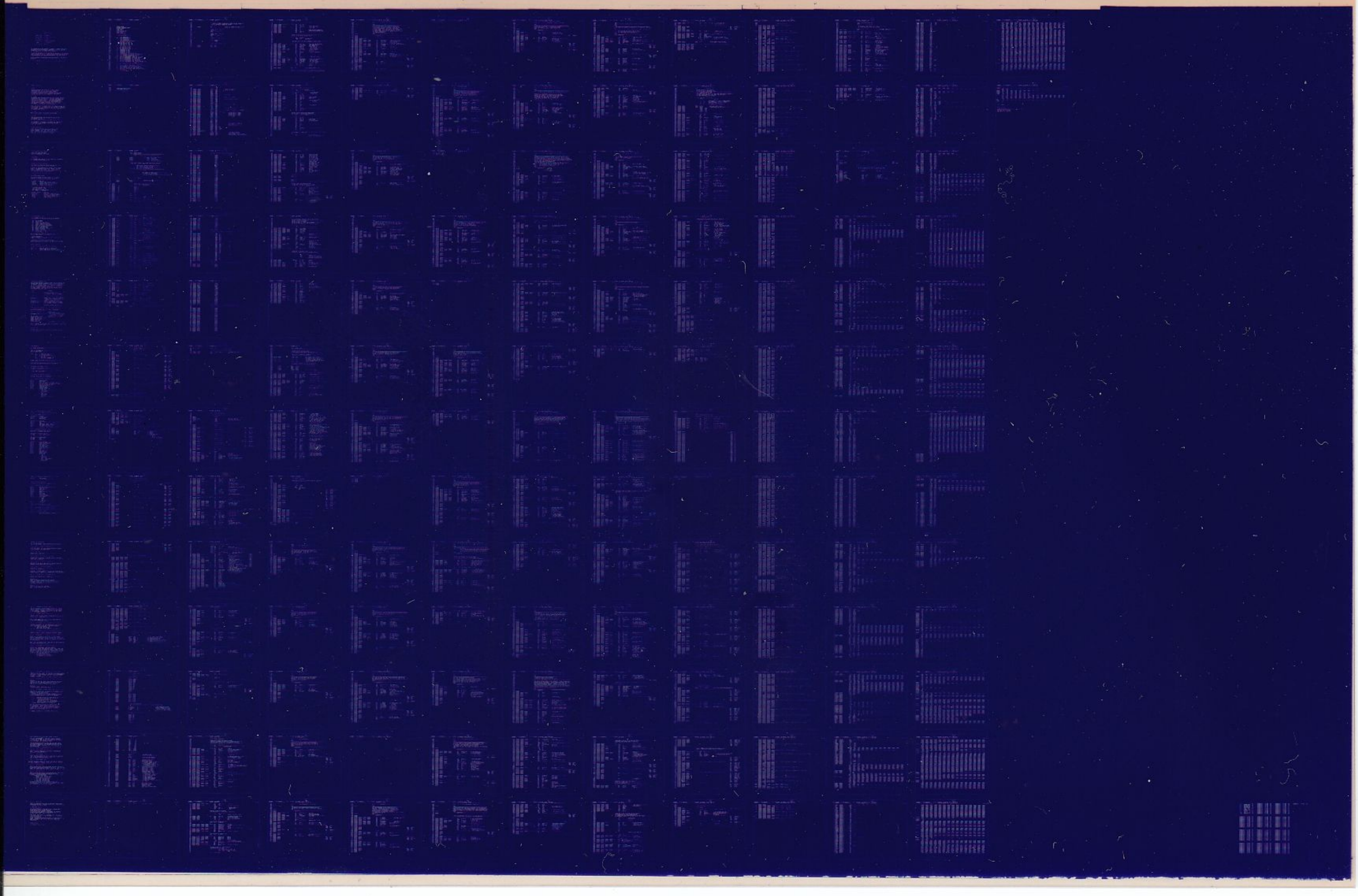
M8061 RL11
RLV11/12

RLV12 DISKLESS
CVRLBB0

AH-S827B-MC
1 OF 1 JUL 1985
 MADE IN USA



IDENTIFICATION

PRODUCT CODE: AC-S825B MC

PRODUCT NAME: CVRLB80 RLV12 DISKLESS

DATE CREATED: FEB 1982

MAINTAINER: DIAGNOSTIC ENGINEERING

AUTHOR: G. PASQUANTONIO

DATE REVISED: MAR 1985

06
1.0 GENERAL INFORMATION

1.1 ABSTRACT

THE RLV12 DISKLESS TEST IS AN LSI 11 (PDP 11) BASED
PROGRAM THAT WILL TEST THE RLV12, RLV11 AND/OR RL11
DISK CONTROLLERS WITH OR WITHOUT DRIVE ATTACHED.
THE PROGRAM IS AN ADAPTATION OF "CVRLABO RLV11 RL01 DSKLS"
RETAINING ALL PREVIOUS TEST CAPABILITIES, AND UPGRADED TO
INCLUDE ADDITIONAL TESTING IN SUPPORT OF THE RLV12.

RLV12 MODE

THE PROGRAM TESTS THE BASIC INTERFACE LOGIC, CONTROL REGISTE
MANIPULATION, AND FUNCTIONALITY. THE RLV12 MAINTENANCE MODE
FUNCTION IS EXECUTED TO TEST THE CONTROLLER WRITE/READ DATA
PATHS WITHOUT A DRIVE PRESENT. THE EXTENDED ADDRESSING
CAPABILITY IS TESTED IN 18 OR 22 BIT MODE DEPENDING ON THE
TYPE AND AMOUNT OF MEMORY INSTALLED IN THE TEST SYSTEM.
ADDITIONALLY, THE DRIVE BUS INTERFACE LOGIC IS TESTED PROVIDED
THE G5388 TEST LOOP MODULE (TLM) IS INSTALLED.

NOTE. THE TLM IS AN IN HOUSE SPECIAL TEST DEVICE DESIGNED FOR
MANUFACTURING USE. IT PROBABLY WILL NOT BE GENERALLY AVAILABLE
IN THE FIELD. THE CODE FOR TESTING WITH THE TLM IS INCLUDED IN
THIS PROGRAM (BYPASSED BY DEFAULT) TO MAINTAIN CONSISTENCY WITH
THE MANUFACTURING VERSION.

RLV11 MODE

SAME AS ABOVE EXCEPT THAT EXTENDED ADDRESSING IS LIMITED
TO 18 BITS, AND DRIVE INTERFACE IS NOT TESTED.

RL11 MODE

SINCE THE MAINTENANCE FUNCTION DOES NOT EXIST ON THE RL11,
THIS PROGRAM WILL ONLY TEST THE BASIC INTERFACE LOGIC,
AND REGISTER FUNCTIONALITY.
THE "NOP" COMMAND IS THE ONLY FUNCTION EXECUTED ON THE RL11.

THIS DIAGNOSTIC IS DESIGNED TO RUN UNDER XXDP+ AND REQUIRES
THE SERVICES OF THE DIAGNOSTIC SUPERVISOR (DRS REV D).
IT WILL RUN STANDALONE UNDER XXDP+ AND IS CHAINABLE UNDER
XXDP+, ACT, OR APT.

1.2 HARDWARE REQUIREMENTS

LSI-11 (PDP 11) PROCESSOR WITH 16K OR MORE OF CORE.
MEMORY MANAGEMENT, KT11 OR EQUIVALENT (OPTIONAL).
CONSOLE TERMINAL (LA30, LA36, VT52, VT100, ETC.).
XXDP+ LOAD DEVICE AND DIAGNOSTIC MEDIA (RX01, RX02, ETC.)
RLV12, RLV11, OR RL11 CONTROLLER(S) UNDER TEST (1 8).
G5388 RLV12 TEST LOOP MODULE (1 8, OPTIONAL).

06
1.3 RELATED DOCUMENTS AND STANDARDS

CHQUSE XXDP+/SUPR USER MANUAL.
RLV12 DISK CONTROLLER USERS GUIDE.
G5388 TLM ENGINEERING SPEC (OPTIONAL).

1.4 MISCELLANEOUS

ALL HARDWARE OTHER THAN THE UNIT(S) UNDER TEST IS ASSUMED TO BE IN PROPER WORKING ORDER. IF NOT (OR YOU DON'T <NOW) RUN ALL APPLICABLE SYSTEM DIAGNOSTICS.

2.0 LOADING AND STARTING PROCEDURES

THIS PROGRAM IS LOADED AND STARTED FROM ANY XXDP+ MEDIA USING THE STANDARD XXDP+ OPERATING PROCEDURES.

