCIIZ | @SEEK COMMAND @                         |                                                               |
| 052220 | 042523 | 051101 | 044103 | EMS606: | .ASCIIZ | @SEARCH COMMAND @                       |                                                               |
| 052240 | 040504 | 040524 | 041440 | EMS607: | .ASCIIZ | @DATA COMMAND @                         |                                                               |
| 052256 | 054105 | 041520 | 042121 | EH1:    | .ASCII  | @EXPCTD RECEVD REGSTR@<CR><LF>          |                                                               |
| 052306 | 052123 | 052101 | 051515 |         |         |                                         |                                                               |

[illegible]

```
052373      122 051505 046125      .ASCIZ @RESULT BIT(S)@
052412 054105 041520 042124 EH7:      .ASCIZ @EXPCTD RECEVD@
052431      040 044506 051522 EH47:     .ASCIZ @ FIRST SECOND CRC@
052457      105 050130 052103 EH52:     .ASCIZ @EXPCTD RECEVD EXPCTD RECEVD@<CR><LF>
052517      106 051111 052123      .ASCIZ @FIRST FIRST SECOND SECOND@
052556 047123 050107 052122 EH57:     .ASCIZ @SNGPRT DULPRT RECEVD DRVTYP@<CR><LF>
052616 051104 052126 050131      .ASCIZ @DRVTYP DRVTYP DRVTYP REGADR@
052655      040 054105 042520 EH61:     .ASCIZ @ EXPECTED ECC RECEIVED ECC@
052713      105 050130 052103 EH65:     .ASCIZ @EXPCTD RECEVD TEST@<CR><LF>
052741      123 040524 052524      .ASCIZ @STATUS STATUS REGSTR@
052770 054105 041520 042124 EH71:     .ASCIZ @EXPCTD RECEVD TEST@<CR><LF>
053017      123 040524 052524      .ASCIZ @STATUS STATUS PATTRN@
053046 054105 041520 042124 EH115:    .ASCIZ @EXPCTD RECEVD REGSTR TEST@<CR><LF>
053105      123 040524 052524      .ASCIZ @STATUS STATUS ADDRESS PATTRN@
053144 054105 041520 042124 EH130:    .ASCIZ @EXPCTD RECEVD REGSTR TEST OFFSET@<CR><LF>
053214 052123 052101 051525      .ASCIZ @STATUS STATUS ADDRESS PATTRN REGSTR@
053263      105 050130 052103 EH132:    .ASCIZ @EXPCTD ACTUAL REGSTR OFFSET@<CR><LF>
053323      103 052517 052116      .ASCIZ @COUNT COUNT ADDRESS REGSTR@
053362 054105 041520 042124 EH145:    .ASCIZ @EXPCTD ACTUAL REGSTR RMER1 RMER2@<CR><LF>
053431      103 050115 051105      .ASCIZ @CMPERR CMPERR ADDRESS PATTRN PATTRN@

053500 054105 041520 042124 EH150:    .ASCIZ @EXPCTD ACTUAL REGSTR FUNCTION@<CR><LF>
053541      122 051505 046125      .ASCIZ @RESULT RESULT ADDRESS CODE@
053577      105 050130 052103 EH213:    .ASCIZ @EXPCTD ACTUAL STATUS TEST@<CR><LF>
053636 042522 052523 052114      .ASCIZ @RESULT RESULT ADDRESS REGSTR@
053675      101 052103 040525 EH220:    .ASCIZ @ACTUAL REGSTR@<CR><LF>
053715      122 051505 046125      .ASCIZ @RESULT ADDRESS@
```

```
7572      .LIST BEX
7573      .EVEN
7573 053734 001140 001142 001136 ED1:      .WORD $GDDAT,$BDDAT,$BDADR,0
7574 053742 000000
7575 053744 001136 000000
7576 053750 001140 001142 000000 ED2:      .WORD $BDADR,0
7577 053756 001174 001176 001200 ED5:      .WORD $GDDAT,$BDDAT,0
7578 053764 000000 ED47:     .WORD $TMP0,$TMP1,$TMP2,0
7579 053766 001174 054116 001176 ED52:     .WORD $TMP0,BUFFER,$TMP1,BUFFER+2,0
7580 053774 054120 000000
7581 054000 001174 001176 001142 ED57:     .WORD $TMP0,$TMP1,$BDDAT,$BDADR,0
7582 054006 001136 000000
7583 054012 001200 001202 001174 ED61:     .WORD $TMP2,$TMP3,$TMP0,$TMP1,0
7584 054020 001176 000000
7585 054024 001140 001142 001174 ED65:     .WORD $GDDAT,$BDDAT,$TMP0,0
7586 054032 000000
7587 054034 001140 001142 001440 ED71:     .WORD $GDDAT,$BDDAT,RMHRO,0
7588 054042 000000
7589 054044 001140 001142 001136 ED115:    .WORD $GDDAT,$BDDAT,$BDADR,$TMP0,0
7590 054052 001174 000000
7591 054056 001140 001142 001136 ED130:    .WORD $GDDAT,$BDDAT,$BDADR,$TMP0,$TMP1,0
7592 054064 001174 001176 000000
7593 054072 001142 001136 ED220:    .WORD $BDDAT,$BDADR
7594
7595 054076 000 000 000 EF1:      .BYTE 0,0,0
7596 054101 000 EF2:      .BYTE 0
7597 054102 000 000 EF5:      .BYTE 0,0
7598 054104 000 000 000 EF57:     .BYTE 0,0,0,0
7599 054107 000
```

```
7600 054110 000 000 000 EF130: .BYTE 0,0,0,0,0
7601 054113 000 000
7602
7603 054116 .EVEN
7604 054116 BUFFER:
7605 054116 BUFO1E: .BLKW 258.
7606 055122 BUFTWO: .BLKW 258.
7607 054116 = BUFFER
7608 .NLIST BEX
      054116 HELP:
      054116 005015 .ASCII <CR><LF>
      054120 044514 052123 047440 .ASCII @LIST OF TESTS@<CR><LF>
      054137 055 026455 026455 .ASCII @-----@<CR><LF>
      054156 005015 .ASCII <CR><LF>
      054160 030524 052011 040522 .ASCII @T1 TRANSFER TEST@<CR><LF>
      054202 031124 041411 047524 .ASCII @T2 CTOD TEST@<CR><LF>
      054220 031524 046411 051501 .ASCII @T3 MASSBUS INITIALIZE TEST@<CR><LF>
      054254 032124 041411 042514 .ASCII @T4 CLEAR STUCK ACTIVE TEST@<CR><LF>
      054310 032524 052011 044522 .ASCII @T5 TRISTATE TRANSFER TEST@<CR><LF>
      054343 124 004466 042522 .ASCII @T6 REGISTER SELECT TEST@<CR><LF>
      054374 033524 042011 044522 .ASCII @T7 DRIVE TYPE TEST@<CR><LF>
      054420 030524 004460 042504 .ASCII @T10 DEVICE AVAILABLE TEST@<CR><LF>
      054453 124 030461 051411 .ASCII @T11 SEARCH TIMEOUT TEST@<CR><LF>
      054504 030524 004462 042523 .ASCII @T12 SET DTE TEST@<CR><LF>
      054526 030524 004463 047506 .ASCII @T13 FORMAT CHANGE TEST@<CR><LF>
      054556 030524 004464 051120 .ASCII @T14 PROM STROBE TEST@<CR><LF>
      054604 030524 004465 054523 .ASCII @T15 SYNC WORD COUNT INHIBIT TEST@<CR><LF>
      054646 030524 004466 054523 .ASCII @T16 SYNC DETECTION TEST@<CR><LF>
      054677 124 033461 040411 .ASCII @T17 ABORT SYNC DETECTION TEST@<CR><LF>
      054736 031124 004460 054523 .ASCII @T20 SYNC GENERATION TEST@<CR><LF>
      054770 031124 004461 051127 .ASCII @T21 WRITE HEADER TEST@<CR><LF>
      055017 124 031062 044011 .ASCII @T22 HEADER COMPARE TEST @<CR><LF>
      055051 124 031462 042411 .ASCII @T23 ECC GENERATION TEST@<CR><LF>
      055102 031124 004464 041505 .ASCII @T24 ECC DETECTION TEST@<CR><LF>
      055132 005015 .ASCII <CR><LF>
      055134 005015 .ASCII <CR><LF>
      055136 053523 052111 044103 .ASCII @SWITCH
      055154 026455 026455 026455 .ASCII @-----@<CR><LF>
      055212 020040 032461 004411 .ASCII @ 15 HALT ON ERROR@<CR><LF>
      055237 040 030440 004464 .ASCII @ 14 LOOP ON TEST@<CR><LF>
      055263 040 030440 004463 .ASCII @ 13 INHIBIT ERROR TYPEOUTS@<CR><LF>
      055321 040 030440 004461 .ASCII @ 11 INHIBIT ITERATIONS@<CR><LF>
      055353 040 030440 004460 .ASCII @ 10 BELL ON ERROR@<CR><LF>
      055400 020040 034440 004411 .ASCII @ 9 LOOP ON ERROR@<CR><LF>
      055425 040 020040 004470 .ASCII @ 8 LOOP ON TEST IN SWR<7:0>@<CR><LF>
      055465 040 020040 004467 .ASCII @ 7 TN128@<CR><LF>
      055502 020040 033040 004411 .ASCII @ 6 TN64@<CR><LF>
      055516 020040 032440 004411 .ASCII @ 5 TN32@<CR><LF>
      055532 020040 032040 004411 .ASCII @ 4 TN16@<CR><LF>
      055546 020040 031440 004411 .ASCII @ 3 TN8@<CR><LF>
      055561 040 020040 004462 .ASCII @ 2 TN4@<CR><LF>
      055574 020040 030440 004411 .ASCII @ 1 TN2@<CR><LF>
      055607 040 020040 004460 .ASCII @ 0 TN1@<CR><LF>
      055622 005015 000 .ASCIIZ <CR><LF>
      .LIST BEX
      .END
```

7609 000001

|                |       |       |      |
|----------------|-------|-------|------|
| ABASE = 176700 | 1359# | 1471  | 1512 |
| ACDW1 = 000000 | 1471  | 1514  |      |
| ACDW2 = 000000 | 1471  | 1515  |      |
| ACPUOP= 000000 | 1471  | 1486  |      |
| ADDW0 = 000000 | 1471  | 1516  |      |
| ADDW1 = 000000 | 1471  | 1517  |      |
| ADDW10= 000000 | 1471  |       |      |
| ADDW11 000000  | 1471  |       |      |
| ADDW12= 000000 | 1471  |       |      |
| ADDW13= 000000 | 1471  |       |      |
| ADDW14= 000000 | 1471  |       |      |
| ADDW15= 000000 | 1471  |       |      |
| ADDW2 = 000000 | 1471  | 1518  |      |
| ADDW3 = 000000 | 1471  | 1519  |      |
| ADDW4 = 000000 | 1471  | 1520  |      |
| ADDW5 = 000000 | 1471  | 1521  |      |
| ADDW6 = 000000 | 1471  | 1522  |      |
| ADDW7 = 000000 | 1471  | 1523  |      |
| ADDW8 = 000000 | 1471  |       |      |
| ADDW9 = 000000 | 1471  |       |      |
| ADEVCT= 000000 | 1471  | 1477  |      |
| ADEVN = 000000 | 1471  | 1513  |      |
| AENV = 000000  | 1471  | 1482  |      |
| AENVN = 000000 | 1471  | 1483  |      |
| AFATAL= 000000 | 1471  | 1474  |      |
| AMADR1= 000000 | 1471  | 1499  |      |
| AMADR2= 000000 | 1471  | 1503  |      |
| AMADR3= 000000 | 1471  | 1506  |      |
| AMADR4= 000000 | 1471  | 1509  |      |
| AMAMS1= 000000 | 1471  | 1493  |      |
| AMAMS2= 000000 | 1471  | 1501  |      |
| AMAMS3= 000000 | 1471  | 1504  |      |
| AMAMS4= 000000 | 1471  | 1507  |      |
| AMSGAD= 000000 | 1471  | 1479  |      |
| AMSGLG= 000000 | 1471  | 1480  |      |
| AMSGTY= 000000 | 1471  | 1473  |      |
| AMTYP1= 000000 | 1471  | 1494  |      |
| AMTYP2= 000000 | 1471  | 1502  |      |
| AMTYP3= 000000 | 1471  | 1505  |      |
| AMTYP4= 000000 | 1471  | 1508  |      |
| AOE = 001000   | 1135# | 1146  | 6746 |
| APASS = 000000 | 1471  | 1476  |      |
| APE = 100000   | 1338# |       |      |
| APRIOR= 000000 | 1471  |       |      |
| APTCU= 000040  | 6075  | 6716# |      |
| APTENV= 000001 | 6068  | 6250  | 6672 |
| APTSIZ= 000200 | 2247  | 6713# |      |
| APTSP0= 000100 | 6070  | 6674  | 6715 |
| ASWREG= 000000 | 1471  | 1484  |      |
| ATA = 100000   | 1115# | 6727  | 6728 |
|                | 6743  | 6744  | 6745 |
| ATESTN= 000000 | 1471  | 1475  |      |
| ATNMSK= 000377 | 1152# |       |      |
| ATNTBL 031734  | 2444  | 2462  | 6759 |
| AUNIT = 000000 | 1471  | 1478  |      |
| AUSWR = 000000 | 1471  | 1485  |      |