AT START UP, THE SUPERVISOR WILL IDENTIFY ITSELF AND THE NAME OF THIS PROGRAM ON THE CONSOLE TERMINAL, AND THEN DISPLAY A COMMAND MODE PROMPT (DR>) WHICH INDICATES READY TO ACCEPT ANY OF THE COMMANDS DESCRIBED IN 2.1 BELOW. THE GENERALIZED COMMAND STRING FORMAT IS:

DR>COM(MAND)/SWITCH:VALUE/SWITCH:VALUE ... <CR>

2.1 SUPERVISOR COMMAND SUMMARY

THIS SECTION PRESENTS A BRIEF OVERVIEW OF THE COMMANDS NECESSARY TO CONTROL THE OPERATION OF THIS PROGRAM UNDER THE XXDP+ DIAGNOSTIC SUPERVISOR (REV D).

THE PRIMARY COMMANDS ARE:

STA(RT)	INITIAL START, BUILD P-TABLES (SEE 2.4).
RES(TART)	RESTART USEING EXISTING P-TABLES.
CON(TINUE)	CONTINUE AFTER <↑C> OR ERROR HALT.
PRO(CEED)	PROCEED (FROM ERROR HALT ONLY).
EXI(T)	RETURN TO XXDP+ MONITOR.

THE FOLLOWING SWITCHES APPLY TO THE ABOVE:

/TEST:<TEST NUMBERS TO RUN>
/FLAG:<SEE FLAG LIST BELOW>
/EOP:<NUMBER OF PASSES 'TIL END OF PASS REPORT>
/PASS:<NUMBER OF PASSES TO RUN>

ADDITIONAL COMMANDS AVAILABLE ARE:

DRO(P)/UNIT:N	REMOVE UNIT N FROM TEST LIST.
ADD/UNIT:N	ADD UNIT N (PREVIOUSLY DROPPED).
DIS(PLAY)/UNIT:N	PRINT UNITS P-TABLE ENTRIES.
PRI(NT)	PRINT OPTIONAL REPORTS (IF ANY).
FLA(GS)	PRINT CURRENT FLAG SETTINGS.
ZFL(AGS)	CLEAR ALL FLAGS.

06
2.2 RUN TIME OPTIONS (FLAGS)

THE FOLLOWING FLAGS ARE USED IN LIEU OF THE HARDWARE
SWITCH REGISTER TO FURTHER DEFINE PROGRAM BEHAVIOUR:

HOE	HALT ON ERROR
LOE	LOOP ON ERROR
IER	INHIBIT ALL ERROR REPORTS
IBR	INHIBIT BASIC ERROR REPORTS
IXR	INHIBIT EXTENDED ERROR REPORTS
PRI	DIRECT OUTPUT TO A LINE PRINTER
PNT	PRINT TEST NUMBERS AS EXECUTED
BOE	GOOD OLD "BELL ON-ERROR"
UAM	RUN IN "UNATTENDED MODE" (UNUSED)
ISR	INHIBIT STATISTICAL REPORTS
IDR	INHIBIT "AUTO-DROP"
ADR	EXECUTE "AUTO-DROP" IF DEVICE NOT READY
LOT	LOOP ON TEST
FVL	EVALUATE ERRORS (UNUSED)

FLAG SETTINGS ARE ALTERED BY USING THE /FLAGS: SWITCH
IN ANY COMMAND STRING. TWO EXAMPLES FOLLOW:

```
  STA/FLA:IER:BOE<CR>
```

START THE PROGRAM, RUN ALL TEST IN ORDER, INHIBIT ERROR
REPORTS AND RING BELL INSTEAD.

```
  RES/TES:1 5,7,9-29/PAS:10/FLA:HOE:BOE<CR>
```

RESTART AND RUN ALL TESTS EXCEPT 6, 8, AND 30 FOR 10 PASSES.
RING THE BELL AND HALT (RETURN TO COMMAND MODE) ON ANY ERROR.

2.3 CONTROL CHARACTERS

THE FOLLOWING CONTROL CHARACTERS ARE RECOGNIZED:

CTRL C <↑C>	ABORT AND RETURN TO COMMAND MODE.
CTRL O <↑O>	SUPPRESS TTY OUTPUT UNTIL NEXT <↑O>.
CTRL Z <↑Z>	DURING START/RESTART PARAMETER ENTRY ONLY. IMPLIES TAKE DEFAULTS ON ALL REMAINING QUERIES.

2.4 HARD AND SOFT PARAMETER SETUP

THE FOLLOWING DIALOGUE IS TAKEN AT START TIME TO ESTABLISH THE HARDWARE ANND SOFTWARE PARAMETER TABLES (P-TABLES) REQUIRED BY THE PROGRAM. DEFAULT VALUES, WHEN APPLICABLE, APPEAR JUST TO THE LEFT OF THE QUESTION MARK (?). TYPE <CR> TO ACCEPT THE DEFAULT, OR ANSWER THE QUERY APPROPRIATLY. A <↑Z> TYPED AT ANY POINT DURING THE SESSION IMPLIES TAKE DEFAULTS FOR ALL REMAINING QUERIES. NOTE THAT ON RESTART OR CONTINUE, ONLY THE SOFTWARE DIALOGUE IS TAKEN.

QUERY	RESPONSE
CHANGE HW (L) ?	NO DEFAULT, ANSWER Y OR N. IF N, ASSUME 1 UNIT IN THE DEFAULT CONFIGURATION, AND GO TO "CHANGE SW'.
# UNITS (D) ?	NO DEFAULT, ENTER # OF UNITS TO TEST.
RLV12 (L) Y ?	ANSWER Y OR N. IF N, SKIP NEXT QUERY.
BAE ENABLED (L) Y ?	ON RLV12, BAE IS ENABLED BY DEFAULT... ...ANSWER Y OR N, AND SKIP NEXT QUERY.
RLV11 (L) N ?	ANSWER Y IF RLV11, N IF RL11.
CSR ADDRESS (O) 174400 ?	ENTER RL CSR ADDRESS IF DIFFERENT.
VECTOR (O) 160 ?	ENTER INTERRUPT VECTOR IF DIFFERENT.
BR LEVEL (O) 4 ?	ENTER INTERRUPT PRIORITY IF DIFFERENT.
CHANGE SW (L) ?	NO DEFAULT, ANSWER Y OR N. IF N, BYPASS ALL REMAINING QUERIES.

ERROR LIMIT FOR AUTO DROP (O) 0 ? SET ERROR LIMIT (IF ANY).

ALL REMAINING QUERIES ARE FOR OPTIONAL (MANUFACTURING)
G5388 TEST-LOOP MODULE SET UP. USE <↑Z> TO BYPASS.

G5388 TLM INSTALLED (L) N ?	ANSWER Y OR N. IF NO, BYPASS THE REST.
CSR ADDRESS (UNIT 0) (O) 160010 ?	BASE TLM CSR (SEE NOTE BELOW).
DUMP PROM ON TTY: (L) N ?	IF Y, GO DIRECTLY TO THE DUMP... ...UTILITY (SEE 7.16.7 BELOW).
PROM ID NUMBER (O) 401 ?	ENTER PROM ID IF DIFFERENT.
INHIBIT MAX PEAK SHIFT (L) N ?	ANSWER Y OR N...
INHIBIT MIN PEAK SHIFT (L) N ?	
INHIBIT NOMINAL CLOCK (L) N ?	
INHIBIT FAST CLOCK (L) N ?	
INHIBIT SLOW CLOCK (L) N ?	
SECTOR NUMBER (O) 0 ?	SECTOR NUMBER TO TEST (0 = ALL).

NOTE: IF RUNNING MULTIPLE UNITS WITH TLM'S (UNLIKELY), THE PROGRAM EXPECTS THAT EACH ADDITIONAL TLM CSR IS OFFSET BY 10 (OCTAL).
I.E. 160010, 160020, 160030, ETC...

2.5 EXECUTION TIME

EXECUTION TIME IS DEPENDANT UPON CPU TYPE, MEMORY SIZE, AND BUS TYPE (18 VS 22 BIT), BUT SHOULD NOT EXCEED 30 SECONDS IN ANY CONFIGURATION.