MOH

|         |        |       |       |       |       |       |       |       |       |       |      |      |      |      |  |  |  |  |  |
|---------|--------|-------|-------|-------|-------|-------|-------|-------|-------|-------|------|------|------|------|--|--|--|--|--|
| AVECT1= | 120254 | 1360# | 1471  | 1510  |       |       |       |       |       |       |      |      |      |      |  |  |  |  |  |
| AVECT2= | 000000 | 1471  | 1511  |       |       |       |       |       |       |       |      |      |      |      |  |  |  |  |  |
| A16 =   | 000400 | 1309# |       |       |       |       |       |       |       |       |      |      |      |      |  |  |  |  |  |
| A17 =   | 001000 | 1308# |       |       |       |       |       |       |       |       |      |      |      |      |  |  |  |  |  |
| BAI =   | 000010 | 1328# |       |       |       |       |       |       |       |       |      |      |      |      |  |  |  |  |  |
| BB00 =  | 000001 | 1245# | 4006  | 4020  | 4026  | 4199  | 4203  |       |       |       |      |      |      |      |  |  |  |  |  |
| BB01 =  | 000002 | 1244# | 4425  | 4428  | 4806  | 4808  |       |       |       |       |      |      |      |      |  |  |  |  |  |
| BB02 =  | 000004 | 1243# |       |       |       |       |       |       |       |       |      |      |      |      |  |  |  |  |  |
| BB03 =  | 000010 | 1242# |       |       |       |       |       |       |       |       |      |      |      |      |  |  |  |  |  |
| BB04 =  | 000020 | 1241# |       |       |       |       |       |       |       |       |      |      |      |      |  |  |  |  |  |
| BB05 =  | 000040 | 1240# |       |       |       |       |       |       |       |       |      |      |      |      |  |  |  |  |  |
| BB06 =  | 000100 | 1239# |       |       |       |       |       |       |       |       |      |      |      |      |  |  |  |  |  |
| BB07 =  | 000200 | 1238# |       |       |       |       |       |       |       |       |      |      |      |      |  |  |  |  |  |
| BB08 =  | 000400 | 1237# |       |       |       |       |       |       |       |       |      |      |      |      |  |  |  |  |  |
| BB09 =  | 001000 | 1236# |       |       |       |       |       |       |       |       |      |      |      |      |  |  |  |  |  |
| BIT0 =  | 000001 | 1031# | 2291  | 2829  | 3258  | 3260  | 4093  | 4230  | 4283  | 4782  |      |      |      |      |  |  |  |  |  |
| BIT00 = | 000001 | 1021# | 1031  | 1057  | 1106  | 1125  | 1144  | 1182  | 1202  | 1245  | 1332 | 1348 |      |      |  |  |  |  |  |
| BIT01 = | 000002 | 1020# | 1030  | 1056  | 1105  | 1143  | 1181  | 1201  | 1244  | 1331  | 1347 |      |      |      |  |  |  |  |  |
| BIT02 = | 000004 | 1019# | 1029  | 1055  | 1104  | 1142  | 1180  | 1200  | 1243  | 1330  | 1346 |      |      |      |  |  |  |  |  |
| BIT03 = | 000010 | 1018# | 1028  | 1054  | 1103  | 1141  | 1179  | 1199  | 1242  | 1257  | 1328 | 1345 |      |      |  |  |  |  |  |
| BIT04 = | 000020 | 1017# | 1027  | 1053  | 1102  | 1140  | 1198  | 1241  | 1327  |       |      |      |      |      |  |  |  |  |  |
| BIT05 = | 000040 | 1016# | 1026  | 1052  | 1139  | 1178  | 1197  | 1240  | 1326  |       |      |      |      |      |  |  |  |  |  |
| BIT06 = | 000100 | 1015# | 1025  | 1124  | 1138  | 1160  | 1177  | 1196  | 1239  | 1311  | 1325 | 1344 |      |      |  |  |  |  |  |
| BIT07 = | 000200 | 1014# | 1024  | 1123  | 1137  | 1159  | 1176  | 1195  | 1219  | 1238  | 1256 | 1310 | 1324 |      |  |  |  |  |  |
| BIT08 = | 000400 | 1013# | 1023  | 1101  | 1122  | 1136  | 1158  | 1175  | 1194  | 1237  | 1309 | 1322 | 6154 |      |  |  |  |  |  |
| BIT09 = | 001000 | 1012# | 1022  | 1100  | 1121  | 1135  | 1157  | 1174  | 1193  | 1236  | 1308 | 1321 | 6172 | 6261 |  |  |  |  |  |
| BIT1 =  | 000002 | 1030# | 2886  |       |       |       |       |       |       |       |      |      |      |      |  |  |  |  |  |
| BIT10 = | 002000 | 1011# | 1099  | 1120  | 1134  | 1156  | 1173  | 1192  | 1218  | 1235  | 1255 | 1307 | 1320 | 1343 |  |  |  |  |  |
|         |        | 6238  |       |       |       |       |       |       |       |       |      |      |      |      |  |  |  |  |  |
| BIT11 = | 004000 | 1010# | 1051  | 1119  | 1133  | 1172  | 1191  | 1209  | 1217  | 1234  | 1254 | 1319 | 1342 | 6179 |  |  |  |  |  |
| BIT12 = | 010000 | 1009# | 1118  | 1132  | 1171  | 1190  | 1216  | 1233  | 1253  | 1318  | 1341 |      |      |      |  |  |  |  |  |
| BIT13 = | 020000 | 1008# | 1117  | 1131  | 1170  | 1189  | 1208  | 1232  | 1252  | 1305  | 1317 | 1340 | 6245 |      |  |  |  |  |  |
| BIT14 = | 040000 | 1007# | 1116  | 1130  | 1169  | 1188  | 1207  | 1231  | 1251  | 1263  | 1304 | 1316 | 1339 | 6140 |  |  |  |  |  |
| BIT15 = | 100000 | 1006# | 1115  | 1129  | 1168  | 1187  | 1206  | 1230  | 1250  | 1262  | 1303 | 1315 | 1338 |      |  |  |  |  |  |
| BIT2 =  | 000004 | 1029# |       |       |       |       |       |       |       |       |      |      |      |      |  |  |  |  |  |
| BIT3 =  | 000010 | 1028# |       |       |       |       |       |       |       |       |      |      |      |      |  |  |  |  |  |
| BIT4 =  | 000020 | 1027# |       |       |       |       |       |       |       |       |      |      |      |      |  |  |  |  |  |
| BIT5 =  | 000040 | 1026# |       |       |       |       |       |       |       |       |      |      |      |      |  |  |  |  |  |
| BIT6 =  | 000100 | 1025# |       |       |       |       |       |       |       |       |      |      |      |      |  |  |  |  |  |
| BIT7 =  | 000200 | 1024# | 2286  |       |       |       |       |       |       |       |      |      |      |      |  |  |  |  |  |
| BIT8 =  | 000400 | 1023# |       |       |       |       |       |       |       |       |      |      |      |      |  |  |  |  |  |
| BIT9 =  | 001000 | 1022# |       |       |       |       |       |       |       |       |      |      |      |      |  |  |  |  |  |
| BOTADR  | 022446 | 5236* | 5254* | 5257  | 5272  | 5317# |       |       |       |       |      |      |      |      |  |  |  |  |  |
| BOTFLG  | 022450 | 5222* | 5264* | 5267  | 5270* | 5318# |       |       |       |       |      |      |      |      |  |  |  |  |  |
| BPTVEC= | 000014 | 1038# |       |       |       |       |       |       |       |       |      |      |      |      |  |  |  |  |  |
| BSE =   | 100000 | 1250# |       |       |       |       |       |       |       |       |      |      |      |      |  |  |  |  |  |
| BUFFER  | 054116 | 3316  | 3405  | 3483  | 3660  | 3798  | 3913  | 3981  | 4130  | 4325  | 4589 | 4591 | 4618 | 7579 |  |  |  |  |  |
|         |        | 7604# | 7607  |       |       |       |       |       |       |       |      |      |      |      |  |  |  |  |  |
| BUFONE  | 054116 | 4885  | 5049  | 7605# |       |       |       |       |       |       |      |      |      |      |  |  |  |  |  |
| BUFTWO  | 055122 | 7606# |       |       |       |       |       |       |       |       |      |      |      |      |  |  |  |  |  |
| CC =    | 004000 | 1234# |       |       |       |       |       |       |       |       |      |      |      |      |  |  |  |  |  |
| CH =    | 002000 | 1235# |       |       |       |       |       |       |       |       |      |      |      |      |  |  |  |  |  |
| CHRCNT  | 022451 | 5223* | 5241* | 5247* | 5248  | 5251* | 5255  | 5260* | 5271* | 5319# |      |      |      |      |  |  |  |  |  |
| CKSWR = | 104410 | 6139  | 6234  | 6260  | 6611# |       |       |       |       |       |      |      |      |      |  |  |  |  |  |
| CLKSNC  | 024522 | 4649  | 4909  | 4960  | 5772# |       |       |       |       |       |      |      |      |      |  |  |  |  |  |
| CLOCK   | 001526 | 1605# | 3328  | 3348  | 5343* | 5356* | 5367* | 5608  | 5684  |       |      |      |      |      |  |  |  |  |  |

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SEQ 0161

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DULPRT- 024024
DVA      = 004000
DVC      = 000200
EBL      = 020000
ECH      000100
ECI      - 004000
ECRC     = 001000
EDT1     037760
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|--------|--------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|------|-------|-------|--|--|--|
| EMS23  | 041363 | 7032  | 7037  | 7045  | 7571# |       |       |       |       |       |       |      |       |       |  |  |  |
| EMS24  | 041441 | 7032  | 7037  | 7042  | 7400  | 7432  | 7464  | 7516  | 7571# |       |       |      |       |       |  |  |  |
| EMS25  | 041520 | 7047  | 7052  | 7060  | 7571# |       |       |       |       |       |       |      |       |       |  |  |  |
| EMS250 | 045742 | 7079  | 7083  | 7087  | 7091  | 7219  | 7228  | 7262  | 7271  | 7309  | 7571# |      |       |       |  |  |  |
| EMS251 | 046000 | 7282  | 7301  | 7571# |       |       |       |       |       |       |       |      |       |       |  |  |  |
| EMS252 | 046044 | 6837  | 6849  | 7123  | 7127  | 7361  | 7571# |       |       |       |       |      |       |       |  |  |  |
| EMS253 | 046077 | 6837  | 6882  | 7123  | 7127  | 7571# |       |       |       |       |       |      |       |       |  |  |  |
| EMS254 | 046132 | 6837  | 6969  | 6980  | 6995  | 7027  | 7042  | 7057  | 7074  | 7571# |       |      |       |       |  |  |  |
| EMS255 | 046173 | 7095  | 7109  | 7219  | 7232  | 7248  | 7262  | 7275  | 7571# |       |       |      |       |       |  |  |  |
| EMS256 | 046235 | 6898  | 7219  | 7224  | 7571# |       |       |       |       |       |       |      |       |       |  |  |  |
| EMS257 | 046265 | 6909  | 7571# |       |       |       |       |       |       |       |       |      |       |       |  |  |  |
| EMS26  | 041576 | 7047  | 7052  | 7057  | 7387  | 7419  | 7451  | 7511  | 7571# |       |       |      |       |       |  |  |  |
| EMS260 | 046321 | 6952  | 7571# |       |       |       |       |       |       |       |       |      |       |       |  |  |  |
| EMS261 | 046352 | 7102  | 7571# |       |       |       |       |       |       |       |       |      |       |       |  |  |  |
| EMS262 | 046411 | 7282  | 7305  | 7317  | 7322  | 7571# |       |       |       |       |       |      |       |       |  |  |  |
| EMS27  | 041655 | 7062  | 7066  | 7070  | 7077  | 7253  | 7488  | 7490  | 7494  | 7519  | 7571# |      |       |       |  |  |  |
| EMS3   | 040162 | 7138  | 7160  | 7168  | 7208  | 7215  | 7258  | 7264  | 7268  | 7350  | 7571# |      |       |       |  |  |  |
| EMS30  | 041721 | 7068  | 7070  | 7074  | 7087  | 7091  | 7109  | 7116  | 7571# |       |       |      |       |       |  |  |  |
| EMS300 | 046454 | 6770  | 6778  | 6849  | 6882  | 6933  | 6937  | 6960  | 7062  | 7105  | 7156  | 7164 | 7173  | 7195  |  |  |  |
|        |        | 7219  | 7224  | 7228  | 7232  | 7356  | 7367  | 7571# |       |       |       |      |       |       |  |  |  |
| EMS301 | 046472 | 6771  | 6775  | 6782  | 6786  | 6789  | 6817  | 6952  | 6969  | 6980  | 6995  | 7027 | 7042  | 7057  |  |  |  |
|        |        | 7074  | 7131  | 7211  | 7571# |       |       |       |       |       |       |      |       |       |  |  |  |
| EMS302 | 046515 | 6771  | 6775  | 6778  | 6789  | 7571# |       |       |       |       |       |      |       |       |  |  |  |
| EMS303 | 046542 | 6771  | 6952  | 7571# |       |       |       |       |       |       |       |      |       |       |  |  |  |
| EMS304 | 046553 | 6771  | 7571# |       |       |       |       |       |       |       |       |      |       |       |  |  |  |
| EMS306 | 046562 | 6775  | 6786  | 6837  | 7131  | 7211  | 7295  | 7298  | 7571# |       |       |      |       |       |  |  |  |
| EMS307 | 046576 | 6778  | 7062  | 7105  | 7156  | 7164  | 7173  | 7195  | 7356  | 7367  | 7571# |      |       |       |  |  |  |
| EMS31  | 042001 | 7079  | 7571# |       |       |       |       |       |       |       |       |      |       |       |  |  |  |
| EMS310 | 046637 | 6782  | 7120  | 7322  | 7571# |       |       |       |       |       |       |      |       |       |  |  |  |
| EMS311 | 046654 | 6782  | 6786  | 7571# |       |       |       |       |       |       |       |      |       |       |  |  |  |
| EMS312 | 046720 | 6785  | 7571# |       |       |       |       |       |       |       |       |      |       |       |  |  |  |
| EMS313 | 046756 | 6789  | 6969  | 6980  | 6995  | 7027  | 7042  | 7057  | 7074  | 7571# |       |      |       |       |  |  |  |
| EMS314 | 047007 | 6792  | 6798  | 6804  | 6810  | 6841  | 7571# |       |       |       |       |      |       |       |  |  |  |
| EMS315 | 047036 | 6795  | 6801  | 6807  | 6813  | 7005  | 7068  | 7571# |       |       |       |      |       |       |  |  |  |
| EMS316 | 047064 | 6792  | 6795  | 6798  | 6801  | 6804  | 6807  | 6810  | 6813  | 7571# |       |      |       |       |  |  |  |
| EMS317 | 047105 | 6792  | 6795  | 7571# |       |       |       |       |       |       |       |      |       |       |  |  |  |
| EMS32  | 042052 | 7083  | 7571# |       |       |       |       |       |       |       |       |      |       |       |  |  |  |
| EMS320 | 047125 | 6798  | 6801  | 7571# |       |       |       |       |       |       |       |      |       |       |  |  |  |
| EMS321 | 047145 | 6804  | 6807  | 7571# |       |       |       |       |       |       |       |      |       |       |  |  |  |
| EMS322 | 047165 | 6810  | 6813  | 7571# |       |       |       |       |       |       |       |      |       |       |  |  |  |
| EMS323 | 047205 | 7571# |       |       |       |       |       |       |       |       |       |      |       |       |  |  |  |
| EMS324 | 047224 | 7571# |       |       |       |       |       |       |       |       |       |      |       |       |  |  |  |
| EMS325 | 047244 | 7571# |       |       |       |       |       |       |       |       |       |      |       |       |  |  |  |
| EMS326 | 047255 | 7571# |       |       |       |       |       |       |       |       |       |      |       |       |  |  |  |
| EMS327 | 047265 | 6837  | 6874  | 6879  | 6903  | 6937  | 7123  | 7189  | 7219  | 7262  | 7264  | 7282 | 7571# |       |  |  |  |
| EMS33  | 042132 | 7087  | 7571# |       |       |       |       |       |       |       |       |      |       |       |  |  |  |
| EMS330 | 047273 | 6841  | 7571# |       |       |       |       |       |       |       |       |      |       |       |  |  |  |
| EMS331 | 047312 | 6898  | 7066  | 7095  | 7571# |       |       |       |       |       |       |      |       |       |  |  |  |
| EMS332 | 047342 | 6909  | 6983  | 6998  | 7030  | 7045  | 7060  | 7077  | 7341  | 7405  | 7437  | 7473 | 7507  | 7571# |  |  |  |
| EMS333 | 047360 | 6913  | 6935  | 6942  | 7009  | 7023  | 7171  | 7192  | 7200  | 7291  | 7301  | 7305 | 7309  | 7322  |  |  |  |
|        |        | 7571# |       |       |       |       |       |       |       |       |       |      |       |       |  |  |  |
| EMS334 | 047374 | 6860  | 6947  | 7009  | 7018  | 7181  | 7282  | 7291  | 7571# |       |       |      |       |       |  |  |  |
| EMS335 | 047404 | 6816  | 6834  | 6860  | 6863  | 6942  | 7181  | 7185  | 7200  | 7286  | 7385  | 7403 | 7417  | 7435  |  |  |  |
|        |        | 7449  | 7467  | 7571# |       |       |       |       |       |       |       |      |       |       |  |  |  |
| EMS336 | 047427 | 6819  | 6858  | 6867  | 6870  | 6930  | 6947  | 7377  | 7387  | 7409  | 7419  | 7441 | 7451  | 7480  |  |  |  |
|        |        | 7488  | 7511  | 7519  | 7571# |       |       |       |       |       |       |      |       |       |  |  |  |

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CROSS REFERENCE TABLE -- USER SYMBOLS