06
3.0 ERROR REPORTING

ALL ERRORS ARE REPORTED ON THE CONSOLE TERMINAL AS THEY OCCUR.
THE GENERAL ERROR FORMAT IS:

```
CVRLB XXX ERR NNNNN UNIT NN TEST TTT SUB SSS PC: PPPPPP
ONE LINE DESCRIPTION.....................
EXP'D: 000000  REC'D: 177777
```

WHERE:

XXX	IS ERROR TYPE (HRD OR SFT),
NNNNN	IS THE ERROR NUMBER,
NN	IS THE FAILING UNIT NUMBER,
TTT	IS THE TEST...
SSS	...AND SUBTEST NUMBERS, AND
PPPPPP	IS THE PC OF THE ERROR CALL.

IN MANY CASES, THE ENTIRE CONTROLLER STATE (ALL REGISTERS
BEFORE AND AFTER THE FACT) IS ALSO DISPLAYED.

ERROR REPORTING AND RECOVERY MAY BE ALTERED AND/OR INHIBITED
VIA THE /FLAG: SWITCH AS DESCRIBED IN 2.2 ABOVE.

4.0 PERFORMANCE AND PROGRESS REPORTS

THE OPERATING ENVIRONMENT IS DISPLAYED ON THE CONSOLE
TERMINAL AT START/RESTART TIME.

A TOTAL (CUMULATIVE) ERROR COUNT IS DISPLAYED AT THE END
OF EVERY PASS, THEREAFTER.

5.0 RLV12 CONTROLLER REGISTER DEFINITION

THE RLV12, RLV11, AND RL11 CONTROLLERS UTILIZE THE FOLLOWING
REGISTERS FOR CONTROL OF THE SUBSYSTEM:

5.1 RLCS - CONTROL AND STATUS REGISTER (174400)

BIT<15>	COMPOSITE ERROR
BIT<14>	DRIVE ERROR
BIT<13>	NON EX MEM (OPI=0), OR PARITY (OPI=1)
BIT<12>	DATA LATE (OPI=0), OR HEADER NOT FOUND (OPI=1)
BIT<11>	DATA CRC (OPI=0), OR HEADER CRC (OPI=1)
BIT<10>	OPERATION INCOMPLETE (OPI)
BIT<9:8>	DRIVE SELECT (3 TO 0)
BIT<7>	CONTROLLER READY (OR DONE)
BIT<6>	INTERRUPT ENABLE
BIT<5:4>	EXTENDED ADDRESS BITS<17:16>
BIT<3:1>	FUNCTION CODE: 0 = MAINT (RLV12/11), NOP (RL11) 1 = WRITE CHECK 2 = GET DRIVE STATUS 3 - SEEK 4 = READ HEADER 5 = WRITE DATA 6 - READ DATA 7 = READ WITHOUT HEADER CHECK
BIT<0>	DRIVE READY

RLBA -- BUS ADDRESS REGISTER (174402)

BIT<15:0> BUS ADDRESS FOR DMA DATA EXCHANGE.

5.3 RLDA -- DISK ADDRESS REGISTER (174404)

FOR READ/WRITE FUNCTIONS:
BIT<15:7> CYLINDER NUMBER
BIT<6> HEAD SELECT
BIT<5:0> SECTOR NUMBER

FOR SEEK/STATUS FUNCTIONS:
BIT<15:7> SEEK DIFFERENCE (SEEK), UNUSED (STATUS)
BIT<6:5> ZERO
BIT<4> HEAD SELECT (SEEK), ZERO (STATUS).
BIT<3> ZERO (SEEK), RESET (STATUS)
BIT<2> SEEK DIRECTION (SEEK), ZERO (STATUS)
BIT<1> 0 = SEEK, 1 = GET STATUS
BIT<0> MARKER, MUST BE 1 FOR EITHER FUNCTION.

5.4 RLMP -- MULTIPURPOSE REGISTER (174406)

WRITE BEFORE READ/WRITE DATA FUNCTIONS:
BIT<15:0> NEGATIVE WORD COUNT

READ AFTER MAINTENANCE FUNCTION:
1ST WORD: CRC OF INITIAL (DA)+3
2ND WORD: CRC OF CRC OF INITIAL (DA)+4

READ AFTER READ-HEADER FUNCTION:
1ST WORD: DISK ADDRESS.
2ND WORD: ZERO.
3RD WORD: HEADER CRC.

READ AFTER GET STATUS FUNCTION:
BIT<15> WRITE DATA ERROR (WDE)
BIT<14> CURRENT HEAD ERROR (CHE)
BIT<13> WRITE LOCK (WL)
BIT<12> SEEK TIME OUT (SKTO)
BIT<11> SPIN ERROR (SPE)
BIT<10> WRITE GATE ERROR (WGE)
BIT<9> VOLUME CHECK (VC)
BIT<8> DRIVE SELECT ERROR (DSE)
BIT<7> ZERO
BIT<6> HEAD SELECT (HS)
BIT<5> COVER OPEN (CO)
BIT<4> HEADS OUT (HO)
BIT<3> BRUSHES HOME (BH)
BIT<2:0> DRIVE STATE:
0 - LOAD
1 = SPIN UP
2 = BRUSH CYCLE
3 - LOAD HEADS
4 = SEEK TRACK COUNTING
5 = SEEK LINEAR MODE
6 = UNLOAD HEADS
7 - SPIN DOWN

06
5.5 RLBAE -- BUS ADDRESS EXTENSION (174410) RLV12 ONLY

SEQ 000H

BIT<15:6> ZERO (UNUSED)
BIT<5:0> EXTENDED ADDRESS BITS<21:16>

6.0 G5388 TLM REGISTER DEFINITION

THE G5388 TLM UTILIZES THE FOLLOWING REGISTERS:

6.1 TCSR -- CONTROL AND STATUS (160010)

BIT<15> NEW SEEK/STATUS COMMAND RECEIVED.
BIT<14> WRITE GATE ERROR.
BIT<13> WRITE GATE.
BIT<12> WRITE DATA (LATCH).
BIT<11> SYS CLK.
BIT<10:9> DRIVE NUMBER SELECTED.
BIT<8> PWR OK.
BIT<7> DRIVE READY.
BIT<6> DRIVE ERROR.
BIT<5> PEAK SHIFT ENABLE.
BIT<4> SECTOR GENERATOR ENABLE.
BIT<3:2> CLOCK SELECT:
0 - SLOW
1 - NOMINAL
2 - FAST
3 - PROM READ MODE
BIT<1> CLEAR FLAGS.
BIT<0> TLM RESET.

6.2 TSKGS -- SEEK/STATUS REGISTER (160012)

BIT<15:0> HOLDS DRIVE COMMAND RECEIVED FROM RLV12.

6.3 TPDS -- PSUEDO-DRIVE STATUS REGISTER (160014)

BIT<15:0> SENDS PSUEDO-DRIVE STATUS TO THE RLV12.

6.4 TPROM -- PROM REGISTER (160016)

BIT<15:0> HOLDS PROM ID DURING "TLM RESET" AND/OR
PROM DATA DURING "READ PROM" MODE.

06
7.0 HARDWARE TEST DESCRIPTION

SEQ 0009

THIS SECTION PROVIDES A BRIEF DESCRIPTION OF THE HARDWARE TESTS.
REFER TO THE PROGRAM LISTING (8.0) FOR FURTHER DETAILS.

7.1 TESTS 1 THRU 5 -- REGISTER ADDRESSABILTY.

THESE TESTS VERIFY THAT EACH CONTROLLER REGISTER ANSWERS TO
IT'S BUS ADDRESS. BOTH READ AND WRITE ACCESS IS VERIFIED
USING "MOV" AND "TST" INSTRUCTIONS.

7.2 TEST 6 - BUS RESET.

VERIFIES THAT A "BUS-RESET" PLACES THE CONTROLLER IF THE
PROPER "INITIALIZED" STATE.

7.3 TESTS 7 THRU 10 -- READ AND WRITE REGISTERS.

VERIFIES THAT WE CAN WRITE TO AND READ FROM ALL REGISTERS
(EXCEPT MPR). VARIOUS DATA PATTERNS ARE WRITTEN AND VERIFIED
USING "MOV" INSTRUCTIONS.

7.4 TESTS 11 THRU 14 -- BIS AND BIC REGISTERS.

VERIFIES THAT WE CAN SET AND CLEAR ALL WRITEABLE BITS IN ALL
REGISTERS (EXCEPT MPR) USING "BIS" AND "BIC" INSTRUCTIONS.
VARIOUS DATA PATTERNS ARE EMPLOYED HERE TOO.

7.5 TESTS 15 THRU 19 - REGISTER UNIQUENESS.

VERIFIES THAT WRITING TO ANY REGISTER HAS NO AFFECT ON ANY
OTHER (NO DUAL-ADDRESSING).