SEQ 0165

|        |        |       |       |       |       |       |       |      |       |       |       |      |       |       |
|--------|--------|-------|-------|-------|-------|-------|-------|------|-------|-------|-------|------|-------|-------|
| EMS337 | 047446 | 6842  | 6845  | 6966  | 6978  | 6990  | 7013  | 7018 | 7037  | 7052  | 7070  | 7116 | 7123  | 7142  |
|        |        | 7177  | 7181  | 7185  | 7189  | 7205  | 7236  | 7262 | 7279  | 7288  | 7571# |      |       |       |
| EMS34  | 042171 | 7091  | 7208  | 7571# |       |       |       |      |       |       |       |      |       |       |
| EMS340 | 047462 | 6816  | 6819  | 6834  | 6860  | 6863  | 6867  | 6870 | 6942  | 6947  | 7200  | 7377 | 7387  | 7409  |
|        |        | 7419  | 7441  | 7451  | 7480  | 7511  | 7571# |      |       |       |       |      |       |       |
| EMS341 | 047473 | 6845  | 6920  | 6973  | 6985  | 6990  | 7000  | 7013 | 7018  | 7032  | 7037  | 7047 | 7052  | 7070  |
|        |        | 7087  | 7091  | 7109  | 7116  | 7123  | 7221  | 7224 | 7228  | 7232  | 7236  | 7240 | 7244  | 7253  |
|        |        | 7313  | 7571# |       |       |       |       |      |       |       |       |      |       |       |
| EMS342 | 047502 | 6930  | 6942  | 6947  | 6957  | 7341  | 7571# |      |       |       |       |      |       |       |
| EMS343 | 047534 | 6893  | 6957  | 7571# |       |       |       |      |       |       |       |      |       |       |
| EMS344 | 047550 | 6957  | 7571# |       |       |       |       |      |       |       |       |      |       |       |
| EMS345 | 047577 | 6963  | 6966  | 7113  | 7248  | 7282  | 7571# |      |       |       |       |      |       |       |
| EMS346 | 047625 | 6920  | 6963  | 6973  | 6985  | 7000  | 7032  | 7047 | 7113  | 7240  | 7244  | 7248 | 7253  | 7313  |
|        |        | 7317  | 7571# |       |       |       |       |      |       |       |       |      |       |       |
| EMS347 | 047643 | 6969  | 6980  | 6995  | 7027  | 7042  | 7057  | 7074 | 7571# |       |       |      |       |       |
| EMS35  | 042227 | 7098  | 7171  | 7181  | 7189  | 7205  | 7571# |      |       |       |       |      |       |       |
| EMS350 | 047664 | 7005  | 7009  | 7018  | 7023  | 7291  | 7322  | 7361 | 7372  | 7571# |       |      |       |       |
| EMS351 | 047671 | 7005  | 7571# |       |       |       |       |      |       |       |       |      |       |       |
| EMS352 | 047707 | 6822  | 6826  | 7023  | 7571# |       |       |      |       |       |       |      |       |       |
| EMS353 | 047723 | 6925  | 6927  | 7066  | 7138  | 7148  | 7152  | 7160 | 7168  | 7177  | 7215  | 7345 | 7571# |       |
| EMS354 | 047747 | 7079  | 7083  | 7127  | 7138  | 7145  | 7160  | 7168 | 7215  | 7258  | 7268  | 7271 | 7275  | 7350  |
|        |        | 7571# |       |       |       |       |       |      |       |       |       |      |       |       |
| EMS355 | 050002 | 7087  | 7091  | 7109  | 7571# |       |       |      |       |       |       |      |       |       |
| EMS356 | 050024 | 6830  | 7330  | 7334  | 7338  | 7477  | 7571# |      |       |       |       |      |       |       |
| EMS357 | 050044 | 7098  | 7326  | 7571# |       |       |       |      |       |       |       |      |       |       |
| EMS36  | 042271 | 7105  | 7131  | 7142  | 7145  | 7148  | 7152  | 7200 | 7326  | 7385  | 7396  | 7403 | 7417  | 7428  |
|        |        | 7435  | 7449  | 7460  | 7467  | 7498  | 7571# |      |       |       |       |      |       |       |
| EMS360 | 050066 | 7098  | 7330  | 7571# |       |       |       |      |       |       |       |      |       |       |
| EMS361 | 050114 | 7334  | 7571# |       |       |       |       |      |       |       |       |      |       |       |
| EMS362 | 050142 | 7102  | 7571# |       |       |       |       |      |       |       |       |      |       |       |
| EMS363 | 050163 | 7120  | 7295  | 7298  | 7322  | 7571# |       |      |       |       |       |      |       |       |
| EMS364 | 050200 | 7127  | 7271  | 7275  | 7571# |       |       |      |       |       |       |      |       |       |
| EMS365 | 050221 | 6863  | 7127  | 7138  | 7148  | 7152  | 7160  | 7168 | 7215  | 7341  | 7345  | 7350 | 7571# |       |
| EMS366 | 050226 | 7135  | 7571# |       |       |       |       |      |       |       |       |      |       |       |
| EMS367 | 050251 | 7138  | 7148  | 7152  | 7160  | 7168  | 7215  | 7345 | 7571# |       |       |      |       |       |
| EMS37  | 042321 | 7109  | 7571# |       |       |       |       |      |       |       |       |      |       |       |
| EMS370 | 050321 | 6852  | 6874  | 6879  | 6903  | 7148  | 7396  | 7428 | 7460  | 7490  | 7571# |      |       |       |
| EMS371 | 050336 | 6923  | 7152  | 7494  | 7571# |       |       |      |       |       |       |      |       |       |
| EMS372 | 050365 | 6816  | 6819  | 7181  | 7185  | 7192  | 7326  | 7350 | 7361  | 7372  | 7571# |      |       |       |
| EMS373 | 050417 | 7248  | 7282  | 7571# |       |       |       |      |       |       |       |      |       |       |
| EMS374 | 050423 | 7262  | 7571# |       |       |       |       |      |       |       |       |      |       |       |
| EMS375 | 050454 | 7301  | 7571# |       |       |       |       |      |       |       |       |      |       |       |
| EMS376 | 050470 | 7305  | 7309  | 7317  | 7361  | 7571# |       |      |       |       |       |      |       |       |
| EMS377 | 050504 | 6816  | 6830  | 6863  | 7341  | 7350  | 7361  | 7382 | 7400  | 7414  | 7432  | 7446 | 7464  | 7485  |
|        |        | 7516  | 7571# |       |       |       |       |      |       |       |       |      |       |       |
| EMS4   | 040227 | 6898  | 7095  | 7571# |       |       |       |      |       |       |       |      |       |       |
| EMS40  | 042361 | 7113  | 7116  | 7571# |       |       |       |      |       |       |       |      |       |       |
| EMS400 | 050515 | 6819  | 6872  | 7372  | 7571# |       |       |      |       |       |       |      |       |       |
| EMS401 | 050532 | 6874  | 6879  | 6885  | 6903  | 6906  | 7345  | 7363 | 7372  | 7392  | 7424  | 7456 | 7469  | 7502  |
|        |        | 7521  | 7571# |       |       |       |       |      |       |       |       |      |       |       |
| EMS402 | 050547 | 6822  | 6826  | 6830  | 6870  | 7382  | 7400  | 7414 | 7432  | 7446  | 7464  | 7485 | 7516  | 7571# |
| EMS403 | 050556 | 7382  | 7400  | 7414  | 7432  | 7446  | 7464  | 7485 | 7516  | 7571# |       |      |       |       |
| EMS404 | 050617 | 7387  | 7419  | 7451  | 7498  | 7511  | 7571# |      |       |       |       |      |       |       |
| EMS405 | 050636 | 6890  | 6900  | 7377  | 7387  | 7392  | 7396  | 7405 | 7409  | 7419  | 7424  | 7428 | 7437  | 7441  |
|        |        | 7451  | 7456  | 7460  | 7469  | 7473  | 7480  | 7490 | 7494  | 7498  | 7502  | 7507 | 7511  | 7521  |
|        |        | 7571# |       |       |       |       |       |      |       |       |       |      |       |       |

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CROSS REFERENCE TABLE -- USER SYMBOLS

SEQ 0166

|        |        |       |       |       |       |       |       |       |      |       |       |       |      |      |
|--------|--------|-------|-------|-------|-------|-------|-------|-------|------|-------|-------|-------|------|------|
| EMS406 | 050646 | 6822  | 6826  | 7377  | 7409  | 7441  | 7480  | 7571# |      |       |       |       |      |      |
| EMS407 | 050661 | 7477  | 7571# |       |       |       |       |       |      |       |       |       |      |      |
| EMS41  | 042437 | 7120  | 7123  | 7127  | 7181  | 7185  | 7192  | 7338  | 7341 | 7571# |       |       |      |      |
| EMS410 | 050701 | 6842  | 7571# |       |       |       |       |       |      |       |       |       |      |      |
| EMS411 | 050710 | 6834  | 6842  | 7571# |       |       |       |       |      |       |       |       |      |      |
| EMS412 | 050726 | 6854  | 6856  | 7571# |       |       |       |       |      |       |       |       |      |      |
| EMS413 | 050742 | 6865  | 6887  | 6890  | 6900  | 6917  | 6925  | 7571# |      |       |       |       |      |      |
| EMS414 | 050756 | 6877  | 6895  | 7571# |       |       |       |       |      |       |       |       |      |      |
| EMS415 | 050776 | 6865  | 6867  | 6870  | 7571# |       |       |       |      |       |       |       |      |      |
| EMS416 | 051016 | 6867  | 6895  | 7571# |       |       |       |       |      |       |       |       |      |      |
| EMS417 | 051030 | 6877  | 6885  | 6887  | 6906  | 6917  | 7571# |       |      |       |       |       |      |      |
| EMS42  | 042505 | 7135  | 7138  | 7571# |       |       |       |       |      |       |       |       |      |      |
| EMS420 | 051047 | 6887  | 6917  | 7571# |       |       |       |       |      |       |       |       |      |      |
| EMS421 | 051062 | 6893  | 6895  | 7571# |       |       |       |       |      |       |       |       |      |      |
| EMS422 | 051077 | 6927  | 7571# |       |       |       |       |       |      |       |       |       |      |      |
| EMS43  | 042567 | 7145  | 7571# |       |       |       |       |       |      |       |       |       |      |      |
| EMS44  | 042640 | 7156  | 7160  | 7571# |       |       |       |       |      |       |       |       |      |      |
| EMS45  | 042701 | 7164  | 7168  | 7571# |       |       |       |       |      |       |       |       |      |      |
| EMS46  | 042756 | 7173  | 7177  | 7571# |       |       |       |       |      |       |       |       |      |      |
| EMS47  | 043040 | 7185  | 7189  | 7195  | 7215  | 7571# |       |       |      |       |       |       |      |      |
| EMS5   | 040260 | 6913  | 7295  | 7571# |       |       |       |       |      |       |       |       |      |      |
| EMS50  | 043100 | 7200  | 7208  | 7571# |       |       |       |       |      |       |       |       |      |      |
| EMS500 | 051145 | 6773  | 7571# |       |       |       |       |       |      |       |       |       |      |      |
| EMS501 | 051305 | 6773  | 6776  | 6780  | 6783  | 6787  | 6790  | 6793  | 6796 | 6799  | 6802  | 6805  | 6808 | 6811 |
|        |        | 6814  | 6839  | 6850  | 6883  | 6899  | 6910  | 6914  | 6931 | 6934  | 6939  | 6944  | 6949 | 6954 |
|        |        | 6975  | 6987  | 6992  | 7002  | 7007  | 7011  | 7015  | 7021 | 7025  | 7034  | 7039  | 7049 | 7054 |
|        |        | 7100  | 7107  | 7121  | 7125  | 7129  | 7132  | 7143  | 7146 | 7170  | 7178  | 7183  | 7187 | 7191 |
|        |        | 7197  | 7202  | 7206  | 7209  | 7212  | 7217  | 7222  | 7226 | 7238  | 7242  | 7246  | 7250 | 7255 |
|        |        | 7265  | 7269  | 7285  | 7289  | 7293  | 7296  | 7299  | 7303 | 7307  | 7311  | 7315  | 7319 | 7324 |
|        |        | 7328  | 7332  | 7336  | 7339  | 7343  | 7347  | 7353  | 7364 | 7369  | 7374  | 7571# |      |      |
| EMS502 | 051332 | 6773  | 6776  | 6780  | 6783  | 6787  | 6790  | 6793  | 6796 | 6799  | 6802  | 6805  | 6808 | 6811 |
|        |        | 6814  | 6839  | 6944  | 6949  | 6954  | 7259  | 7358  | 7364 | 7504  | 7571# |       |      |      |
| EMS503 | 051401 | 6773  | 6780  | 6783  | 6787  | 6790  | 6818  | 6821  | 6824 | 6828  | 6832  | 6836  | 6839 | 6844 |
|        |        | 6847  | 6850  | 6857  | 6859  | 6876  | 6881  | 6883  | 6886 | 6892  | 6902  | 6905  | 6907 | 6924 |
|        |        | 6961  | 6964  | 6967  | 6971  | 6975  | 6979  | 6982  | 6987 | 6992  | 6997  | 7002  | 7015 | 7029 |
|        |        | 7034  | 7039  | 7044  | 7049  | 7054  | 7059  | 7064  | 7067 | 7072  | 7076  | 7080  | 7084 | 7103 |
|        |        | 7132  | 7136  | 7140  | 7150  | 7154  | 7158  | 7162  | 7166 | 7170  | 7175  | 7178  | 7197 | 7202 |
|        |        | 7259  | 7319  | 7347  | 7353  | 7358  | 7364  | 7369  | 7374 | 7380  | 7384  | 7390  | 7394 | 7398 |
|        |        | 7402  | 7407  | 7412  | 7416  | 7422  | 7426  | 7430  | 7434 | 7439  | 7444  | 7448  | 7454 | 7458 |
|        |        | 7462  | 7466  | 7471  | 7475  | 7478  | 7483  | 7487  | 7492 | 7496  | 7500  | 7504  | 7509 | 7514 |
|        |        | 7518  | 7523  | 7571# |       |       |       |       |      |       |       |       |      |      |
| EMS504 | 051425 | 6783  | 6787  | 6790  | 6824  | 6828  | 6832  | 6847  | 6853 | 6855  | 6862  | 6866  | 6869 | 6873 |
|        |        | 6878  | 6889  | 6894  | 6897  | 6919  | 6922  | 6926  | 6928 | 6939  | 7080  | 7084  | 7089 | 7093 |
|        |        | 7096  | 7111  | 7114  | 7118  | 7212  | 7230  | 7234  | 7250 | 7255  | 7265  | 7273  | 7277 | 7280 |
|        |        | 7571# |       |       |       |       |       |       |      |       |       |       |      |      |
| EMS505 | 051451 | 6776  | 7571# |       |       |       |       |       |      |       |       |       |      |      |
| EMS506 | 051524 | 6910  | 7571# |       |       |       |       |       |      |       |       |       |      |      |
| EMS507 | 051561 | 6914  | 7571# |       |       |       |       |       |      |       |       |       |      |      |
| EMS51  | 043147 | 7211  | 7244  | 7571# |       |       |       |       |      |       |       |       |      |      |
| EMS510 | 051651 | 7259  | 7571# |       |       |       |       |       |      |       |       |       |      |      |
| EMS511 | 051724 | 6773  | 6776  | 6780  | 6783  | 6787  | 6790  | 6793  | 6796 | 6799  | 6802  | 6805  | 6808 | 6811 |
|        |        | 6814  | 6818  | 6821  | 6824  | 6828  | 6832  | 6836  | 6839 | 6844  | 6847  | 6850  | 6853 | 6855 |
|        |        | 6857  | 6859  | 6862  | 6866  | 6869  | 6873  | 6876  | 6878 | 6881  | 6883  | 6886  | 6889 | 6892 |
|        |        | 6894  | 6897  | 6899  | 6902  | 6905  | 6907  | 6910  | 6914 | 6919  | 6922  | 6924  | 6926 | 6928 |
|        |        | 6931  | 6934  | 6939  | 6944  | 6949  | 6954  | 6961  | 6964 | 6967  | 6971  | 6975  | 6979 | 6982 |
|        |        | 6987  | 6992  | 6997  | 7002  | 7007  | 7011  | 7015  | 7021 | 7025  | 7029  | 7034  | 7039 | 7044 |

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CROSS REFERENCE TABLE -- USER SYMBOLS

SEQ 0167

|         |        |       |       |       |       |       |      |       |       |       |       |      |       |      |
|---------|--------|-------|-------|-------|-------|-------|------|-------|-------|-------|-------|------|-------|------|
|         |        | 7049  | 7054  | 7059  | 7064  | 7067  | 7072 | 7076  | 7080  | 7084  | 7089  | 7093 | 7096  | 7100 |
|         |        | 7103  | 7107  | 7111  | 7114  | 7118  | 7121 | 7125  | 7129  | 7132  | 7136  | 7140 | 7143  | 7146 |
|         |        | 7150  | 7154  | 7158  | 7162  | 7166  | 7170 | 7175  | 7178  | 7183  | 7187  | 7191 | 7197  | 7202 |
|         |        | 7206  | 7209  | 7212  | 7217  | 7222  | 7226 | 7230  | 7234  | 7238  | 7242  | 7246 | 7250  | 7255 |
|         |        | 7259  | 7265  | 7269  | 7273  | 7277  | 7280 | 7285  | 7289  | 7293  | 7296  | 7299 | 7303  | 7307 |
|         |        | 7311  | 7315  | 7319  | 7324  | 7328  | 7332 | 7336  | 7339  | 7343  | 7347  | 7353 | 7358  | 7364 |
|         |        | 7369  | 7374  | 7380  | 7384  | 7390  | 7394 | 7398  | 7402  | 7407  | 7412  | 7416 | 7422  | 7426 |
|         |        | 7430  | 7434  | 7439  | 7444  | 7448  | 7454 | 7458  | 7462  | 7466  | 7471  | 7475 | 7478  | 7483 |
|         |        | 7487  | 7492  | 7496  | 7500  | 7504  | 7509 | 7514  | 7518  | 7523  | 7571# |      |       |      |
| EMS52   | 043216 | 7236  | 7240  | 7248  | 7253  | 7571# |      |       |       |       |       |      |       |      |
| EMS53   | 043257 | 7258  | 7502  | 7571# |       |       |      |       |       |       |       |      |       |      |
| EMS54   | 043320 | 7262  | 7268  | 7271  | 7275  | 7571# |      |       |       |       |       |      |       |      |
| EMS55   | 043375 | 7279  | 7571# |       |       |       |      |       |       |       |       |      |       |      |
| EMS56   | 043453 | 7282  | 7286  | 7288  | 7361  | 7571# |      |       |       |       |       |      |       |      |
| EMS57   | 043546 | 7291  | 7571# |       |       |       |      |       |       |       |       |      |       |      |
| EMS6    | 040330 | 6933  | 6937  | 6942  | 6947  | 7571# |      |       |       |       |       |      |       |      |
| EMS60   | 043632 | 7291  | 7571# |       |       |       |      |       |       |       |       |      |       |      |
| EMS600  | 052023 | 7221  | 7224  | 7228  | 7232  | 7571# |      |       |       |       |       |      |       |      |
| EMS601  | 052053 | 7236  | 7571# |       |       |       |      |       |       |       |       |      |       |      |
| EMS602  | 052073 | 7240  | 7244  | 7571# |       |       |      |       |       |       |       |      |       |      |
| EMS603  | 052134 | 7313  | 7571# |       |       |       |      |       |       |       |       |      |       |      |
| EMS604  | 052155 | 7377  | 7382  | 7387  | 7392  | 7396  | 7400 | 7405  | 7571# |       |       |      |       |      |
| EMS605  | 052202 | 7409  | 7414  | 7419  | 7424  | 7428  | 7432 | 7437  | 7571# |       |       |      |       |      |
| EMS606  | 052220 | 7441  | 7446  | 7451  | 7456  | 7460  | 7464 | 7469  | 7473  | 7571# |       |      |       |      |
| EMS607  | 052240 | 6900  | 7480  | 7485  | 7490  | 7494  | 7498 | 7502  | 7507  | 7511  | 7516  | 7521 | 7571# |      |
| EMS61   | 043704 | 7298  | 7571# |       |       |       |      |       |       |       |       |      |       |      |
| EMS62   | 043757 | 7301  | 7305  | 7309  | 7313  | 7571# |      |       |       |       |       |      |       |      |
| EMS63   | 044040 | 7317  | 7322  | 7326  | 7330  | 7334  | 7338 | 7341  | 7345  | 7392  | 7424  | 7456 | 7571# |      |
| EMS64   | 044100 | 7350  | 7571# |       |       |       |      |       |       |       |       |      |       |      |
| EMS65   | 044150 | 7356  | 7363  | 7571# |       |       |      |       |       |       |       |      |       |      |
| EMS66   | 044211 | 7367  | 7372  | 7377  | 7387  | 7409  | 7419 | 7441  | 7451  | 7477  | 7480  | 7511 | 7571# |      |
| EMS67   | 044266 | 7405  | 7437  | 7473  | 7507  | 7571# |      |       |       |       |       |      |       |      |
| EMS7    | 040374 | 6935  | 6937  | 7571# |       |       |      |       |       |       |       |      |       |      |
| EMS70   | 044400 | 6822  | 6978  | 7469  | 7521  | 7571# |      |       |       |       |       |      |       |      |
| EMS71   | 044446 | 6816  | 6819  | 7571# |       |       |      |       |       |       |       |      |       |      |
| EMS72   | 044525 | 6816  | 6819  | 7571# |       |       |      |       |       |       |       |      |       |      |
| EMS73   | 044602 | 6822  | 6826  | 6830  | 6834  | 6842  | 6870 | 7571# |       |       |       |      |       |      |
| EMS74   | 044652 | 6822  | 7571# |       |       |       |      |       |       |       |       |      |       |      |
| EMS75   | 044725 | 6826  | 6830  | 7571# |       |       |      |       |       |       |       |      |       |      |
| EMS76   | 045001 | 6834  | 6842  | 7571# |       |       |      |       |       |       |       |      |       |      |
| EMS77   | 045042 | 6826  | 6830  | 7571# |       |       |      |       |       |       |       |      |       |      |
| EMTVEC= | 000030 | 1041# | 2218* | 2219* | 2489* |       |      |       |       |       |       |      |       |      |
| EMT1    | 031744 | 1630  | 6770# |       |       |       |      |       |       |       |       |      |       |      |
| EMT10   | 032132 | 1687  | 6792# |       |       |       |      |       |       |       |       |      |       |      |
| EMT100  | 033602 | 6969# |       |       |       |       |      |       |       |       |       |      |       |      |
| EMT101  | 033622 | 6973# |       |       |       |       |      |       |       |       |       |      |       |      |
| EMT102  | 033642 | 6978# |       |       |       |       |      |       |       |       |       |      |       |      |
| EMT103  | 033654 | 6980# |       |       |       |       |      |       |       |       |       |      |       |      |
| EMT104  | 033700 | 6985# |       |       |       |       |      |       |       |       |       |      |       |      |
| EMT105  | 033720 | 6990# |       |       |       |       |      |       |       |       |       |      |       |      |
| EMT106  | 033740 | 6995# |       |       |       |       |      |       |       |       |       |      |       |      |
| EMT107  | 033764 | 7000# |       |       |       |       |      |       |       |       |       |      |       |      |
| EMT11   | 032150 | 1695  | 6795# |       |       |       |      |       |       |       |       |      |       |      |
| EMT110  | 034004 | 7005# |       |       |       |       |      |       |       |       |       |      |       |      |
| EMT111  | 034026 | 7009# |       |       |       |       |      |       |       |       |       |      |       |      |
| EMT112  | 034046 | 7013# |       |       |       |       |      |       |       |       |       |      |       |      |

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| EMT115 | 034134 | 7027# |       |
| EMT116 | 034160 | 7032# |       |
| EMT117 | 034200 | 7037# |       |
| EMT12  | 032166 | 1703  | 6798# |
| EMT120 | 034220 | 7042# |       |
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| EMT122 | 034264 | 7052# |       |
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| EMT124 | 034330 | 7062# |       |
| EMT125 | 034346 | 7066# |       |
| EMT126 | 034366 | 7070# |       |
| EMT127 | 034404 | 7074# |       |
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| EMT135 | 034540 | 7098# |       |
| EMT136 | 034556 | 7102# |       |
| EMT137 | 034570 | 7105# |       |
| EMT14  | 032222 | 1719  | 6804# |
| EMT140 | 034606 | 7109# |       |
| EMT141 | 034626 | 7113# |       |
| EMT142 | 034642 | 7116# |       |
| EMT143 | 034660 | 7120# |       |
| EMT144 | 034674 | 7123# |       |
| EMT145 | 034716 | 7127# |       |
| EMT146 | 034740 | 7131# |       |
| EMT147 | 034756 | 7135# |       |
| EMT15  | 032240 | 1727  | 6807# |
| EMT150 | 034770 | 7138# |       |
| EMT151 | 035012 | 7142# |       |
| EMT152 | 035024 | 7145# |       |
| EMT153 | 035040 | 7148# |       |
| EMT154 | 035060 | 7152# |       |
| EMT155 | 035100 | 7156# |       |
| EMT156 | 035116 | 7160# |       |
| EMT157 | 035140 | 7164# |       |
| EMT16  | 032256 | 1735  | 6810# |
| EMT160 | 035156 | 7168# |       |
| EMT161 | 035206 | 7173# |       |
| EMT162 | 035224 | 7177# |       |
| EMT163 | 035242 | 7181# |       |
| EMT164 | 035264 | 7185# |       |
| EMT165 | 035306 | 7189# |       |
| EMT166 | 035332 | 7195# |       |
| EMT167 | 035352 | 7200# |       |
| EMT17  | 032274 | 1743  | 6813# |
| EMT170 | 035374 | 2125  | 7205# |
| EMT171 | 035406 | 7208# |       |
| EMT172 | 035422 | 2141  | 7211# |
| EMT173 | 035440 | 2149  | 7215# |
| EMT174 | 035462 | 2157  | 7219# |

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| EMT176 | 035526 | 2173  | 7228# |
| EMT177 | 035544 | 2181  | 7232# |
| EMT2   | 031752 | 1638  | 6771# |
| EMT20  | 032312 | 1751  | 6816# |
| EMT200 | 035562 | 2189  | 7236# |
| EMT201 | 035600 | 7240# |       |
| EMT202 | 035616 | 7244# |       |
| EMT203 | 035634 | 7248# |       |
| EMT204 | 035656 | 7253# |       |
| EMT205 | 035676 | 7258# |       |
| EMT206 | 035716 | 7262# |       |
| EMT207 | 035746 | 7268# |       |
| EMT21  | 032334 | 1759  | 6819# |
| EMT210 | 035762 | 7271# |       |
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| EMT212 | 036016 | 7279# |       |
| EMT213 | 036030 | 7282# |       |
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| EMT215 | 036072 | 7291# |       |
| EMT216 | 036112 | 7295# |       |
| EMT217 | 036126 | 7298# |       |
| EMT22  | 032356 | 1767  | 6822# |
| EMT220 | 036142 | 7301# |       |
| EMT221 | 036160 | 7305# |       |
| EMT222 | 036176 | 7309# |       |
| EMT223 | 036214 | 7313# |       |
| EMT224 | 036232 | 7317# |       |
| EMT225 | 036252 | 7322# |       |
| EMT226 | 036274 | 7326# |       |
| EMT227 | 036312 | 7330# |       |
| EMT23  | 032402 | 1775  | 6826# |
| EMT230 | 036330 | 7334# |       |
| EMT231 | 036346 | 7338# |       |
| EMT232 | 036362 | 7341# |       |
| EMT233 | 036404 | 7345# |       |
| EMT234 | 036426 | 7350# |       |
| EMT235 | 036454 | 7356# |       |
| EMT236 | 036474 | 7361# |       |
| EMT237 | 036526 | 7367# |       |
| EMT24  | 032426 | 1783  | 6830# |
| EMT240 | 036546 | 7372# |       |
| EMT241 | 036572 | 7377# |       |
| EMT242 | 036616 | 7382# |       |
| EMT243 | 036642 | 7387# |       |
| EMT244 | 036666 | 7392# |       |
| EMT245 | 036704 | 7396# |       |
| EMT246 | 036722 | 7400# |       |
| EMT247 | 036746 | 7405# |       |
| EMT25  | 032452 | 1791  | 6834# |
| EMT250 | 036764 | 7409# |       |
| EMT251 | 037010 | 7414# |       |
| EMT252 | 037034 | 7419# |       |
| EMT253 | 037060 | 7424# |       |
| EMT254 | 037076 | 7428# |       |
| EMT255 | 037114 | 7432# |       |

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CROSS REFERENCE TABLE -- USER SYMBOLS

SEQ 0170

|        |        |       |            |
|--------|--------|-------|------------|
| EMT256 | 037140 | 7437# |            |
| EMT257 | 037156 | 7441# |            |
| EMT26  | 032472 | 1799  | 6837#      |
| EMT260 | 037202 | 7446# |            |
| EMT261 | 037226 | 7451# |            |
| EMT262 | 037252 | 7456# |            |
| EMT263 | 037270 | 7460# |            |
| EMT264 | 037306 | 7464# |            |
| EMT265 | 037332 | 7469# |            |
| EMT266 | 037350 | 7473# |            |
| EMT267 | 037366 | 7477# |            |
| EMT27  | 032524 | 1807  | 6842#      |
| EMT270 | 037402 | 7480# |            |
| EMT271 | 037426 | 7485# |            |
| EMT272 | 037452 | 7490# |            |
| EMT273 | 037470 | 7494# |            |
| EMT274 | 037506 | 7498# |            |
| EMT275 | 037524 | 2133  | 7502#      |
| EMT276 | 037544 | 1967  | 7507#      |
| EMT277 | 037562 | 7511# |            |
| EMT3   | 032000 | 1646  | 6775#      |
| EMT30  | 032544 | 1815  | 6845#      |
| EMT300 | 037606 | 7516# |            |
| EMT301 | 037632 | 7521# |            |
| EMT31  | 032564 | 1823  | 6849#      |
| EMT32  | 032600 | 1831  | 6852#      |
| EMT33  | 032612 | 1839  | 6854#      |
| EMT34  | 032624 | 1847  | 6856#      |
| EM' 35 | 032636 | 1855  | 6858#      |
| EMT36  | 032650 | 1863  | 6860#      |
| EMT37  | 032670 | 1871  | 6863#      |
| EMT4   | 032020 | 1654  | 6778#      |
| EMT40  | 032720 | 1879  | 6867#      |
| EMT41  | 032742 | 1887  | 6870#      |
| EMT42  | 032770 | 1895  | 6874#      |
| EMT43  | 033006 | 1903  | 1911 6877# |
| EMT44  | 033022 | 6879# |            |
| EMT45  | 033040 | 1919  | 6882#      |
| EMT46  | 033054 | 1927  | 6885#      |
| EMT47  | 033070 | 1935  | 6887#      |
| EMT5   | 032042 | 1662  | 6782#      |
| EMT50  | 033106 | 1943  | 6890#      |
| EMT51  | 033124 | 6893# |            |
| EMT52  | 033140 | 1959  | 6895#      |
| EMT53  | 033156 | 6898# |            |
| EMT54  | 033172 | 1975  | 6900#      |
| EMT55  | 033210 | 1951  | 1983 6903# |
| EMT56  | 033226 | 1991  | 6906#      |
| EMT57  | 033242 | 1999  | 6909#      |
| EMT6   | 032066 | 1670  | 6786#      |
| EMT60  | 033256 | 2007  | 6913#      |
| EMT61  | 033272 | 2015  | 6917#      |
| EMT62  | 033310 | 2023  | 6920#      |
| EMT63  | 033326 | 2031  | 6923#      |
| EMT64  | 033340 | 2039  | 6925#      |
| EMT65  | 033354 | 2047  | 6927#      |

SEQ 0171

|         |         |       |       |       |       |      |       |       |       |       |       |       |       |       |  |  |  |  |  |
|---------|---------|-------|-------|-------|-------|------|-------|-------|-------|-------|-------|-------|-------|-------|--|--|--|--|--|
| EMT66   | 033366  | 2054  | 6930# |       |       |      |       |       |       |       |       |       |       |       |  |  |  |  |  |
| EMT67   | 033402  | 2061  | 6933# |       |       |      |       |       |       |       |       |       |       |       |  |  |  |  |  |
| EMT7    | 032110  | 1679  | 6789# |       |       |      |       |       |       |       |       |       |       |       |  |  |  |  |  |
| EMT70   | 033420  | 2068  | 6937# |       |       |      |       |       |       |       |       |       |       |       |  |  |  |  |  |
| EMT71   | 033440  | 2075  | 6942# |       |       |      |       |       |       |       |       |       |       |       |  |  |  |  |  |
| EMT72   | 033464  | 2082  | 6947# |       |       |      |       |       |       |       |       |       |       |       |  |  |  |  |  |
| EMT73   | 033510  | 2089  | 6952# |       |       |      |       |       |       |       |       |       |       |       |  |  |  |  |  |
| EMT74   | 033530  | 2096  | 6957# |       |       |      |       |       |       |       |       |       |       |       |  |  |  |  |  |
| EMT75   | 033540  | 2103  | 6960# |       |       |      |       |       |       |       |       |       |       |       |  |  |  |  |  |
| EMT76   | 033552  | 2110  | 6963# |       |       |      |       |       |       |       |       |       |       |       |  |  |  |  |  |
| EMT77   | 033566  | 2117  | 6966# |       |       |      |       |       |       |       |       |       |       |       |  |  |  |  |  |
| ENBSCH  | 023352  | 3321  | 3410  | 3488  | 3667  | 3803 | 3918  | 3986  | 4138  | 4335  | 4631  | 4891  | 5498# |       |  |  |  |  |  |
| EQUALS  | 030753  | 6720# |       |       |       |      |       |       |       |       |       |       |       |       |  |  |  |  |  |
| ERR =   | 040000  | 1116# |       |       |       |      |       |       |       |       |       |       |       |       |  |  |  |  |  |
| ERRNMB  | 022444  | 5203* | 5204* | 5207  | 5219  | 5224 | 5316# |       |       |       |       |       |       |       |  |  |  |  |  |
| ERRTYP  | 021706  | 5182# | 6247  |       |       |      |       |       |       |       |       |       |       |       |  |  |  |  |  |
| ERRVEC= | 000004  | 1034# | 2232  | 2233* | 2244* | 5336 | 5337  | 5338* | 5339* | 5354* | 5375* | 5376* | 6145  | 6146* |  |  |  |  |  |
|         |         | 6148* | 6151* |       |       |      |       |       |       |       |       |       |       |       |  |  |  |  |  |
| ERTY00  | 022452  | 5189  | 5321# |       |       |      |       |       |       |       |       |       |       |       |  |  |  |  |  |
| ERTY01  | 022460  | 5197  | 5322# |       |       |      |       |       |       |       |       |       |       |       |  |  |  |  |  |
| ERTY02  | 022470  | 5206  | 5324# |       |       |      |       |       |       |       |       |       |       |       |  |  |  |  |  |
| ERTY03  | 022477  | 5212  | 5326# |       |       |      |       |       |       |       |       |       |       |       |  |  |  |  |  |
| ERTY04  | 022505  | 5308  | 5328# |       |       |      |       |       |       |       |       |       |       |       |  |  |  |  |  |
| ESRC =  | 004000  | 1191# | 5655  | 5659  |       |      |       |       |       |       |       |       |       |       |  |  |  |  |  |
| FER =   | 000020  | 1140# | 1146  | 4580  |       |      |       |       |       |       |       |       |       |       |  |  |  |  |  |
| FMT16 = | 010000  | 1216# | 2634  | 3315  | 3404  | 3548 | 3550  | 3659  | 3797  | 3912  | 3980  | 4129  | 4327  | 4617  |  |  |  |  |  |
|         |         | 4884  |       |       |       |      |       |       |       |       |       |       |       |       |  |  |  |  |  |
| FNCDTB  | 031634  | 6724# |       |       |       |      |       |       |       |       |       |       |       |       |  |  |  |  |  |
| FNCMSK= | 000077  | 1058# |       |       |       |      |       |       |       |       |       |       |       |       |  |  |  |  |  |
| F0 =    | 000002  | 1056# |       |       |       |      |       |       |       |       |       |       |       |       |  |  |  |  |  |
| F1 =    | 000004  | 1055# |       |       |       |      |       |       |       |       |       |       |       |       |  |  |  |  |  |
| F2 =    | 000010  | 1054# |       |       |       |      |       |       |       |       |       |       |       |       |  |  |  |  |  |
| F3 =    | 000020  | 1053# |       |       |       |      |       |       |       |       |       |       |       |       |  |  |  |  |  |
| F4 =    | 000040  | 1052# |       |       |       |      |       |       |       |       |       |       |       |       |  |  |  |  |  |
| GNS =   | ***** U | 1369  | 2274  | 5141  | 5148  | 6602 | 6603  | 6604  | 6605  | 6606  | 6607  | 6609  | 6611  | 6612  |  |  |  |  |  |
|         |         | 6613  | 6614  | 6615  | 6616  |      |       |       |       |       |       |       |       |       |  |  |  |  |  |
| GO -    | 000001  | 1057# | 3318  | 3407  | 3485  | 3662 | 3800  | 3915  | 3983  | 4135  | 43    |       |       |       |  |  |  |  |  |