EXCEPTION: EXTENDED ADDRESS BITS<17:16> MAY BE WRITTEN VIA
EITHER RLCS<5:4> OR RLBAE<1:0>. REGARDLESS OF WHICH REGISTER IS
ACTUALLY WRITTEN, THOSE BITS ARE COPIED INTO THE OTHER REGISTER.

7.6 TEST 20 - FUNCTION CODE 0, MAINTENANCE OR NOP.

VERIFIES THAT FUNCTION CODE 0 EXECUTES AS A "MAINTENANCE"
FUNCTION (RLV12 AND RLV11), OR "NOP" (RL11).

FOR RLV12/11:
EXPECT TO EXECUTE A MAINTENANCE MODE SEQUENCE.
CHECK THAT THE MAINTENANCE FUNCTION COMPLETES WITH NO
CONTROLLER ERRORS, AND THAT THE FINAL VALUE IN THE RLDA
IS CORRECT, INDICATING THAT THE INTERNAL MAINTENANCE
MODE SEQUENCER FINISHED IT'S CYCLE.

FOR RL11:
EXPECT TO EXECUTE A "NOP" FUNCTION.
CHECK THAT ALL ERROR BITS ARE CLEAR (RLCS<13:10>)
AND ALL OTHER REGISTERS UNAFFECTED.

7.7 TEST 21 -- INTERRUPT ON FUNCTION COMPLETE.

THIS TEST EXECUTES A NOP/MAINTENANCE FUNCTION WITH INTERRUPT ENABLED, AND VERIFIES THAT AN INTERRUPT THRU THE RL VECTOR ACTUALLY OCCURS. INCORRECT VECTORS UNDER 1000 ARE TRAPPED BY THE SUPERVISOR. INCORRECT VECTORS TO ANY OTHER ADDRESS WILL YIELD UNPREDICTABLE RESULTS.

7.8 TEST 22 -- INTERRUPT PRIORITY LEVEL TEST.

SIMILAR TO THE LAST TEST, EXCEPT THAT WE REITERATE AT ALL CPU LEVELS (7 TO 0), VERIFYING THAT THE INTERRUPT IS HELD OFF WHEN THE CPU LEVEL => CONTROLLER LEVEL.

NOTE: IF UNIT UNDER TEST IS RL11, YOU'LL SEE AN END-PASS AT THE COMPLETION OF THIS TEST. ALL FOLLOWING TESTS UTILIZE THE RLV12/11 MAINTENANCE FUNCTION.

.9 TEST 23 -- MAINTENANCE, FORCE OPI ERROR (RLV12/11 ONLY).

THIS TEST WILL VERIFY THAT THE CONTROLLER WILL SET THE OPI (OPERATION INCOMPLETE) BIT ON A MAINTENANCE FUNCTION IF THE INITIAL WORD COUNT IS INCORRECT. WE'LL DO 2 PASSES.

1. WORD COUNT LESS THAN 510.
2. WORD COUNT GREATER THAN 511.

BOTH CASES SHOULD CAUSE AN OPI ERROR IN THE CONTROLLER.

7.10 TEST 24 - MAINTENANCE, FORCE OPI AND INTERRUPT (RLV12/11 ONLY).

SIMILAR TO THE LAST, EXCEPT EXECUTE WITH INTERRUPT ENABLED. EXPECT OPI ERROR TO CAUSE AN INTERRUPT THRU THE RL VECTOR.

7.11 TEST 25 -- MAINTENANCE, OPI TIMING TEST (RLV12/11 ON LSI ONLY).

VERIFY THAT THE SETTING OF THE OPI BIT IS TIMED CORRECTLY. EXECUTE A MAINTENANCE FUNCTION IN FLAG MODE WITH INVALID WORD COUNT TO FORCE OPI ERROR. MEASURE THE TIME FROM "GO" UNTIL THE OPI ERROR FLAG SETS AND CHECK THAT TIME AGAINST THE SPEC LIMITS (155 TO 650 MSECS.).

NOTE: THIS TEST EMPLOYS A SOFT TIMER THAT HAS BEEN CALIBRATED FOR LSI11/2,/23,/73 CPUS ONLY. IF YOUR CPU IS NOT ONE OF THESE THIS TEST IS AUTOMATICALLY BYPASSED.

7.12 TEST 26 -- MAINTENANCE, FIFO AND DMA TRANSFER (RLV12/11 ONLY).

VERIFIES THAT "MAINTENANCE" FUNCTIONS CORRECTLY.
EXECUTE A MAINTENANCE MODE FUNCTION IN FLAG MODE. VERIFY THE FINAL BA, DA, AND BAE REGISTERS ARE CORRECT. CHECK THE SERIAL WRITE/READ DATA PATHS BY READING THE TWO MAINTENANCE CRC WORDS (CRC OF DA+3, AND CRC OF CRC OF DA+4) FROM THE FIFO VIA THE MP REGISTER. VERIFY THAT 256 WORDS WERE TRANSFERED FROM MEMORY TO THE FIFO, AND 255 WORDS FROM FIFO BACK TO MEMORY.
REPEAT 57 TIMES USING VARIOUS DATA.

1. 28 DIFFERENT DATA PATTERNS.
2. THE COMPLIMENT OF THOSE PATTERNS.
3. ONE RANDOM 256 WORD PATTERN.

06
7.13 TEST 27 - MAINTENANCE, FIFO ADDRESS TEST (RLV12/11 ONLY). SEQ 0011

SIMILAR TO THE LAST, EXCEPT THAT THE DATA IS AN ADDRESS PATTERN WHERE EACH FIFO LOCATION WILL BE WRITTEN WITH IT'S OWN ADDRESS (0 TO 255.). RFPEAT A SECOND TIME WITH A COMPLIMENT ADDRESS PATTERN (-1 TO -256.).
INTERRUPT ON DONE IS ENABLED AND EXPECTED DURING THIS TEST.

7.14 TEST 28 -- MAINTENANCE, BANK SELECT 7 AND NXM (RLV12/11 ONLY).

FOR RLV12:
VERIFIES THAT BBS7 WILL SELECT THE I/O PAGE AND THAT ACCESS TO LOCATION 0 IN THAT PAGE WILL GENERATE NXM AND OPI ERRORS.
NOTE: IF BANK 7 IS NOT PROPERLY SELECTED, 1000 BYTES STARTING AT XXXX1000 WILL PROBABLY GET CRUNCHED !!!

FOR RLV11:
SINCF RLV11 DOESN'T ASSERT BBS7, WE'LL EXECUTE THIS TEST ONLY IF MEMORY SIZE IS LESS THAN 124K WORDS.

7.15 TEST 29 -- MAINTENANCE, EXTENDED MEMORY ACCESS (RLV12/11 ONLY).

THIS TEST WILL VERIFY THAT THE CONTROLLER CAN ADDRESS EXTENDED MEMORY UP TO 124K (18 BIT) OR 2044K (22 BIT) DEPENDING UPON CONTROLLER TYPE AND CONFIGURATION.
IT REQUIRES THE SERVICES OF THE MEMORY MANAGEMENT FACILITY (KT11 OR EQUIVALENT IN 11/23) TO ESTABLISH AND VERIFY DATA BUFFERS IN MEMORY FROM 32K TO 2044K, IN 4K INCREMENTS.

1. SETUP -- USING MMU, INITIALIZE A WRITE BUFFER WITH A RANDOM DATA PATTERN, AND CLEAR THE READ BUFFER.
2. EXECUTE - RLV12/11 MAINTENANCE MODE. WRITE BUFFER => FIFO => READ BUFFER.
3. VERIFY USING MMU, VERIFY THAT THE READ BUFFER RECEIVED A COPY OF THE DATA IN THE WRITE BUFFER.
4. INCREMENT BUFFER ADDRESS BY 4K, AND REPEAT.

NOTE THAT THE ENTIRE 18 (OR 22) BIT ADDRESS SPACE IS TESTED ON 4K BOUNDARIES, WHETHER MEMORY EXISTS THERE OR NOT.
IF MEMORY EXISTS VERIFY THE DATA EXCHANGE AS DESCRIBED.
IF NOT, VERIFY THAT THE CONTROLLER GOT A "NXM ERROR".
CONTINUE ALL THE ABOVE UNTIL THE I/O PAGE IS REACHED AT 760000 (18 BIT) OR 17760000 (22 BIT).

OF COURSE, IF AN MMU ISN'T AVAILABLE, THEN ALL THIS IS ACADEMIC, AND WE'LL JUST FALL THRU TO THE NEXT TEST.