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SEQ 0172

|                |       |       |       |      |      |      |      |      |      |      |      |      |      |
|----------------|-------|-------|-------|------|------|------|------|------|------|------|------|------|------|
| ILF36 = 000036 | 1079# |       |       |      |      |      |      |      |      |      |      |      |      |
| ILF40 = 000040 | 1080# |       |       |      |      |      |      |      |      |      |      |      |      |
| ILF42 = 000042 | 1081# |       |       |      |      |      |      |      |      |      |      |      |      |
| ILF44 = 000044 | 1082# |       |       |      |      |      |      |      |      |      |      |      |      |
| ILF46 = 000046 | 1083# |       |       |      |      |      |      |      |      |      |      |      |      |
| ILF54 = 000054 | 1086# |       |       |      |      |      |      |      |      |      |      |      |      |
| ILF56 = 000056 | 1087# |       |       |      |      |      |      |      |      |      |      |      |      |
| ILF64 = 000064 | 1090# |       |       |      |      |      |      |      |      |      |      |      |      |
| ILF66 = 000066 | 1091# |       |       |      |      |      |      |      |      |      |      |      |      |
| ILF74 = 000074 | 1094# |       |       |      |      |      |      |      |      |      |      |      |      |
| ILF76 = 000076 | 1095# | 2628  | 2649  | 2681 | 2697 | 2771 | 2808 | 2844 | 2869 | 3109 | 3116 |      |      |
| ILR = 000002   | 1143# |       |       |      |      |      |      |      |      |      |      |      |      |
| ILRG50= 000050 | 1283# |       |       |      |      |      |      |      |      |      |      |      |      |
| ILRG52= 000052 | 1284# |       |       |      |      |      |      |      |      |      |      |      |      |
| ILRG54= 000054 | 1285# |       |       |      |      |      |      |      |      |      |      |      |      |
| ILRG56= 000056 | 1286# |       |       |      |      |      |      |      |      |      |      |      |      |
| ILRG60= 000060 | 1287# |       |       |      |      |      |      |      |      |      |      |      |      |
| ILRG62= 000062 | 1288# |       |       |      |      |      |      |      |      |      |      |      |      |
| ILRG64= 000064 | 1289# |       |       |      |      |      |      |      |      |      |      |      |      |
| ILRG66= 000066 | 1290# |       |       |      |      |      |      |      |      |      |      |      |      |
| ILRG70= 000070 | 1291# |       |       |      |      |      |      |      |      |      |      |      |      |
| ILRG72= 000072 | 1292# |       |       |      |      |      |      |      |      |      |      |      |      |
| ILRG74= 000074 | 1293# |       |       |      |      |      |      |      |      |      |      |      |      |
| ILRG76= 000076 | 1294# |       |       |      |      |      |      |      |      |      |      |      |      |
| IOTVEC= 000020 | 1039# | 2216* | 2217* |      |      |      |      |      |      |      |      |      |      |
| IPCK0 = 000001 | 1348# |       |       |      |      |      |      |      |      |      |      |      |      |
| IPCK1 = 000002 | 1347# |       |       |      |      |      |      |      |      |      |      |      |      |
| IPCK2 = 000004 | 1346# |       |       |      |      |      |      |      |      |      |      |      |      |
| IPCK3 = 000010 | 1345# |       |       |      |      |      |      |      |      |      |      |      |      |
| IR = 000100    | 1325# | 2549  | 2570  |      |      |      |      |      |      |      |      |      |      |
| IVC = 010000   | 1253# | 6727  | 6728  | 6729 | 6731 | 6732 | 6733 | 6736 | 6737 | 6738 | 6739 | 6740 | 6741 |
|                | 6742  | 6743  | 6744  | 6745 | 6746 | 6747 | 6748 | 6749 | 6750 | 6751 | 6752 | 6753 | 6754 |
|                | 6755  | 6756  | 6757  |      |      |      |      |      |      |      |      |      |      |
| LBC = 002000   | 1255# |       |       |      |      |      |      |      |      |      |      |      |      |
| LBT = 002000   | 1120# |       |       |      |      |      |      |      |      |      |      |      |      |
| LCLOCK 022766  | 5356  | 5385# |       |      |      |      |      |      |      |      |      |      |      |
| LCOUNT 023036  | 5358  | 5403# |       |      |      |      |      |      |      |      |      |      |      |
| LF = 000012    | 945#  | 5243  | 6118  | 6124 | 6720 | 7571 | 7608 |      |      |      |      |      |      |
| LS = 000004    | 1200# |       |       |      |      |      |      |      |      |      |      |      |      |
| LSC = 004000   | 1254# |       |       |      |      |      |      |      |      |      |      |      |      |
| LST = 000002   | 1201# |       |       |      |      |      |      |      |      |      |      |      |      |
| LSTOP 023100   | 5357  | 5417# |       |      |      |      |      |      |      |      |      |      |      |
| MCLK 004000    | 1172# | 3578  | 3593  | 3610 | 3627 | 3685 | 3711 | 3728 | 3750 | 3762 | 3832 | 3851 | 3878 |
|                | 3881  | 3946  | 4032  | 4045 | 4073 | 4097 | 4157 | 4184 | 4212 | 4233 | 4260 | 4286 | 4358 |
|                | 4384  | 4410  | 4436  | 4458 | 4483 | 4494 | 4502 | 4517 | 4525 | 4540 | 4566 | 4760 | 4785 |
|                | 4819  | 4842  | 4971  | 4992 | 4995 | 5066 | 5090 | 5523 | 5541 | 5717 | 5728 | 5748 | 5758 |
|                | 5790  | 5819  | 5822  |      |      |      |      |      |      |      |      |      |      |
| MCPE - 020000  | 1305# |       |       |      |      |      |      |      |      |      |      |      |      |
| MDF - 000100   | 1177# |       |       |      |      |      |      |      |      |      |      |      |      |
| MDPE 000400    | 1322# |       |       |      |      |      |      |      |      |      |      |      |      |
| MI = 000004    | 1180# | 3393  | 3478  | 3518 | 5561 | 5679 |      |      |      |      |      |      |      |
| MOC = 000400   | 1175# | 1183  | 3346  | 3418 | 3420 | 3433 | 3435 | 3437 | 3440 | 3442 | 3496 | 3498 | 3500 |
|                | 3502  | 3518  | 3521  | 3523 | 3525 | 3528 | 3530 | 3685 | 3687 | 3711 | 3713 | 3728 | 3730 |
|                | 3750  | 3752  | 3762  | 3764 | 5598 | 5631 | 5633 | 5642 | 5648 | 5650 | 5679 | 5681 | 5691 |
|                | 5693  | 5696  | 5698  | 5700 | 5702 | 5717 | 5719 | 5728 | 5730 |      |      |      |      |
| MOH = 020000   | 1208# |       |       |      |      |      |      |      |      |      |      |      |      |

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| 1118# | 3829  | 3832 | 3834 | 3874 | 4498 | 4521 | 4971 | 4973 | 4988 | 5814 |      |      |
| 1173# | 3829  | 3832 | 3834 | 3851 | 3853 | 3870 | 3941 | 3946 | 3948 | 4032 | 4034 | 4045 |
| 1183# | 4073  | 4075 | 4097 | 4099 | 4157 | 4159 | 4184 | 4186 | 4212 | 4214 | 4233 | 4235 |
| 4047  | 4262  | 4286 | 4288 | 4358 | 4360 | 4384 | 4386 | 4410 | 4412 | 4436 | 4438 | 4458 |
| 4260  | 4483  | 4485 | 4494 | 4517 | 4540 | 4542 | 4566 | 4568 | 4760 | 4762 | 4785 | 4787 |
| 4460  | 4821  | 4842 | 4844 | 4971 | 4973 | 4984 | 5066 | 5068 | 5090 | 5092 | 5748 | 5750 |
| 4819  | 5760  | 5790 | 5792 | 5810 |      |      |      |      |      |      |      |      |
| 5758  | 3/ 18 | 3435 | 3440 | 3498 | 3523 | 3528 | 3941 | 3946 | 3948 | 5691 | 5698 |      |
| 1178# | 3433  | 3435 | 3437 | 3496 | 3498 | 3500 | 3521 | 3523 | 3525 | 5696 | 5698 | 5700 |
| 1181# |       |      |      |      |      |      |      |      |      |      |      |      |
| 1262# |       |      |      |      |      |      |      |      |      |      |      |      |
| 1176# |       |      |      |      |      |      |      |      |      |      |      |      |
| 1174# | 1183  | 3346 | 3418 | 3420 | 3433 | 3435 | 3437 | 3440 | 3442 | 3496 | 3498 | 3500 |
| 3502  | 3518  | 3521 | 3523 | 3525 | 3528 | 3530 | 3685 | 3687 | 3711 | 3713 | 3728 | 3730 |
| 3750  | 3752  | 3762 | 3764 | 5444 | 5477 | 5523 | 5525 | 5541 | 5543 | 5561 | 5563 | 5598 |
| 5631  | 5633  | 5640 | 5642 | 5648 | 5650 | 5679 | 5681 | 5691 | 5693 | 5696 | 5698 | 5700 |
| 5702  | 5717  | 5719 | 5728 | 5730 |      |      |      |      |      |      |      |      |
| 1199# | 4064  | 4091 | 4228 | 4281 | 4780 |      |      |      |      |      |      |      |
| 1179# |       |      |      |      |      |      |      |      |      |      |      |      |
| 1321# |       |      |      |      |      |      |      |      |      |      |      |      |
| 1146# |       |      |      |      |      |      |      |      |      |      |      |      |
| 1318# | 2296  | 2545 | 2560 | 2566 | 2579 |      |      |      |      |      |      |      |
| 1319# |       |      |      |      |      |      |      |      |      |      |      |      |
| 1062# |       |      |      |      |      |      |      |      |      |      |      |      |
| 2304  | 6720# |      |      |      |      |      |      |      |      |      |      |      |
| 1206# |       |      |      |      |      |      |      |      |      |      |      |      |
| 1187# |       |      |      |      |      |      |      |      |      |      |      |      |
| 1219# | 2634  |      |      |      |      |      |      |      |      |      |      |      |
| 1068# | 5483  |      |      |      |      |      |      |      |      |      |      |      |
| 1125# | 5486  | 5488 |      |      |      |      |      |      |      |      |      |      |
| 1252# |       |      |      |      |      |      |      |      |      |      |      |      |
| 1131# | 3337  | 3355 | 3357 | 6726 | 6727 | 6728 | 6729 | 6730 | 6731 | 6732 | 6733 | 6734 |
| 6735  | 6736  | 6737 | 6738 | 6739 | 6740 | 6741 | 6742 | 6743 | 6744 | 6745 | 6746 | 6747 |
| 6748  | 6749  | 6750 | 6751 | 6752 | 6753 | 6754 | 6755 | 6756 | 6757 |      |      |      |
| 1324# |       |      |      |      |      |      |      |      |      |      |      |      |
| 1072# | 5450  | 5460 | 5570 | 5580 |      |      |      |      |      |      |      |      |
| 1071# | 1072  |      |      |      |      |      |      |      |      |      |      |      |
| 1141# |       |      |      |      |      |      |      |      |      |      |      |      |
| 1327# |       |      |      |      |      |      |      |      |      |      |      |      |
| 5343  | 5381# |      |      |      |      |      |      |      |      |      |      |      |
| 5345  | 5402# |      |      |      |      |      |      |      |      |      |      |      |
| 1194# | 4670  | 4709 | 4718 | 4732 | 4733 | 4736 | 4755 | 5010 | 5014 |      |      |      |
| 1320# |       |      |      |      |      |      |      |      |      |      |      |      |
| 1121# |       |      |      |      |      |      |      |      |      |      |      |      |
| 1195# | 4170  | 4175 | 4242 | 4246 | 4670 | 4805 | 4807 |      |      |      |      |      |
| 1117# |       |      |      |      |      |      |      |      |      |      |      |      |
| 951#  |       |      |      |      |      |      |      |      |      |      |      |      |
| 1045# |       |      |      |      |      |      |      |      |      |      |      |      |
| 5383  | 5387# |      |      |      |      |      |      |      |      |      |      |      |

|                  |       |       |       |       |       |       |       |       |       |       |       |       |       |  |
|------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|--|
| PR3 = 000140     | 971#  | 2251  | 2489  |       |       |       |       |       |       |       |       |       |       |  |
| PR4 = 000200     | 972#  |       |       |       |       |       |       |       |       |       |       |       |       |  |
| PR5 = 000240     | 973#  | 5394  |       |       |       |       |       |       |       |       |       |       |       |  |
| PR6 = 000300     | 974#  | 5339  | 5346  | 5359  | 5392  |       |       |       |       |       |       |       |       |  |
| PR7 = 000340     | 975#  | 5391  |       |       |       |       |       |       |       |       |       |       |       |  |
| PS = 177776      | 948#  | 949   |       |       |       |       |       |       |       |       |       |       |       |  |
| PSEL = 002000    | 1307# |       |       |       |       |       |       |       |       |       |       |       |       |  |
| PSTOP = 023072   | 5344  | 5414# |       |       |       |       |       |       |       |       |       |       |       |  |
| PSW = 177776     | 949#  |       |       |       |       |       |       |       |       |       |       |       |       |  |
| PWRVEC = 000024  | 1040# | 2222* | 2223* | 6621* | 6622* | 6631* | 6637* | 6649* | 6650* |       |       |       |       |  |
| QSTMRK = 030761  | 2335  | 2440  | 6720# |       |       |       |       |       |       |       |       |       |       |  |
| RD = 000070      | 1092# | 3800  | 3915  | 4888  |       |       |       |       |       |       |       |       |       |  |
| RDCHR = 104411   | 2327  | 2341  | 2351  | 2354  | 2422  | 2431  | 6474  | 6612# |       |       |       |       |       |  |
| RDLIN = 104412   | 6544  | 6613# |       |       |       |       |       |       |       |       |       |       |       |  |
| RDOCT = 104413   | 2365  | 2381  | 2402  | 6614# |       |       |       |       |       |       |       |       |       |  |
| RDY = 000200     | 1310# |       |       |       |       |       |       |       |       |       |       |       |       |  |
| READY = 004414   | 2332  | 2490# | 5116  | 5164  |       |       |       |       |       |       |       |       |       |  |
| RECAL = 000006   | 1065# |       |       |       |       |       |       |       |       |       |       |       |       |  |
| RESREG = 104415  | 5312  | 6616# |       |       |       |       |       |       |       |       |       |       |       |  |
| RESVEC = 000010  | 1035# |       |       |       |       |       |       |       |       |       |       |       |       |  |
| REX = 010000     | 1190# |       |       |       |       |       |       |       |       |       |       |       |       |  |
| RG = 040000      | 1188# | 5612  | 5617  |       |       |       |       |       |       |       |       |       |       |  |
| RH = 000072      | 1093# | 4328  |       |       |       |       |       |       |       |       |       |       |       |  |
| RIP = 000020     | 1070# |       |       |       |       |       |       |       |       |       |       |       |       |  |
| RELEASE = 000012 | 1067# |       |       |       |       |       |       |       |       |       |       |       |       |  |
| RMA = 000016     | 1271# | 2593  | 3047* |       |       |       |       |       |       |       |       |       |       |  |
| RMAI = 001344    | 1541# |       |       |       |       |       |       |       |       |       |       |       |       |  |
| RMAO = 001420    | 1571# |       |       |       |       |       |       |       |       |       |       |       |       |  |
| RMBA = 000004    | 1353# | 2589  | 5594* |       |       |       |       |       |       |       |       |       |       |  |
| RMBAE = 000050   | 1356# |       |       |       |       |       |       |       |       |       |       |       |       |  |
| RMBAEI = 001376  | 1554# |       |       |       |       |       |       |       |       |       |       |       |       |  |
| RMBAEO = 001452  | 1584# |       |       |       |       |       |       |       |       |       |       |       |       |  |
| RMBAI = 001332   | 1536# |       |       |       |       |       |       |       |       |       |       |       |       |  |
| RMBAO = 001406   | 1566# | 3316* | 3405* | 3483* | 3660* | 3798* | 3913* | 3981* | 4131* | 4325* | 4619* | 4886* | 5594  |  |
| RMCS1 = 000000   | 1267# | 1351# | 2298  | 2628* | 2639  | 2681* | 2691  | 2771* | 2782* | 2795  | 2844* | 2857  | 3109* |  |
|                  | 3289  | 5450* | 5483* | 5570* | 5604* |       |       |       |       |       |       |       |       |  |
| RMCS1I = 001326  | 1534# | 2639* | 2649* | 2691* | 2697* | 2699  | 2795* | 2808* | 2812* | 2818  | 2857* | 2869* | 2874  |  |
| RMCS1O = 001402  | 1564# | 3318* | 3407* | 3485* | 3662* | 3800* | 3915* | 3983* | 4135* | 4328* | 4622* | 4888* | 5604  |  |
| RMCS2 = 000010   | 1354# | 2293* | 2294* | 2295  | 2541* | 2542* | 2544  | 2551  | 2560  | 2562* | 2563* | 2565  | 2572  |  |
|                  | 2579  | 2591  | 2624* | 2625* | 2677* | 2678* | 2687* | 2688* | 2725* | 2726* | 2767* | 2768* | 2832* |  |
|                  | 2833* | 2893* | 2894* | 3015* | 3016* | 3038* | 3039* | 3070* | 3071* | 3102* | 3103* | 3126* | 3127* |  |
|                  | 3158* | 3159* | 3181* | 3182* | 3203* | 3204* | 3286* | 3287* | 3380* | 3381* | 3471* | 3472* | 3568* |  |
|                  | 3569* | 3663* | 3664* | 4124* | 4125* | 4331* | 4332* | 4612* | 4613* | 4879* | 4880* | 5439* | 5440* |  |
|                  | 5514* | 5515* |       |       |       |       |       |       |       |       |       |       |       |  |
| RMCS2I = 001336  | 1538# |       |       |       |       |       |       |       |       |       |       |       |       |  |
| RMCS2O = 001412  | 1568# |       |       |       |       |       |       |       |       |       |       |       |       |  |
| RMCS3 = 000052   | 1357# |       |       |       |       |       |       |       |       |       |       |       |       |  |
| RMCS3I = 001400  | 1555# |       |       |       |       |       |       |       |       |       |       |       |       |  |
| RMCS3O = 001454  | 1585# |       |       |       |       |       |       |       |       |       |       |       |       |  |
| RMDA = 000006    | 1268# | 2630* | 2641  | 2773* | 2784* | 2797  | 2837* | 2846* | 2859  | 2897* | 2908  | 3041* | 3053  |  |
|                  | 3073* | 3085  | 3161* | 3169  | 3186* | 3194  | 3216* | 5586* |       |       |       |       |       |  |
| RMDAI = 001334   | 1537# | 2641* | 2651  | 2797* | 2813* | 2819  | 2859* | 2875  | 2908* | 2920  | 3053* | 3058  | 3085* |  |
|                  | 3090  | 3169* | 3172  | 3194* | 3197  |       |       |       |       |       |       |       |       |  |
| RMDAO = 001410   | 1567# | 3313* | 3402* | 3480* | 3657* | 3795* | 3910* | 3978* | 4127* | 4324* | 4615* | 4882* | 5586  |  |
| RMDB = 000022    | 1355# | 2595  |       |       |       |       |       |       |       |       |       |       |       |  |
| RMDBI = 001350   | 1543# |       |       |       |       |       |       |       |       |       |       |       |       |  |

|        |          |       |       |       |       |       |       |       |       |       |       |       |       |       |
|--------|----------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| RMDBO  | 001424   | 1573# |       |       |       |       |       |       |       |       |       |       |       |       |
| RMDC   | = 000034 | 1277# | 2632* | 2643  | 2790* | 2803  | 2841* | 2850* | 2863  | 2901* | 2912  | 3020* | 3028  | 3107* |
|        |          | 3115  | 3133* | 3145  | 3188* | 3208* | 3220  | 5588* |       |       |       |       |       |       |
| RMDCI  | 001362   | 1548# | 2643* | 2653* | 2803* | 2810* | 2816* | 2822  | 2863* | 2871* | 2877  | 2912* | 2930  | 3028* |
|        |          | 3031* | 3032  | 3115* | 3119* | 3120  | 3145* | 3151* | 3152  | 3220* | 3225  | 3226  |       |       |
| RMDCO  | 001436   | 1578# | 3314* | 3403* | 3481* | 3658* | 3796* | 3911* | 3979* | 4128* | 4323* | 4616* | 4883* | 5588  |
| RMDS   | = 000012 | 1269# | 3165* | 3212* | 5452  | 5456  | 5485  | 5490  | 5572  | 5576  |       |       |       |       |
| RMDSI  | 001340   | 1539# |       |       |       |       |       |       |       |       |       |       |       |       |
| RMDSO  | 001414   | 1569# |       |       |       |       |       |       |       |       |       |       |       |       |
| RMDT   | = 000026 | 1274# | 3135* | 3253  | 3265  |       |       |       |       |       |       |       |       |       |
| RMDTI  | 001354   | 1545# |       |       |       |       |       |       |       |       |       |       |       |       |
| RMDTO  | 001430   | 1575# |       |       |       |       |       |       |       |       |       |       |       |       |
| RMEC1  | = 000044 | 1281# | 3139* |       |       |       |       |       |       |       |       |       |       |       |
| RMEC1I | 001372   | 1552# |       |       |       |       |       |       |       |       |       |       |       |       |
| RMEC1O | 001446   | 1582# |       |       |       |       |       |       |       |       |       |       |       |       |
| RMEC2  | = 000046 | 1282# | 2597  | 3083* |       |       |       |       |       |       |       |       |       |       |
| RMEC2I | 001374   | 1553# |       |       |       |       |       |       |       |       |       |       |       |       |
| RMEC2O | 001450   | 1583# |       |       |       |       |       |       |       |       |       |       |       |       |
| RMER1  | 000014   | 1270# | 2683* | 2693  | 2729* | 2736  | 2775* | 2786* | 2799  | 2852* | 2865  | 2903* | 2914  | 3018* |
|        |          | 3026  | 3105* | 3113  | 3129* | 3141  | 3184* | 3192  | 3214* | 3334  | 3336  | 3354  | 3377  | 3383  |
|        |          | 3395  | 3425  | 3444  | 3505  | 3509  | 3532  | 3536  | 4579  | 4584  | 5036  | 5043  | 5446* | 5479* |
|        |          | 5566* | 5600* |       |       |       |       |       |       |       |       |       |       |       |
| RMER1I | 001342   | 1540# | 2693* | 2701  | 2736* | 2741* | 2799* | 2814* | 2820  | 2865* | 2878  | 2914* | 2936  | 3026* |
|        |          | 3029  | 3113* | 3116* | 3117  | 3141* | 3146  | 3192* | 3195  |       |       |       |       |       |
| RMER1O | 001416   | 1570# |       |       |       |       |       |       |       |       |       |       |       |       |
| RMER2  | = 000042 | 1280# | 2685* | 2695  | 2731* | 2738  | 2779* | 2792* | 2805  | 2854* | 2867  | 2905* | 2916  | 3045* |
|        |          | 3057  | 3077* | 3089  | 3137* | 3163* | 3171  | 3190* | 3210* | 3222  | 5448* | 5481* | 5568* | 5602* |
| RMER2I | 001370   | 1551# | 2695* | 2698* | 2703  | 2738* | 2743* | 2805* | 2811* | 2817* | 2823  | 2867* | 2872* | 2879  |
|        |          | 2916* | 2940  | 3057* | 3063* | 3064  | 3089* | 3095* | 3096  | 3171* | 3174* | 3175  | 3222* | 3228* |
|        |          | 3229  |       |       |       |       |       |       |       |       |       |       |       |       |
| RMER2O | 001444   | 1581# |       |       |       |       |       |       |       |       |       |       |       |       |
| RMHR   | = 000036 | 1278# | 3024* | 3081* |       |       |       |       |       |       |       |       |       |       |
| RMHRI  | 001364   | 1549# |       |       |       |       |       |       |       |       |       |       |       |       |
| RMHRO  | 001440   | 1579# | 7587  |       |       |       |       |       |       |       |       |       |       |       |
| RMLA   | = 000020 | 1272# | 3079* |       |       |       |       |       |       |       |       |       |       |       |
| RMLAI  | 001346   | 1542# |       |       |       |       |       |       |       |       |       |       |       |       |
| RMLAO  | 001422   | 1572# |       |       |       |       |       |       |       |       |       |       |       |       |
| RMMR1  | 000024   | 1273# | 2733* | 2740  | 3022* | 3346* | 3391* | 3393* | 3418* | 3420* | 3433* | 3435* | 3437* | 3440* |
|        |          | 3442* | 3476* | 3478* | 3496* | 3498* | 3500* | 3502* | 3518* | 3521* | 3523* | 3525* | 3528* | 3530* |
|        |          | 3571  | 3574* | 3578* | 3580* | 3582  | 3593* | 3595* | 3597  | 3610* | 3612* | 3614  | 3627* | 3629* |
|        |          | 3631  | 3685* | 3687* | 3690  | 3700  | 3711* | 3713* | 3716  | 3728* | 3730* | 3735  | 3740  | 3750* |
|        |          | 3752* | 3762* | 3764* | 3766  | 3772  | 3826  | 3829* | 3832* | 3834* | 3836  | 3851* | 3853* | 3855  |
|        |          | 3877* | 3880* | 3883* | 3885  | 3941* | 3946* | 3948* | 3950  | 3957  | 4032* | 4034* | 4036  | 4045* |
|        |          | 4047* | 4049  | 4063  | 4073* | 4075* | 4089  | 4097* | 4099* | 4157* | 4159* | 4161  | 4178  | 4184* |
|        |          | 4186* | 4188  | 4212* | 4214* | 4226  | 4233* | 4235* | 4245  | 4256  | 4260* | 4262* | 4267  | 4279  |
|        |          | 4286* | 4288* | 4358* | 4360* | 4362  | 4384* | 4386* | 4388  | 4410* | 4412* | 4414  | 4436* | 4438* |
|        |          | 4440  | 4458* | 4460* | 4462  | 4475  | 4483* | 4485* | 4501* | 4504* | 4524* | 4527* | 4540* | 4542* |
|        |          | 4544  | 4560  | 4566* | 4568* | 4570  | 4669  | 4676  | 4708  | 4721  | 4731  | 4738  | 4754  | 4760* |
|        |          | 4762* | 4768  | 4778  | 4785* | 4787* | 4819* | 4821* | 4823  | 4831  | 4842* | 4844* | 4846  | 4854  |
|        |          | 4923  | 4933  | 4943  | 4954  | 4971* | 4973* | 4991* | 4994* | 4997* | 5009  | 5018  | 5066* | 5068* |
|        |          | 5070  | 5078  | 5090* | 5092* | 5094  | 5102  | 5442* | 5444* | 5477* | 5517* | 5523* | 5525* | 5527  |
|        |          | 5533  | 5541* | 5543* | 5545  | 5551  | 5561* | 5563* | 5598* | 5611  | 5619  | 5631* | 5633* | 5640* |
|        |          | 5642* | 5648* | 5650* | 5654  | 5658  | 5679* | 5681* | 5691* | 5693* | 5696* | 5698* | 5700* | 5702* |
|        |          | 5717* | 5719* | 5721  | 5728* | 5730* | 5732  | 5744  | 5748* | 5750* | 5754  | 5758* | 5760* | 5775  |
|        |          | 5782  | 5790* | 5792* | 5794  | 5802  | 5818* | 5821* | 5824* |       |       |       |       |       |
| RMHR1I | 001352   | 1544# | 2740* | 2745  |       |       |       |       |       |       |       |       |       |       |



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|         |        |       |       |       |       |       |       |       |       |       |       |       |       |       |  |  |  |  |
|---------|--------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|--|--|--|--|
| \$DDW5  | 001320 | 1521# |       |       |       |       |       |       |       |       |       |       |       |       |  |  |  |  |
| \$DDW6  | 001322 | 1522# |       |       |       |       |       |       |       |       |       |       |       |       |  |  |  |  |
| \$DDW7  | 001324 | 1523# |       |       |       |       |       |       |       |       |       |       |       |       |  |  |  |  |
| \$DEVCT | 001232 | 1477# |       |       |       |       |       |       |       |       |       |       |       |       |  |  |  |  |
| \$DEVN  | 001300 | 1513# | 2289* | 2301* | 2419* | 2428* | 2446* | 2447  | 2454  |       |       |       |       |       |  |  |  |  |
| \$DOAGN | 021676 | 5135  | 5156  | 5162# |       |       |       |       |       |       |       |       |       |       |  |  |  |  |
| \$DTBL  | 025346 | 5928  | 5963# |       |       |       |       |       |       |       |       |       |       |       |  |  |  |  |
| \$ENDAD | 021666 | 1380  | 2259  | 5158# | 6268  |       |       |       |       |       |       |       |       |       |  |  |  |  |
| \$ENDCT | 021532 | 2224  | 5137# |       |       |       |       |       |       |       |       |       |       |       |  |  |  |  |
| \$ENULL | 021702 | 5165# |       |       |       |       |       |       |       |       |       |       |       |       |  |  |  |  |
| \$ENV   | 001242 | 1482# | 2265  | 2281  | 2481  | 6068  | 6250  | 6672  | 6696  |       |       |       |       |       |  |  |  |  |
| \$ENVN  | 001243 | 1483# | 2247  | 2286  | 6070  | 6075  | 6674  |       |       |       |       |       |       |       |  |  |  |  |
| \$EOP   | 021476 | 5127# |       |       |       |       |       |       |       |       |       |       |       |       |  |  |  |  |
| \$EOPCT | 021524 | 2224* | 5134# | 5138  |       |       |       |       |       |       |       |       |       |       |  |  |  |  |
| \$EOSP  | 021442 | 2605  | 3267  | 5109# |       |       |       |       |       |       |       |       |       |       |  |  |  |  |
| \$ERFLG | 001117 | 1425# | 6129  | 6168  | 6170  | 6176* | 6198  | 6235* | 6273  |       |       |       |       |       |  |  |  |  |
| \$ERMAX | 001131 | 1431# | 2227* | 2531* | 2617* | 2670* | 2718* | 2759* | 2973* | 3245* | 3279* | 3305* | 3369* | 3460* |  |  |  |  |
|         |        | 3561* | 3649* | 3787* | 3902* | 3970* | 4117* | 4313* | 4605* | 4872* | 6170  | 6193* | 6198  |       |  |  |  |  |
| \$ERROR | U26460 | 2218  | 6233# |       |       |       |       |       |       |       |       |       |       |       |  |  |  |  |
| \$ERRPC | 001132 | 1432# | 5213  | 6242* | 6243* | 6244  | 6273  |       |       |       |       |       |       |       |  |  |  |  |
| \$ERRTB | 001532 | 1624# | 5228  |       |       |       |       |       |       |       |       |       |       |       |  |  |  |  |
| \$ERTTL | 001126 | 1429# | 5150  | 5154* | 6241* | 6273  |       |       |       |       |       |       |       |       |  |  |  |  |
| \$ESCAP | 001210 | 1458# | 2226* | 6192* | 6264  | 6266  | 6273  |       |       |       |       |       |       |       |  |  |  |  |
| \$ETABL | 001242 | 1481# |       |       |       |       |       |       |       |       |       |       |       |       |  |  |  |  |
| \$ETEND | 001326 | 1413  | 1524# |       |       |       |       |       |       |       |       |       |       |       |  |  |  |  |
| \$FATAL | 001224 | 1474# | 6700* |       |       |       |       |       |       |       |       |       |       |       |  |  |  |  |
| \$FFLG  | 030750 | 6663* | 6666* | 6694  | 6703* | 6711# |       |       |       |       |       |       |       |       |  |  |  |  |
| \$FILLC | 001172 | 1450# | 6093  | 6124  |       |       |       |       |       |       |       |       |       |       |  |  |  |  |
| \$FILLS | 001171 | 1449# | 6124  |       |       |       |       |       |       |       |       |       |       |       |  |  |  |  |
| \$GDADR | 001134 | 1433# |       |       |       |       |       |       |       |       |       |       |       |       |  |  |  |  |
| \$GDDAT | 001140 | 1435# | 2547* | 2548* | 2549* | 2568* | 2569* | 2570* | 2827* | 2884* | 2953* | 3292* | 3339* | 3357* |  |  |  |  |
|         |        | 3378* | 3510* | 3537* | 3587* | 3602* | 3618* | 3634* | 3698* | 3738* | 3769* | 3827* | 3890* | 3955* |  |  |  |  |
|         |        | 4008* | 4026* | 4103* | 4105  | 4175* | 4203* | 4246* | 4268* | 4377* | 4428* | 4473* | 4558* | 4582* |  |  |  |  |
|         |        | 4671* | 4672  | 4684* | 4685  | 4718* | 4736* | 4766* | 4829* | 4852* | 4931* | 4949* | 5016* | 5027* |  |  |  |  |
|         |        | 5038* | 5039  | 5058* | 5076* | 5100* | 5457* | 5488* | 5535* | 5553* | 5577* | 5617* | 5659* | 5780* |  |  |  |  |
|         |        | 5800* | 7573  | 7576  | 7585  | 7587  | 7589  | 7591  |       |       |       |       |       |       |  |  |  |  |
|         |        | 5155# |       |       |       |       |       |       |       |       |       |       |       |       |  |  |  |  |
| \$GET42 | 021656 | 6379# | 6609  |       |       |       |       |       |       |       |       |       |       |       |  |  |  |  |
| \$GTSWR | 027246 | 916   | 917   |       |       |       |       |       |       |       |       |       |       |       |  |  |  |  |
| \$HD =  | 000001 |       |       |       |       |       |       |       |       |       |       |       |       |       |  |  |  |  |
| \$HIBTS | 001100 | 1408# |       |       |       |       |       |       |       |       |       |       |       |       |  |  |  |  |
| \$HIOCT | 030216 | 6561* | 6566# |       |       |       |       |       |       |       |       |       |       |       |  |  |  |  |
| \$ICNT  | 001120 | 1426# | 2530* | 2616* | 2669* | 2717* | 2758* | 2972* | 3244* | 3278* | 3304* | 3368* | 3459* | 3560* |  |  |  |  |
|         |        | 3648* | 3786* | 3901* | 3969* | 4116* | 4312* | 4604* | 4871* | 6183* | 6184  | 6186* | 6197  |       |  |  |  |  |
| \$ILLUP | 030466 | 6621  | 6637  | 6654# |       |       |       |       |       |       |       |       |       |       |  |  |  |  |
| \$INTAG | 001151 | 1440# | 6376* | 6395  | 6415  | 6528  |       |       |       |       |       |       |       |       |  |  |  |  |
| \$ITEMB | 001130 | 1430# | 5204  | 6244* | 6252  | 6273  |       |       |       |       |       |       |       |       |  |  |  |  |
| \$LF    | 001220 | 1462# | 6124  | 6273  | 6511  | 6521  |       |       |       |       |       |       |       |       |  |  |  |  |
| \$LFLG  | 030747 | 6704* | 6710# |       |       |       |       |       |       |       |       |       |       |       |  |  |  |  |
| \$LLCSR | 001512 | 1599# | 5355  | 5385* | 5417* |       |       |       |       |       |       |       |       |       |  |  |  |  |
| \$LLVEC | 001514 | 1600# | 5347* | 5348* | 5358* | 5359* | 5370* | 5371* |       |       |       |       |       |       |  |  |  |  |
| \$LPADR | 001122 | 1427# | 2228* | 2532* | 2618* | 2671* | 2719* | 2760* | 2974* | 3246* | 3280* | 3306* | 3370* | 3461* |  |  |  |  |
|         |        | 3562* | 3650* | 3788* | 3903* | 3971* | 4118* | 4314* | 4606* | 4873* | 6165* | 6174* | 6190* | 6195  |  |  |  |  |
|         |        | 6197  |       |       |       |       |       |       |       |       |       |       |       |       |  |  |  |  |
| \$LPCSB | 001504 | 1596# | 5381* |       |       |       |       |       |       |       |       |       |       |       |  |  |  |  |
| \$LPCSR | 001502 | 1595# | 5342  | 5382* | 5414* |       |       |       |       |       |       |       |       |       |  |  |  |  |
| \$LPERR | 001124 | 1428# | 2229* | 2533* | 2619* | 2672* | 2720* | 2761* | 2975* | 3247* | 3281* | 3307* | 3371* | 3462* |  |  |  |  |