06
7.16 DRIVE INTERFACE TESTS (RLV12 ONLY, G5388 TLM REQ'D).

THIS IS AN ASSORTMENT OF 6 TESTS AND 1 UTILITY DESIGNED TO VERIFY THE INTEGRITY OF THE DRIVE INTERFACE SECTION OF THE RLV12 CONTROLLER. ALL REQUIRE THE SERVICES OF THE SPECIAL TEST-LOOP-MODULE (TLM) DESIGNATED G5388.

FROM THE CONTROLLERS POINT OF VIEW, THE TLM LOOKS LIKE A 6 SECTOR RL01/RL02 DISK. VARIOUS HEADER AND DATA PATTERNS ARE STORED IN PROM ON THE TLM, AND ARE ACCESSABLE THRU THE EXECUTION OF "NORMAL" READ/WRITE AND STATUS FUNCTIONS IN THE RLV12 CONTROLLER.
REFER TO THE G5388 TLM ENGINEERING SPEC FOR FURTHER DETAILS.

7.16.1 TEST 30 -- STATIC CONTROL AND STATUS BITS.

CHECK THE STATIC CONTROL AND STATUS BITS TO AND FROM THE RLV12. THESE BITS INCLUDE SYS-CLK, PWR-OK, DRIVE-ERROR, DRIVE-READY, AND DRIVE-SELECTS.

7.16.2 TEST 31 -- DRIVE COMMAND, STATUS.

VERIFY THE DRIVE COMMAND AND STATUS CLOCK LOGIC BY EXECUTING A GET-STATUS COMMAND IN THE RLV12. CHECK THAT A DUMMY STATUS WORD IS CORRECTLY RECEIVED FROM THE TLM.

7.16.3 TEST 32 -- DRIVE COMMAND, SEEK.

VERIFY THE DRIVE COMMAND AND SECTOR PULSE LOGIC BY EXECUTING A SEEK COMMAND IN THE RLV12. CHECK THAT THE SEEK DIFFERENCE WORD WAS CORRECTLY TRANSMITTED TO THE TLM.

7.16.4 TEST 33 -- WRITE DATA PATH.

VERIFY THE WRITE GATE, WRITE GATE ERROR, AND WRITE DATA PATH BY EXECUTING A WRITE-DATA FUNCTION IN THE RLV12. THIS TEST ONLY PROVES THAT TRANSITIONS ARE TAKEING PLACE ON THE WRITE DATA LINE SINCE THE PSUEDO SECTORS ARE ACTUALLY READ-ONLY (PROM).

7.16.5 TEST 34 - READ DATA PATHS.

VERIFY THE READ DATA PATHS BY EXECUTING READ-DATA, READ HEADER, AND READ-DATA-WITHOUT-HEADER FUNCTIONS IN THE RLV12.
BY DEFAULT, EACH PSUEDO-SECTOR IS EXERCISED SIX TIMES, USEING THE FOLLOWING CLOCK VARIATIONS:

1. NOMINAL CLOCK, MIN PEAK SHIFT.
2. NOMINAL CLOCK, MAX PEAK SHIFT.
3. FAST CLOCK, MIN PEAK SHIFT.
4. FAST CLOCK, MAX PEAK SHIFT.
5. SLOW CLOCK, MIN PEAK SHIFT.
6. SLOW CLOCK, MAX PEAK SHIFT.

RETURNED DATA AND STATUS ARE VERIFIED IN EVERY CASE.
PEAK SHIFT AND CLOCKS MAY BE SELECTIVELY INHIBITED AND A SINGLE SECTOR EXERCISED (VS ALL OF THEM) AS DESCRIBED IN THE P-TABLE SOFT PARAMETER SETUP (SECTION 2.4) ABOVE.

7.16 6 TEST 35 -- WRITE CHECK.

VERIFY THE READ/WRITE DATA PATHS BY EXECUTING A WRITE CHECK FUNCTION IN THE RLV12. EXECUTE USEING CLOCK AND SECTOR OPTIONS AS DESCRIBED FOR TEST 34 ABOVE.

7.16.7 TLM PROM DUMP UTILITY.

THE FINAL SECTION IS A "PROM DUMP UTILITY" ROUTINE WHICH CAN BE USED TO PRINT THE CONTENTS OF ANY OF THE 6 TLM PSUEDO-SECTORS ON THE CONSOLE TERMINAL.
THIS ROUTINE IS NOT INCLUDED IN THE NORMAL TEST SEQUENCE.
IT MUST BE CALLED DIRECTLY AT START/RESTART TIME VIA THE SOFTWARE CHANGE QUERY "DUMP TLM PROM ON TTY: ?"

WHEN CALLED, THE PROGRAM WILL INTRODUCE ITSELF, AND ASK FOR A TLM UNIT NUMBER (0 - 7), SECTOR NUMBER (1 - 6), AND DUMP FORMAT (OCTAL OR HEX).
IT WILL THEN READ THAT SECTOR AND PRINT IT IN THE SPECIFIED FORMAT, 8 WORDS PER LINE FOR 20 LINES (160. WORDS TOTAL).
WHEN YOU'RE DONE, TYPE <↑C> TO EXIT BACK TO SUPERVISOR COMMAND MODE.

8.0 PROGRAM LISTING

THE PROGRAM LISTING FOLLOWS:

TABLE OF CONTENTS

```
                        .SBTTL  PROGRAM HEADER
                        ;**********************************************************************
                                .MCALL  SVC
000000'                         SVC             ; INITIALIZE SUPERVISOR MACROS

                        SVCGBL= 1               ; LIST GLOBAL TAGS AT RIGHT MARGIN.
                        SVCTST= 1               ;       DITTO   TEST TAGS.
                        SVCSUB= 1               ;       DITTO   SUBTEST TAGS.
                        SVCTAG= 1               ;       DITTO   ANY OTHER TAGS.
                        SVCINS= 1               ;       DITTO   INSTRUCTIONS AND DATA.
                        ;
                        ; THESE SYMBOLS CONTROL THE LISTING FIELD OF ALL SVC MACRO
                        ; EXPANSIONS.  YOU MAY CHANGE THEM AT ANY TIME OR PLACE.
                        ;
                        ;       1 = RIGHT-JUSTIFY (MAKES IT EASY TO DISTINGUISH
                        ;           SVC'S MACRO CODE FROM YOUR OWN).
                        ;       0 = LEFT-JUSTIFY (ALIGN IN A NORMAL FASHION).
                        ;       1 = DON'T LIST THE EXPANSIONS AT ALL.
                        ;**********************************************************************

                        ;                       HISTORY
                        ;
                        ; 27 MAR-85 -  LWL01 - ;MADE CHANGE TO SIZER TO ALLOW FOR 11/73 TIMING
                        ;                     ;TO CORRECT OPI TIMING ERROR.
                        ;                     ;ALSO, MADE CHANGES TO CORRECT TEST 20.  MP REGISTER
                        ;                     ;WAS NOT BEING COMPARED CORRECTLY TO INITIAL SETTING.
                        ;

                                .ENABL  ABS,AMA
002000                          .=      2000

000101                  PRGSIZ= ↑H<L$LAST>      ; PROGRAM SIZE IN 1/8 K UNITS (OCTAL).
000000                  SVCGBL= 0               ; ALIGN THE HEADER STUFF.
000000                  SVCINS= 0

                                POINTER BGNSFT,BGNSW,BGNDU,BGNAU,BGNRPT,BGNSETUP
                                HEADER  CVRLB,B,0,30.,0,340
002000                  L$NAME::                ;DIAGNOSTIC NAME
002000  103                     .ASCII /C/
002001  126                     .ASCII /V/
002002  122                     .ASCII /R/
002003  114                     .ASCII /L/
002004  102                     .ASCII /B/
002005  000                     .BYTE   0
002006  000                     .BYTE   0
002007  000                     .BYTE   0
002010                  L$REV::                 ;REVISION LEVEL
002010  102                     .ASCII  /B/
002011                  L$DEPO::                ;0
002011  060                     .ASCII  /0/
002012                  L$UNIT::                ;NUMBER OF UNITS
002012  000001                  .WORD   T$PTHV
002014                  L$TIML::                ;LONGEST TEST TIME
002014  000036                  .WORD   30.
002016                  L$HPCP::                ;POINTER TO H.W. QUES.
002016  002172                  .WORD   L$HARD
```

```
(5)  002020
(4)  002020  002412
(5)  002022
(4)  002022  002376
(5)  002024
(4)  002024  003304
(5)  002026
(4)  002026  040416
(5)  002030
(4)  002030  000000
(5)  002032
(4)  002032  000000
(5)  002034
(4)  002034  000000
(5)  002036
(4)  002036  000000
(5)  002040
(4)  002040  026124
(5)  002042
(4)  002042  000340
(5)  002044
(4)  002044  000000
(5)  002046
(4)  002046  000000
(5)  002050
(4)  002050     003
(3)  002051     003
(5)  002052
(4)  002052  000000
(5)  002054  000000
(5)  002056
(4)  002056  000000
(5)  002060
(4)  002060  002142
(5)  002062
(4)  002062  011722
(5)  002064
(4)  002064  000000
(5)  002066
(4)  002066  000000
(5)  002070
(4)  002070  007476
(5)  002072
(4)  002072  007414
(5)  002074
(4)  002074  000000
(5)  002076
(4)  002076  002122
(5)  002100
(4)  002100  104035
(5)  002102
(4)  002102  000000
(5)  002104
(4)  002104  006376
(5)  002106
(4)  002106  007336
```

```
L$SPCP::                ;POINTER TO S.W. QUES.
        .WORD   L$SOFT
L$HPTP::                ;PTR. TO DEF. H.W. PTABLE
        .WORD   L$HW
L$SPTP::                ;PTR. TO S.W. PTABLE
        .WORD   L$SW
L$LADP::                ;DIAG. END ADDRESS
        .WORD   L$LAST
L$STA::                 ;RESERVED FOR APT STATS
        .WORD   0
L$CO::
        .WORD   0
L$DTYP::                ;DIAGNOSTIC TYPE
        .WORD   0
L$APT::                 ;APT EXPANSION
        .WORD   0
L$DTP::                 ;PTR. TO DISPATCH TABLE
        .WORD   L$DISPATCH
L$PRIO::                ;DIAGNOSTIC RUN PRIORITY
        .WORD   340
L$ENVI::                ;FLAGS DESCRIBE HOW IT WAS SETUP
        .WORD   0
L$EXP1::                ;EXPANSION WORD
        .WORD   0
L$MREV::                ;SVC REV AND EDIT #
        .BYTE   C$REVISION
        .BYTE   C$EDIT
L$EF::                  ;DIAG. EVENT FLAGS
        .WORD   0
        .WORD   0
L$SPC::
        .WORD   0
L$DEVP::                ; POINTER TO DEVICE TYPE LIST
        .WORD   L$DVTYP
L$REPP::                ;PTR. TO REPORT CODE
        .WORD   L$RPT
L$EXP4::
        .WORD   0
L$EXP5::
        .WORD   0
L$AUT::                 ;PTR. TO ADD UNIT CODE
        .WORD   L$AU
L$DUT::                 ;PTR. TO DROP UNIT CODE
        .WORD   L$DU
L$LUN::                 ;LUN FOR EXERCISERS TO FILL
        .WORD   0
L$DESP::                ;POINTER TO DIAG. DESCRIPTION
        .WORD   L$DESC
L$LOAD::                ;GENERATE SPECIAL AUTOLOAD EMT
        EMT     E$LOAD
L$ETP::                 ;POINTER TO ERRTBL
        .WORD   0
L$ICP::                 ;PTR. TO INIT CODE
        .WORD   L$INIT
L$CCP::                 ;PTR. TO CLEAN-UP CODE
        .WORD   L$CLEAN
```

```
(5)  002110                                  L$ACP::                 ;PTR. TO AUTO CODE
(4)  002110  007260                                  .WORD   L$AUTO
(5)  002112                                  L$PRT::                 ;PTR. TO PROTECT TABLE
(4)  002112  006370                                  .WORD   L$PROT
(5)  002114                                  L$TEST::                ;TEST NUMBER
(4)  002114  000000                                  .WORD   0
(5)  002116                                  L$DLY::                 ;DELAY COUNT
(4)  002116  000000                                  .WORD   0
(5)  002120                                  L$HIME::                ;PTR. TO HIGH MEM
(4)  002120  000000                                  .WORD   0
 51
 52  002122                                          DESCRIPT <RLV12 DISKLESS>
(4)  002122                                  L$DESC::
(3)  002122  046122  030526  020062                  .ASCIZ  /RLV12 DISKLESS/
(3)  002130  044504  045523  042514
(3)  002136  051523     000
(2)          002142                                  .EVEN
 53
 54  002142                                          DEVTYP  <RLV12, RLV11, OR RL11>
(4)  002142                                  L$DVTYP::
(3)  002142  046122  030526  026062                  .ASCIZ  /RLV12, RLV11, OR RL11/
(3)  002150  051040  053114  030461
(3)  002156  020054  051117  051040
(3)  002164  030514  000061
(2)                                                  .EVEN
 55
 56          000001                          SVCGBL= 1               ; SHOVE EVERYTHING BACK TO THE RIGHT.
 57          000001                          SVCINS= 1
```

```
                        .SBTTL  HARDWARE PARAMETER CODING
                        ;
                        ; GET PARAMETERS FROM OPERATOR.
                        ;
                                BGNHRD
                                                                        .WORD L10000-L$HARD/2
                                                                L$HARD::
                                GPRML   RL1,10,BIT1,YES         ; RLV12 ??
                                                                        .WORD   T$CODE
                                                                        .WORD   RL1
                                                                        .WORD   BIT1
                                XFERF   1$
                                                                        .WORD   T$CODE
                                GPRML   RL1A,10,BIT0,YES        ; BAE ENABLED ??
                                                                        .WORD   T$CODE
                                                                        .WORD   RL1A
                                                                        .WORD   BIT0
                                XFER    2$
                                                                        .WORD   T$CODE
                        1$:     GPRML   RL2,10,BIT0,YES         ; RLV11 ??
                                                                        .WORD   T$CODE
                                                                        .WORD   RL2
                                                                        .WORD   BIT0
                        2$:     GPRMA   CSRA,0,0,160000,177776,YES ; CSR.
                                                                        .WORD   T$CODE
                                                                        .WORD   CSRA
                                                                        .WORD   T$LOLIM
                                                                        .WORD   T$HILIM
                                GPRMA   VECA,2,0,0,776,YES      ; VECTOR.
                                                                        .WORD   T$CODE
                                                                        .WORD   VECA
                                                                        .WORD   T$LOLIM
                                                                        .WORD   T$HILIM
                                GPRMD   BRL,4,0,340,0,7,YES     ; BR LEVEL.
                                                                        .WORD   T$CODE
                                                                        .WORD   BRL
                                                                        .WORD   340
                                                                        .WORD   T$LOLIM
                                                                        .WORD   T$HILIM
                                XFER    3$              ; DRIVE IS ALWAYS 0 IN DISKLESS.
                                                                        .WORD   T$CODE
                                GPRMD   DRN,6,0,3400,0,7,YES    ; DRIVE.
                                                                        .WORD   T$CODE