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|                 |       |       |       |       |       |       |       |       |       |       |       |       |       |
|-----------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| \$SVPC = 000200 | 1378# | 1383  |       |       |       |       |       |       |       |       |       |       |       |
| \$SWR = 167400  | 905#  | 916   | 921   | 922   | 923   | 924   | 925   | 926   | 927   | 1457  | 1458  | 1459  | 2225  |
|                 | 2226  | 2228  | 2229  | 2527  | 2614  | 2666  | 2714  | 2756  | 2969  | 3241  | 3275  | 3302  | 3366  |
|                 | 3457  | 3558  | 3646  | 3784  | 3899  | 3967  | 4114  | 4310  | 4602  | 4869  | 5124  | 5130  | 5157  |
|                 | 5163  | 5165  | 6130  | 6131  | 6132  | 6133  | 6134  | 6140  | 6152  | 6154  | 6155  | 6168  | 6169  |
|                 | 6170  | 6177  | 6178  | 6179  | 6191  | 6194  | 6197  | 6225  | 6226  | 6227  | 6228  | 6229  | 6238  |
|                 | 6245  | 6257  | 6261  | 6273  | 6653  |       |       |       |       |       |       |       |       |
| \$SWREG 001244  | 1484# | 2249  |       |       |       |       |       |       |       |       |       |       |       |
| \$SWRMK= 000000 | 927   | 928   | 6134  | 6135  | 6158  |       |       |       |       |       |       |       |       |
| \$SWOBT 026410  | 6164  | 6198# |       |       |       |       |       |       |       |       |       |       |       |
| \$TESTN 001226  | 1475# | 2527* | 2614* | 2666* | 2714* | 2756* | 2969* | 3241* | 3275* | 3302* | 3366* | 3457* | 3558* |
|                 | 3646* | 3784* | 3899* | 3967* | 4114* | 4310* | 4602* | 4869* | 5196  | 6189* |       |       |       |
| \$TIMES 001206  | 1457# | 2225* | 5130* | 6177* | 6184  | 6187* | 6197  |       |       |       |       |       |       |
| \$TKB 001162    | 1445# | 6276  | 6297  | 6308  | 6333  | 6361  | 6388  |       |       |       |       |       |       |
| \$TKCNT 026660  | 6277# | 6292* | 6322  | 6339* | 6453  | 6455* |       |       |       |       |       |       |       |
| \$TKINT 026670  | 2319  | 2491  | 6292# | 6313  | 6374  |       |       |       |       |       |       |       |       |
| \$TKQEN= 026667 | 6281# | 6347  | 6458  |       |       |       |       |       |       |       |       |       |       |
| \$TKQIN 026662  | 6278# | 6293* | 6294  | 6345* | 6346* | 6347  | 6349* |       |       |       |       |       |       |
| \$TKQOU 026664  | 6279# | 6294* | 6456  | 6457* | 6458  | 6460* |       |       |       |       |       |       |       |
| \$TKQSR 026666  | 6280# | 6293  | 6349  | 6460  |       |       |       |       |       |       |       |       |       |
| \$TKS 001160    | 1444# | 6276  | 6298* | 6329* | 6331  | 6337* | 6359  | 6375* | 6385  | 6397* | 6417* |       |       |
| \$TKSRV 026740  | 6295  | 6308# |       |       |       |       |       |       |       |       |       |       |       |
| \$TMP0 001174   | 1452# | 3262* | 3511* | 3701* | 3839* | 3858* | 4219* | 4221  | 4239  | 4296  | 4509  | 4510* | 4530  |
|                 | 4589  | 4773  | 4791  | 4795  | 4980* | 4982  | 5460* | 5580* | 7577  | 7579  | 7581  | 7583  | 7585  |
|                 | 7589  | 7591  |       |       |       |       |       |       |       |       |       |       |       |
| \$TMP1 001176   | 1453# | 2328* | 2329  | 2330  | 2333  | 2342* | 2343  | 2344  | 2352* | 2353  | 2356  | 2366* | 2368  |
|                 | 2372  | 2373* | 2374* | 2376  | 2382* | 2384  | 2388  | 2389* | 2390* | 2391* | 2392* | 2393* | 2394* |
|                 | 2395* | 2397  | 2403* | 2405  | 2410* | 2411* | 2412* | 2413* | 2414* | 2415  | 2423* | 2424  | 2425  |
|                 | 2432* | 2433  | 2434  | 2436  | 2438  | 2442  | 3263* | 3512* | 4220* | 4298  | 4511* | 4591  | 4797  |
|                 | 4981* | 5001  | 7577  | 7579  | 7581  | 7583  | 7591  |       |       |       |       |       |       |
| \$TMP2 001200   | 1454# | 4300  | 4512* | 4799* | 7577  | 7583  |       |       |       |       |       |       |       |
| \$TMP3 001202   | 1455# | 4800* | 7583  |       |       |       |       |       |       |       |       |       |       |
| \$TMP4 001204   | 1456# |       |       |       |       |       |       |       |       |       |       |       |       |
| \$TN = 000025   | 916#  | 2522  | 2527# | 2532  | 2609  | 2614# | 2618  | 2661  | 2666# | 2671  | 2709  | 2714# | 2719  |
|                 | 2751  | 2756# | 2760  | 2964  | 2969# | 2974  | 3236  | 3241# | 3246  | 3270  | 3275# | 3280  | 3297  |
|                 | 3302# | 3306  | 3361  | 3366# | 3370  | 3452  | 3457# | 3461  | 3553  | 3558# | 3562  | 3641  | 3646# |
|                 | 3650  | 3779  | 3784# | 3788  | 3894  | 3899# | 3903  | 3962  | 3967# | 3971  | 4109  | 4114# | 4118  |
|                 | 4305  | 4310# | 4314  | 4597  | 4602# | 4606  |       |       |       |       |       |       |       |

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|                                                                      |       |       |       |      |      |      |      |      |      |      |      |      |      |      |      |
|----------------------------------------------------------------------|-------|-------|-------|------|------|------|------|------|------|------|------|------|------|------|------|
| C 15                                                                 |       |       |       |      |      |      |      |      |      |      |      |      |      |      |      |
| CZRMKB0 RM03/2 DSKLS PRT 2 MACY11 30A(1052) 18-AUG-78 12:59 PAGE 186 |       |       |       |      |      |      |      |      |      |      |      |      |      |      |      |
| CZRMKB.P11 14-AUG-78 15:53 CROSS REFERENCE TABLE -- MACRO NAMES      |       |       |       |      |      |      |      |      |      |      |      |      |      |      |      |
| CLEAR                                                                | 905#  | 2541  | 2562  | 2624 | 2677 | 2687 | 2725 | 2767 | 2832 | 2892 | 3015 | 3038 | 3070 | 3102 | 3126 |
|                                                                      | 3158  | 3181  | 3203  | 3286 | 3380 | 3471 | 3568 | 3663 | 4124 | 4331 | 4612 | 4879 | 5439 | 5514 |      |
| CLKOFF                                                               | 905#  | 3331  | 3351  | 5616 | 5624 | 5687 |      |      |      |      |      |      |      |      |      |
| CLKON                                                                | 905#  | 3327  | 3347  | 5607 | 5683 |      |      |      |      |      |      |      |      |      |      |
| CLKSNC                                                               | 905#  | 4648  | 4907  | 4959 |      |      |      |      |      |      |      |      |      |      |      |
| COMMEN                                                               | 1046# |       |       |      |      |      |      |      |      |      |      |      |      |      |      |
| ENBSCH                                                               | 905#  | 3320  | 3409  | 3487 | 3666 | 3802 | 3917 | 3985 | 4137 | 4334 | 4630 | 4889 |      |      |      |
| ENDCOM                                                               | 1046# |       |       |      |      |      |      |      |      |      |      |      |      |      |      |
| ERR                                                                  | 905#  | 1629  | 1637  | 1645 | 1653 | 1661 | 1669 | 1678 | 1686 | 1694 | 1702 | 1710 | 1718 | 1726 | 1734 |
|                                                                      | 1742  | 1750  | 1758  | 1766 | 1774 | 1782 | 1790 | 1798 | 1806 | 1814 | 1822 | 1830 | 1838 | 1846 | 1854 |
|                                                                      | 1862  | 1870  | 1878  | 1886 | 1894 | 1902 | 1910 | 1918 | 1926 | 1934 | 1942 | 1950 | 1958 | 1966 | 1974 |
|                                                                      | 1982  | 1990  | 1998  | 2006 | 2014 | 2022 | 2030 | 2038 | 2046 | 2053 | 2060 | 2067 | 2074 | 2081 | 2088 |
|                                                                      | 2095  | 2102  | 2109  | 2116 | 2124 | 2132 | 2140 | 2148 | 2156 | 2164 | 2172 | 2180 | 2188 |      |      |
| ERROR                                                                | 940#  | 2474  | 2552  | 2573 | 2604 | 2658 | 2706 | 2747 | 2828 | 2885 | 2955 | 3034 | 3066 | 3098 | 3122 |
|                                                                      | 3154  | 3177  | 3199  | 3231 | 3266 | 3294 | 3323 | 3340 | 3358 | 3386 | 3398 | 3412 | 3428 | 3448 | 3490 |
|                                                                      | 3513  | 3538  | 3588  | 3603 | 3619 | 3635 | 3669 | 3675 | 3702 | 3741 | 3773 | 3805 | 3811 | 3817 | 3840 |
|                                                                      | 3859  | 3891  | 3920  | 3926 | 3932 | 3958 | 3988 | 3995 | 4011 | 4027 | 4069 | 4081 | 4107 | 4140 | 4146 |
|                                                                      | 4179  | 4204  | 4247  | 4270 | 4303 | 4337 | 4343 | 4378 | 4429 | 4476 | 4561 | 4585 | 4595 | 4633 | 4639 |
|                                                                      | 4645  | 4651  | 4677  | 4690 | 4722 | 4739 | 4769 | 4801 | 4832 | 4855 | 4893 | 4899 | 4905 | 4911 | 4934 |
|                                                                      | 4955  | 4962  | 5019  | 5030 | 5044 | 5060 | 5079 | 5103 |      |      |      |      |      |      |      |
| ESCAPE                                                               | 1046# |       |       |      |      |      |      |      |      |      |      |      |      |      |      |
| GETAS                                                                | 905#  |       |       |      |      |      |      |      |      |      |      |      |      |      |      |
| GETBA                                                                | 905#  |       |       |      |      |      |      |      |      |      |      |      |      |      |      |
| GETBAE                                                               | 905#  |       |       |      |      |      |      |      |      |      |      |      |      |      |      |
| GETCS1                                                               | 905#  | 2637  | 2690  | 2794 | 2856 | 3288 |      |      |      |      |      |      |      |      |      |
| GETCS2                                                               | 905#  | 2543  | 2564  |      |      |      |      |      |      |      |      |      |      |      |      |
| GETDA                                                                | 905#  | 2640  | 2796  | 2858 | 2907 | 3052 | 3084 | 3168 | 3193 |      |      |      |      |      |      |
| GETDB                                                                | 905#  |       |       |      |      |      |      |      |      |      |      |      |      |      |      |
| GETDC                                                                | 905#  | 2642  | 2802  | 2862 | 2911 | 3027 | 3114 | 3144 | 3219 |      |      |      |      |      |      |
| GETDS                                                                | 905#  | 5451  | 5484  | 5571 |      |      |      |      |      |      |      |      |      |      |      |
| GETDT                                                                | 905#  | 3252  |       |      |      |      |      |      |      |      |      |      |      |      |      |
| GETEC1                                                               | 905#  |       |       |      |      |      |      |      |      |      |      |      |      |      |      |
| GETEC2                                                               | 905#  |       |       |      |      |      |      |      |      |      |      |      |      |      |      |
| GETER1                                                               | 905#  | 2692  | 2735  | 2798 | 2864 | 2913 | 3025 | 3112 | 3140 | 3191 | 3333 | 3353 | 3382 | 3394 | 3424 |
|                                                                      | 3443  | 3504  | 3531  | 4578 | 5035 |      |      |      |      |      |      |      |      |      |      |
| GETER2                                                               | 905#  | 2694  | 2737  | 2804 | 2866 | 2915 | 3056 | 3088 | 3170 | 3221 |      |      |      |      |      |
| GETHR                                                                | 905#  |       |       |      |      |      |      |      |      |      |      |      |      |      |      |
| GETLA                                                                | 905#  |       |       |      |      |      |      |      |      |      |      |      |      |      |      |
| GETMR1                                                               | 905#  | 2739  | 3581  | 3596 | 3613 | 3630 | 3689 | 3715 | 3734 | 3765 | 3835 | 3854 | 3884 | 3949 | 4035 |
|                                                                      | 4048  | 4061  | 4088  | 4160 | 4187 | 4225 | 4254 | 4277 | 4361 | 4387 | 4413 | 4439 | 4461 | 4543 | 4569 |
|                                                                      | 4668  | 4707  | 4730  | 4752 | 4776 | 4822 | 4845 | 4921 | 4942 | 5008 | 5069 | 5093 | 5526 | 5544 | 5609 |
|                                                                      | 5653  | 5720  | 5731  | 5743 | 5752 | 5774 | 5793 |      |      |      |      |      |      |      |      |
| GETMR2                                                               | 905#  | 4004  | 4018  | 4196 | 4372 | 4422 | 4681 | 5022 |      |      |      |      |      |      |      |
| GETOF                                                                | 905#  | 2644  | 2800  | 2860 | 2909 | 3054 | 3086 | 3142 | 3217 |      |      |      |      |      |      |
| GETPRI                                                               | 1046# | 5388  |       |      |      |      |      |      |      |      |      |      |      |      |      |
| GETSN                                                                | 905#  |       |       |      |      |      |      |      |      |      |      |      |      |      |      |
| GETSWR                                                               | 905#  | 1046# | 2262# | 2478 |      |      |      |      |      |      |      |      |      |      |      |
| GETWC                                                                | 905#  |       |       |      |      |      |      |      |      |      |      |      |      |      |      |
| GETX                                                                 | 905#  |       |       |      |      |      |      |      |      |      |      |      |      |      |      |
| MSG                                                                  | 905#  | 2524  | 2611  | 2663 | 2711 | 2753 | 2966 | 3238 | 3272 | 3299 | 3363 | 3454 | 3555 | 3643 | 3781 |
|                                                                      | 3896  | 3964  | 4111  | 4307 | 4599 | 4866 |      |      |      |      |      |      |      |      |      |
| MULT                                                                 | 1046# |       |       |      |      |      |      |      |      |      |      |      |      |      |      |
| NEWTST                                                               | 1046# | 2522  | 2609  | 2661 | 2709 | 2751 | 2964 | 3236 | 3270 | 3297 | 3361 | 3452 | 3553 | 3641 | 3779 |
|                                                                      | 3894  | 3962  | 4109  | 4305 | 4597 | 4864 |      |      |      |      |      |      |      |      |      |
| POP                                                                  | 1046# | 5374  | 5376  | 5870 | 5954 | 6562 | 6642 | 6643 | 6706 | 6707 |      |      |      |      |      |
| PUSH                                                                 | 1046# | 5336  | 5337  | 5850 | 5913 | 6541 | 6623 | 6629 | 6667 | 6669 | 6690 |      |      |      |      |