                                                                        .WORD   DRN
                                                                        .WORD   3400
                                                                        .WORD   T$LOLIM
                                                                        .WORD   T$HILIM
                        3$:     ENDHRD
                                                                        .EVEN
                                                                L10000:
                        ;
                        ; THESE ARE THE HARDWARE QUERIES...
                        ;
002266 046122 030526 004462 RL1:    .ASCIZ  'RLV12          '
002274 000011
002276 040502 020105 047105 RL1A:   .ASCIZ  'BAE ENABLED    '
```

```
        002304  041101  042514  004504
        002312     000
    80  002313     122  053114  030461  RL2:    .ASCIZ  'RLV11           '
        002320  004411     000
    81  002323     103  051123  040440  CSRA:   .ASCIZ  'CSR ADDRESS     '
        002330  042104  042522  051523
        002336  000011
    82  002340  042526  052103  051117  VECA:    ASCIZ  'VECTOR          '
        002346  004411     000
    83  002351     102  020122  042514  BRL:    .ASCIZ  'BR LEVEL       '
        002356  042526  004514     000
    84  002363     104  044522  042526  DRN:    .ASCIZ  'DRIVE          '       ; UNUSED.
        002370  004411     000
    85          002374                       .EVEN
    86                                  ;
    87                                  ;...AND THESE ARE THE SINGLE UNIT DEFAULTS (HARD P TABLE).
    88                                  ;
    89  002374                          BGNHW                                                .WORD   L10001 L$HW/2
  (3)   002374  000005                                                                  L$HW::
  (3)   002376
    90  002376  174400                  .WORD   174400          ; (0) CSR BUS ADDRESS.
    91  002400  000160                  .WORD   160             ; (2) VECTOR
    92  002402  000200                  .WORD   PRI04           ; (4) PRIORITY
    93  002404  000000                  .WORD   0               ; (6) DRIVE (BITS 8,9,10)
    94  002406  000003                  .WORD   3               ; (10) CONTROLLER TYPE...
    95                                                          ;......0 = RL11...
    96                                                          ;......1 = RLV11...
    97                                                          ;......2 = RLV12, BAE DISABLED...
    98                                                          ;......3 = RLV12, BAE ENABLED.
    99  002410                          ENDHW
  (3)   002410                                                                          L10001:
```

```
                        .SBTTL  SOFTWARE PARAMETER CODING
                        ;
                        ; GET SOFT PARAMETERS FROM OPERATOR.
                        ;
                                BGNSFT
                                                                        .WORD L10002-L$SOFT/2
                                                                L$SOFT::
                                GPRMD   ADLIM,0,D, 1,0,-1,YES   ; GET AUTO-DROP ERROR LIMIT.
                                                                        .WORD   T$CODE
                                                                        .WORD   ADLIM
                                                                        .WORD   -1
                                                                        .WORD   T$LOLIM
                                                                        .WORD   T$HILIM
                                DISPLAY TLMBP                   ; BYPASS MESSAGE.
                                                                        .WORD   T$CODE
                                                                        .WORD   TLMBP
                                GPRML   TLMIN,12,BIT0,YES       ; TLM ON THIS UNIT ??
                                                                        .WORD   T$CODE
                                                                        .WORD   TLMIN
                                                                        .WORD   BIT0
                                XFERF   1$
                                                                        .WORD   T$CODE
                                GPRMA   TCSU0,14,0,160000,177776,YES ; TLM CSR FOR UNIT 0.
                                                                        .WORD   T$CODE
                                                                        .WORD   TCSU0
                                                                        .WORD   T$LOLIM
                                                                        .WORD   T$HILIM
                                GPRML   PRMDMP,2,BIT0,YES       ; PROM DUMP ??
                                                                        .WORD   T$CODE
                                                                        .WORD   PRMDMP
                                                                        .WORD   BIT0
                                XFERT   1$
                                                                        .WORD   T$CODE
                                GPRMD   PRM,4,0,-1,0,-1,YES     ; PROM ID.
                                                                        .WORD   T$CODE
                                                                        .WORD   PRM
                                                                        .WORD    1
                                                                        .WORD   T$LOLIM
                                                                        .WORD   T$HILIM
                                GPRML   INHMXP,6,BIT15,YES      ; INHIBIT MAX PEAK...
                                                                        .WORD   T$CODE
                                                                        .WORD   INHMXP
                                                                        .WORD   BIT15
                                GPRML   INHMNP,6,BIT14,YES      ;...MIN PEAK...
                                                                        .WORD   T$CODE
                                                                        .WORD   INHMNP
                                                                        .WORD   BIT14
                                GPRML   INHNC,6,BIT2,YES        ; ..NOMINAL CLOCK...
                                                                        .WORD   T$CODE
                                                                        .WORD   INHNC
                                                                        .WORD   BIT2
                                GPRML   INHFC,6,BIT1,YES        ;...FAST CLOCK...
                                                                        .WORD   T$CODE
                                                                        .WORD   INHFC
                                                                        .WORD   BIT1
                                GPRML   INHSC,6,BIT0,YES        ;...SLOW CLOCK.
```

```
   (4)  002522  003130                                                                  .WORD   T$CODE
   (4)  002524  003223                                                                  .WORD   INHSC
   (4)  002526  000001                                                                  .WORD   BIT0
   119  002530                        GPRMD   SEC1,10,0,7,0,6,YES     ; SINGLE SECTOR OPTION.
   (4)  002530  004032                                                                  .WORD   T$CODE
   (4)  002532  003247                                                                  .WORD   SEC1
   (4)  002534  000007                                                                  .WORD   7
   (4)  002536  000000                                                                  .WORD   T$LOLIM
   (4)  002540  000006                                                                  .WORD   T$HILIM
   120  002542                  1$:     ENDSFT                                          .EVEN
   (2)
   (3)  002542                                                                L10002.
   121                          ;
   122                          ; THESE ARE THE SOFTWARE QUERIES...
   123                          ;
   124  002542  051105  047522  020122  ADLIM:  .ASCIZ  'ERROR LIMIT FOR AUTO DROP '
        002550  044514  044515  020124
        002556  047506  020122  052501
        002564  047524  042055  047522
        002572  020120     000
   125
   126  002575     101  046114  051040  TLMBP:  .ASCIZ  'ALL REMAINING QUERIES ARE FOR OPTIONAL (MANUFACTURING)'
        002602  046505  044501  044516
        002610  043516  050440  042525
        002616  044522  051505  040440
        002624  042522  043040  051117
        002632  047440  052120  047511
        002640  040516  020114  046450
        002646  047101  043125  041501
        002654  052524  044522  043516
        002662  000051
   127  002664  032507  034063  020070          .ASCIZ  'G5388 TEST-LOOP-MODULE SET-UP.  USE <↑Z> TO BYPASS.'
        002672  042524  052123  046055
        002700  047517  026520  047515
        002706  052504  042514  051440
        002714  052105  052455  027120
        002722  020040  051525  020105
        002730  057074  037132  052040
        002736  020117  054502  040520
        002744  051523  000056
                                        .BYTE   0
   128  002750     000
   129  002751     107  031465  034070  TLMIN:  .ASCIZ  'G5388 TLM INSTALLED     '
        002756  052040  046514  044440
        002764  051516  040524  046114
        002772  042105  000011
   130  002776  051503  020122  042101  TCSUO:  .ASCIZ  'CSR ADDRESS (UNIT 0)    '
        003004  051104  051505  020123
        003012  052450  044516  020124
        003020  024460  000011
   131  003024  052504  050115  050040  PRMDMP: .ASCIZ  'DUMP PROM ON TTY:       '
        003032  047522  020115  047117
        003040  052040  054524  004472
        003046     000
   132  003047     120  047522  020115  PRM:    .ASCIZ  'PROM ID NUMBER
        003054  042111  047040  046525
        003062  042502  004522  000011
```

```
  133  003070  047111  044510  044502  INHMXP: .ASCIZ  'INHIBIT MAX PEAK SHIFT '
       003076  020124  040515  020130
       003104  042520  045501  051440
       003112  044510  052106  000011
  134  003120  047111  044510  044502  INHMNP: .ASCIZ  'INHIBIT MIN PEAK SHIFT '