|        |       |       |      |      |      |      |      |      |      |      |      |      |      |      |      |  |
|--------|-------|-------|------|------|------|------|------|------|------|------|------|------|------|------|------|--|
| PUTAS  | 905#  | 3046  |      |      |      |      |      |      |      |      |      |      |      |      |      |  |
| PUTBA  | 905#  | 5593  |      |      |      |      |      |      |      |      |      |      |      |      |      |  |
| PUTBAE | 905#  |       |      |      |      |      |      |      |      |      |      |      |      |      |      |  |
| PUTCS1 | 905#  | 2627  | 2680 | 2770 | 2781 | 2843 | 3108 | 5449 | 5482 | 5569 | 5603 |      |      |      |      |  |
| PUTCS2 | 905#  |       |      |      |      |      |      |      |      |      |      |      |      |      |      |  |
| PUTDA  | 905#  | 2629  | 2772 | 2783 | 2836 | 2845 | 2896 | 3040 | 3072 | 3160 | 3185 | 3215 | 5585 |      |      |  |
| PUTDB  | 905#  |       |      |      |      |      |      |      |      |      |      |      |      |      |      |  |
| PUTDC  | 905#  | 2631  | 2789 | 2840 | 2849 | 2900 | 3019 | 3106 | 3132 | 3187 | 3207 | 5587 |      |      |      |  |
| PUTDS  | 905#  | 3164  | 3211 |      |      |      |      |      |      |      |      |      |      |      |      |  |
| PUTDT  | 905#  | 3134  |      |      |      |      |      |      |      |      |      |      |      |      |      |  |
| PUTEC1 | 905#  | 3138  |      |      |      |      |      |      |      |      |      |      |      |      |      |  |
| PUTEC2 | 905#  | 3082  |      |      |      |      |      |      |      |      |      |      |      |      |      |  |
| PUTER1 | 905#  | 2682  | 2728 | 2774 | 2785 | 2851 | 2902 | 3017 | 3104 | 3128 | 3183 | 3213 | 5445 | 5478 | 5565 |  |
|        | 5599  |       |      |      |      |      |      |      |      |      |      |      |      |      |      |  |
| PUTER2 | 905#  | 2684  | 2730 | 2778 | 2791 | 2853 | 2904 | 3044 | 3076 | 3136 | 3162 | 3189 | 3209 | 5447 | 5480 |  |
|        | 5567  | 5601  |      |      |      |      |      |      |      |      |      |      |      |      |      |  |
| PUTHR  | 905#  | 3023  | 3080 |      |      |      |      |      |      |      |      |      |      |      |      |  |
| PUTLA  | 905#  | 3078  |      |      |      |      |      |      |      |      |      |      |      |      |      |  |
| PUTMR1 | 905#  | 2732  | 3021 | 3345 | 3389 | 3392 | 3416 | 3419 | 3432 | 3434 | 3436 | 3439 | 3441 | 3475 | 3477 |  |
|        | 3495  | 3497  | 3499 | 3501 | 3517 | 3520 | 3522 | 3524 | 3527 | 3529 | 3573 | 3576 | 3579 | 3591 | 3594 |  |
|        | 3608  | 3611  | 3625 | 3628 | 3684 | 3686 | 3709 | 3712 | 3726 | 3729 | 3748 | 3751 | 3761 | 3763 | 3828 |  |
|        | 3831  | 3833  | 3850 | 3852 | 3875 | 3879 | 3882 | 3940 | 3945 | 3947 | 4031 | 4033 | 4044 | 4046 | 4072 |  |
|        | 4074  | 4096  | 4098 | 4155 | 4158 | 4183 | 4185 | 4210 | 4213 | 4231 | 4234 | 4259 | 4261 | 4284 | 4287 |  |
|        | 4357  | 4359  | 4383 | 4385 | 4408 | 4411 | 4435 | 4437 | 4457 | 4459 | 4481 | 4484 | 4500 | 4503 | 4522 |  |
|        | 4526  | 4539  | 4541 | 4565 | 4567 | 4759 | 4761 | 4784 | 4786 | 4818 | 4820 | 4840 | 4843 | 4969 | 4972 |  |
|        | 4989  | 4993  | 4996 | 5064 | 5067 | 5089 | 5091 | 5441 | 5443 | 5476 | 5516 | 5521 | 5524 | 5539 | 5542 |  |
|        | 5560  | 5562  | 5597 | 5629 | 5632 | 5639 | 5641 | 5647 | 5649 | 5678 | 5680 | 5690 | 5692 | 5695 | 5697 |  |
|        | 5699  | 5701  | 5715 | 5718 | 5726 | 5729 | 5747 | 5749 | 5757 | 5759 | 5789 | 5791 | 5816 | 5820 | 5823 |  |
| PUTMR2 | 905#  | 3050  |      |      |      |      |      |      |      |      |      |      |      |      |      |  |
| PUTOF  | 905#  | 2633  | 2776 | 2787 | 2838 | 2847 | 2898 | 3042 | 3074 | 3130 | 3166 | 3205 | 3473 | 5589 |      |  |
| PUTSN  | 905#  | 3048  | 3110 |      |      |      |      |      |      |      |      |      |      |      |      |  |
| PUTWC  | 905#  | 5591  |      |      |      |      |      |      |      |      |      |      |      |      |      |  |
| PUTX   | 905#  |       |      |      |      |      |      |      |      |      |      |      |      |      |      |  |
| REPORT | 1046# |       |      |      |      |      |      |      |      |      |      |      |      |      |      |  |
| RGBFMC | 905#  | 1527  | 1557 |      |      |      |      |      |      |      |      |      |      |      |      |  |
| SCOPE  | 941#  | 2526  | 2613 | 2665 | 2713 | 2755 | 2968 | 3240 | 3274 | 3301 | 3365 | 3456 | 3557 | 3645 | 3783 |  |
|        | 3898  | 3966  | 4113 | 4309 | 4601 | 4868 |      |      |      |      |      |      |      |      |      |  |
| SCTCMP | 905#  | 3672  | 3808 | 3923 | 3992 | 4143 | 4340 | 4636 | 4895 |      |      |      |      |      |      |  |
| SETLFS | 905#  | 3814  | 3929 | 4642 | 4901 |      |      |      |      |      |      |      |      |      |      |  |
| SETOM  | 905#  |       |      |      |      |      |      |      |      |      |      |      |      |      |      |  |
| SETPRI | 1046# | 2251  | 5394 | 5420 | 6449 |      |      |      |      |      |      |      |      |      |      |  |
| SETTRA | 6594# | 6603  | 6604 | 6605 | 6606 | 6607 | 6609 | 6611 | 6612 | 6613 | 6614 | 6615 | 6616 |      |      |  |
| SETUP  | 1046# | 2208  |      |      |      |      |      |      |      |      |      |      |      |      |      |  |
| SETVV  | 905#  |       |      |      |      |      |      |      |      |      |      |      |      |      |      |  |
| SKIP   | 1046# |       |      |      |      |      |      |      |      |      |      |      |      |      |      |  |
| SLASH  | 1046# |       |      |      |      |      |      |      |      |      |      |      |      |      |      |  |
| SPACE  | 1046# |       |      |      |      |      |      |      |      |      |      |      |      |      |      |  |
| STARS  | 1046# | 1376  | 1394 | 1396 | 1403 | 1417 | 1463 | 1466 | 2522 | 2525 | 2609 | 2612 | 2661 | 2664 | 2709 |  |
|        | 2712  | 2751  | 2754 | 2964 | 2967 | 3236 | 3239 | 3270 | 3273 | 3297 | 3300 | 3361 | 3364 | 3452 | 3455 |  |
|        | 3469  | 3541  | 3553 | 3556 | 3641 | 3644 | 3677 | 3721 | 3755 | 3779 | 3782 | 3820 | 3847 | 3867 | 3894 |  |
|        | 3897  | 3935  | 3962 | 3965 | 3999 | 4055 | 4109 | 4112 | 4149 | 4217 | 4250 | 4273 | 4292 | 4305 | 4308 |  |
|        | 4400  | 4451  | 4489 | 4507 | 4532 | 4597 | 4600 | 4699 | 4725 | 4793 | 4864 | 4867 | 4913 | 4937 | 4965 |  |
|        | 4978  | 5033  | 5047 | 5120 | 5169 | 5334 | 5379 | 5496 | 5510 | 5583 | 5595 | 5605 | 5626 | 5636 | 5643 |  |
|        | 5663  | 5676  | 5704 | 5708 | 5767 | 5834 | 5879 | 5903 | 5970 | 6047 | 6126 | 6221 | 6275 | 6352 | 6367 |  |
|        | 6438  | 6462  | 6531 | 6569 | 6619 | 6635 | 6662 |      |      |      |      |      |      |      |      |  |
| SWRSU  | 1046# | 2230# |      |      |      |      |      |      |      |      |      |      |      |      |      |  |

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CROSS REFERENCE TABLE -- MACRO NAMES

E 15

SEQ 0186

|            |       |       |      |      |      |      |      |      |      |      |      |      |      |      |      |
|------------|-------|-------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| TAGS       | 905#  | 1526  |      |      |      |      |      |      |      |      |      |      |      |      |      |
| TRMTRP     | 6594# |       |      |      |      |      |      |      |      |      |      |      |      |      |      |
| TSTSET     | 905#  | 2529  | 2615 | 2668 | 2716 | 2757 | 2971 | 3243 | 3277 | 3303 | 3367 | 3458 | 3559 | 3647 | 3785 |
|            | 3900  | 3968  | 4115 | 4311 | 4603 | 4870 |      |      |      |      |      |      |      |      |      |
| TYPBIN     | 1046# |       |      |      |      |      |      |      |      |      |      |      |      |      |      |
| TYPDEC     | 1046# | 5143  | 5150 |      |      |      |      |      |      |      |      |      |      |      |      |
| TYPNAM     | 905#  | 1046# | 2255 |      |      |      |      |      |      |      |      |      |      |      |      |
| TYPNUM     | 1046# |       |      |      |      |      |      |      |      |      |      |      |      |      |      |
| TYPOCS     | 1046# | 2376  | 2397 | 5190 | 5198 | 5207 | 5213 |      |      |      |      |      |      |      |      |
| TYPOCT     | 1046# | 2362  | 6380 |      |      |      |      |      |      |      |      |      |      |      |      |
| TYPTXT     | 1046# | 5139  | 5146 |      |      |      |      |      |      |      |      |      |      |      |      |
| \$\$CMRE   | 1415# |       |      |      |      |      |      |      |      |      |      |      |      |      |      |
| \$\$CMTM   | 1415# | 1452  | 1453 | 1454 | 1455 | 1456 |      |      |      |      |      |      |      |      |      |
| \$\$E...CA | 1046# |       |      |      |      |      |      |      |      |      |      |      |      |      |      |
| \$\$NEWT   | 1046# | 2522  | 2609 | 2661 | 2709 | 2751 | 2964 | 3236 | 3270 | 3297 | 3361 | 3452 | 3553 | 3641 | 3779 |
|            | 3894  | 3962  | 4109 | 4305 | 4597 | 4864 |      |      |      |      |      |      |      |      |      |
| \$\$SET    | 6594# | 6603  | 6604 | 6605 | 6606 | 6607 | 6609 | 6611 | 6612 | 6613 | 6614 | 6615 | 6616 |      |      |
| \$\$SETM   | 2246# |       |      |      |      |      |      |      |      |      |      |      |      |      |      |
| \$\$SKIP   | 1046# |       |      |      |      |      |      |      |      |      |      |      |      |      |      |
| .EQUAT     | 905#  | 936   |      |      |      |      |      |      |      |      |      |      |      |      |      |
| .GETPR     | 905#  |       |      |      |      |      |      |      |      |      |      |      |      |      |      |
| .HEADE     | 905#  | 906   |      |      |      |      |      |      |      |      |      |      |      |      |      |
| .SETUP     | 905#  | 1362  |      |      |      |      |      |      |      |      |      |      |      |      |      |
| .SWRHI     | 905#  | 917   |      |      |      |      |      |      |      |      |      |      |      |      |      |
| .SWRLO     | 905#  | 928#  |      |      |      |      |      |      |      |      |      |      |      |      |      |
| .\$ACT1    | 905#  | 1374  |      |      |      |      |      |      |      |      |      |      |      |      |      |
| .\$APT8    | 905#  | 1464# |      |      |      |      |      |      |      |      |      |      |      |      |      |
| .\$APTH    | 905#  | 1392  |      |      |      |      |      |      |      |      |      |      |      |      |      |
| .\$APTY    | 905#  | 6660  |      |      |      |      |      |      |      |      |      |      |      |      |      |
| .\$CATC    | 905#  | 1363  |      |      |      |      |      |      |      |      |      |      |      |      |      |
| .\$CMTA    | 905#  | 1415  |      |      |      |      |      |      |      |      |      |      |      |      |      |
| .\$DIV     | 905#  |       |      |      |      |      |      |      |      |      |      |      |      |      |      |
| .\$EOP     | 905#  | 5118  |      |      |      |      |      |      |      |      |      |      |      |      |      |
| .\$ERRO    | 905#  | 6219  |      |      |      |      |      |      |      |      |      |      |      |      |      |
| .\$ERRT    | 905#  |       |      |      |      |      |      |      |      |      |      |      |      |      |      |
| .\$MULT    | 905#  |       |      |      |      |      |      |      |      |      |      |      |      |      |      |
| .\$POWE    | 905#  | 6617  |      |      |      |      |      |      |      |      |      |      |      |      |      |
| .\$RAND    | 905#  |       |      |      |      |      |      |      |      |      |      |      |      |      |      |
| .\$RDDE    | 905#  |       |      |      |      |      |      |      |      |      |      |      |      |      |      |
| .\$RDOC    | 905#  | 6529  |      |      |      |      |      |      |      |      |      |      |      |      |      |
| .\$READ    | 905#  | 6273  |      |      |      |      |      |      |      |      |      |      |      |      |      |
| .\$SAVE    | 905#  | 5832  |      |      |      |      |      |      |      |      |      |      |      |      |      |
| .\$SCOP    | 905#  | 6124  |      |      |      |      |      |      |      |      |      |      |      |      |      |
| .\$SIZE    | 905#  |       |      |      |      |      |      |      |      |      |      |      |      |      |      |
| .\$TRAP    | 905#  | 6567  |      |      |      |      |      |      |      |      |      |      |      |      |      |
| .\$TYPB    | 905#  | 5877  |      |      |      |      |      |      |      |      |      |      |      |      |      |
| .\$TYPD    | 905#  | 5901  |      |      |      |      |      |      |      |      |      |      |      |      |      |
| .\$TYPE    | 905#  | 6045  |      |      |      |      |      |      |      |      |      |      |      |      |      |
| .\$TYPO    | 905#  | 5968  |      |      |      |      |      |      |      |      |      |      |      |      |      |

. ABS. 056126 000

ERRORS DETECTED: 0

F 15  
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CZRMKB.P11 14-AUG-78 15:53 CROSS REFERENCE TABLE -- MACRO NAMES

SEQ 0187

DSK1:CZRMKB.BIN,DSK2:CZRMKB.SEQ/SOL/NL:TOC:CND:MC:MD/LI:ME/DOC/CRF DSKM:CZRMKB.P11  
RUN-TIME: 35 24 3 SECONDS  
RUN-TIME RATIO: 144/64=2.2  
CORE USED: 32K (63 PAGES)

DOCUMENT PAGES: 187