       003126  020124  044515  020116
       003134  042520  045501  051440
       003142  044510  052106  000011
  135  003150  047111  044510  044502  INHNC:  .ASCIZ  'INHIBIT NOMINAL CLOCK  '
       003156  020124  047516  044515
       003164  040516  020114  046103
       003172  041517  004513     000
  136  003177     111  044116  041111  INHFC:  .ASCIZ  'INHIBIT FAST CLOCK     '
       003204  052111  043040  051501
       003212  020124  046103  041517
       003220  004513     000
  137  003223     111  044116  041111  INHSC:  .ASCIZ  'INHIBIT SLOW CLOCK     '
       003230  052111  051440  047514
       003236  020127  046103  041517
       003244  004513     000
  138  003247     123  041505  047524  SEC1:   .ASCIZ  'SECTOR NUMBER (0=USE ALL)'
       003254  020122  052516  041115
       003262  051105  024040  036460
       003270  051525  020105  046101
       003276  024514     000
  139          003302                          .EVEN
  140                                          ;
  141                                          ;... AND THESE ARE THE DEFAULT SOFT PARAMETERS.
  142                                          ;
  143  003302                                  BGNSW
(3)    003302  000007                                                  .WORD   L10003 L$SW/2
(3)    003304                                                        L$SW::
  144  003304  000000  ERRLMT: .WORD   0              ; (00) NZ = DROP AFTER N ERRORS.
  145  003306  000000  PDSW:   .WORD   0              ; (02) PROM DUMP SWITCH (BIT0).
  146  003310  000401  PROMID: .WORD   401            ; (04) CURRENT PROM SET ID.
  147  003312  000000  MPXCLK: .WORD   0              ; (06) PEAK SHIFT AND CLOCK INHIBITS.
  148  003314  000000  SNGLSEC: .WORD  0              ; (10) SINGLE SECTOR TO USE (0 - ALL 6).
  149  003316  000000  TLMF:   .WORD   0              ; (12) G5388 TLM FLAG (1 = INSTALLED).
  150  003320  160010  TCSO:   .WORD   160010         ; (14) G5388 TLM CSR ADDRESS.
  151  003322                                  ENDSW
(3)    003322                                                        L10003:
```

```
                        .SBTTL  GLOBAL EQUATES

                                EQUALS          ; GET STANDARD EQUATES.
                        ;
                        ; BIT DIFINITIONS
                        ;
100000                  BIT15== 100000
040000                  BIT14== 40000
020000                  BIT13== 20000
010000                  BIT12== 10000
004000                  BIT11== 4000
002000                  BIT10== 2000
001000                  BIT09== 1000
000400                  BIT08== 400
000200                  BIT07== 200
000100                  BIT06== 100
000040                  BIT05=- 40
000020                  BIT04=- 20
000010                  BIT03== 10
000004                  BIT02== 4
000002                  BIT01== 2
000001                  BIT00== 1
                        ;
001000                  BIT9==  BIT09
000400                  BIT8==  BIT08
000200                  BIT7==  BIT07
000100                  BIT6==  BIT06
000040                  BIT5==  BIT05
000020                  BIT4==  BIT04
000010                  BIT3==  BIT03
000004                  BIT2==  BIT02
000002                  BIT1==  BIT01
000001                  BIT0==  BIT00
                        ;
                        ; EVENT FLAG DEFINITIONS
                        ;   EF32:EF17 RESERVED FOR SUPERVISOR TO PROGRAM COMMUNICATION
                        ;
000040                  EF.START==      32.                     ; START COMMAND WAS ISSUED
000037                  EF.RESTART==    31.                     ; RESTART COMMAND WAS ISSUED
000036                  EF.CONTINUE==   30.                     ; CONTINUE COMMAND WAS ISSUED
000035                  EF.NEW==        29.                     ; A NEW PASS HAS BEEN STARTED
000034                  EF.PWR==        28.                     ; A POWER-FAIL/POWER UP OCCURRED
                        ;
                        ;
                        ; PRIORITY LEVEL DEFINITIONS
                        ;
000340                  PRI07== 340
000300                  PRI06== 300
000240                  PRI05== 240
000200                  PRI04== 200
000140                  PRI03=- 140
000100                  PRI02== 100
000040                  PRI01== 40
000000                  PRI00== 0
                        ;
                        ;OPERATOR FLAG BITS
```

```
(1)                                     ;
(1)             000004                  EVL==       4
(1)             000010                  LOT==      10
(1)             000020                  ADR==      20
(1)             000040                  IDU==      40
(1)             000100                  ISR==     100
(1)             000200                  UAM==     200
(1)             000400                  BOE==     400
(1)             001000                  PNT==    1000
(1)             002000                  PRI==    2000
(1)             004000                  IXE==    4000
(1)             010000                  IBE==   10000
(1)             020000                  IER==   20000
(1)             040000                  LOE==   40000
(1)             100000                  HOE==  100000
156                                     ;
157                                     ; RL/RLV EQUATES.
158                                     ;
159             000004                  ERRVEC= 4               ; BUS-ERROR VECTOR.
160             000000                  RL11=   0               ; EQUATE THE CONTROLLER TYPES.
161             000001                  RLV11=  1
162             000002                  RLV12=  2               ; RLV12 WITH BAE DISABLED.
163             000003                  RLV12X= 3               ; RLV12 WITH BAE ENABLED.
164
165             100000                  ERR=    BIT15           ;COMPOSITE ERROR (RLCS)
166             040000                  DERR=   BIT14           ;DRIVE ERROR (RLCS)
167             020000                  NXM=    BIT13           ;NON-EXISTANT MEMORY (IF OPI = 0)...
168             020000                  PAR=    BIT13           ;...OR PARITY ERROR (IF OPI = 1).
169             010000                  DLT=    BIT12           ;DATA LATE ERROR (IF OPI=0)...
170             010000                  HNF=    BIT12           ;...OR HEADER NOT FOUND (IF OPI=1).
171             004000                  DCRC=   BIT11           ;DATA CRC ERROR (IF OPI=0)...
172             004000                  HCRC=   BIT11           ;...OR HEADER CRC ERROR (IF OPI=1).
173             002000                  OPI=    BIT10           ;OPERATION INCOMPLETE (RLCS)
174             000000                  DS0=    0               ;DRIVE SELECT 0 (RLCS)
175             000400                  DS1=    BIT8            ;DRIVE SELECT 1 (RLCS)
176             001000                  DS2=    BIT9            ;DRIVE SELECT 2 (RLCS)
177             001400                  DS3=    BIT8!BIT9       ;DRIVE SELECT 3 (RLCS)
178             000200                  CRDY=   BIT7            ;CONTROLLER READY (RLCS)
179             000100                  INTEN=  BIT6            ;INTERRUPT ENABLE (RLCS)
180             000000                  NOOP=   0               ; (0) NO-OP  - RL11 ONLY.
181             000000                  MAINT=  0               ; (0) MAINTENANCE -  RLV11 AND RLV12.
182             000002                  WRCHK=  BIT1            ; (1) WRITE CHECK FUNCTION
183             000004                  GSTAT=  BIT2            ; (2) GET STATUS FUNCTION
184             000006                  SEEK=   BIT2!BIT1       ; (3) SEEK FUNCTION
185             000010                  RDHDR=  BIT3            ; (4) READ HEADER FUNCTION
186             000012                  WRITE=  BIT3!BIT1       ; (5) WRITE DATA FUNCTION
187             000014                  READ=   BIT3!BIT2       ; (6) READ DATA FUNCTION
188             000016                  RDNHDR= BIT3!BIT2!BIT1  ; (7) READ DATA WITHOUT HEADER CHECK.
189             000001                  DRDY=   BIT0            ;DRIVE READY.
190
191             000010                  DRST=   BIT3            ;DRIVE RESET (RLDA)
192             000002                  GSBIT=  BIT1            ;GET STATUS BIT (RLDA)
193             000001                  MK=     BIT0            ;MARKER BIT (RLDA)
194             000004                  SIGN=   BIT2            ;SIGN BIT (RLDA)
195             000100                  RHHS=   BIT6            ;HEAD SELECT IN READ HEADER
196             000100                  STHS=   BIT6            ;HEAD SELECT IN STATUS BACK
```

```
   197          000020                    DAHS=    BIT4            ;HEAD SELECT IN SEEK
```

```
                        ;
                        ; A COUPLE OF MACROS TO REDEFINE THE ERROR CALLING CONVENTIONS
                        ; SO THAT SEQUENTIAL ERRORS ARE ASSIGNED AT ASSEMBLY TIME,
                        ; AND I DON'T HAVE TO BOTHER WITH THEM !!
                        ;
000000                  SFN=    0               ; SYSTEM FATAL ERRORS RUN FROM 1 TO 99.
000143                  DFN=    99.             ; DEVICE FATAL ERRORS RUN FROM 100. UP.

                        .MACRO  SFERR   ADDR,PNTR
                        SFN=SFN+1
                        ERRSF   SFN,ADDR,PNTR
                        .ENDM

                        .MACRO  DFERR   ADDR,PNTR
                        DFN=DFN+1
                        ERRDF   DFN,ADDR,PNTR
                        .ENDM
                        ;
                        ; ANOTHER TO START EACH TEST.
                        ;
                        .MACRO  BEGIN.TEST
                                BGNTST
                                .ENDM
                        ;
                        ; AND A COUPLE OF HANDY SKIPS.
                        ;
000401                  SKP1=   BR+1
000402                  SKP2=   BR+2
000403                  SKP3=   BR+3
```

```
                        .SBTTL  GLOBAL DATA

003322  000000  UNITST: .WORD   0       ; CURRENT UNIT UNDER TEST.
003324  000000  RLCS:   .WORD   0       ; REGISTER ADDRESSES.
003326  000000  RLBA:   .WORD   0
003330  000000  RLDA:   .WORD   0
003332  000000  RLMP:   .WORD   0
003334  000000  RLBAE:  .WORD   0
003336  000000  BCSR:   .WORD   0       ; BASE ADDRESS
003340  000000  BPRIOR: .WORD   0
003342  000000  BVEC:   .WORD   0
003344  000000  TCSR:   .WORD   0       ; G5388 TLM CSR ADDRESS.
003346  000000  DRIVE:  .WORD   0
003350  000000  B.CS:   .WORD   0       ; REGISTERS BEFORE FUNCTION.
003352  000000  B.BA:   .WORD   0
003354  000000  B.DA:   .WORD   0
003356  000000  B.MP:   .WORD   0
003360  000000  B.BAE:  .WORD   0
003362  000000  DERFLG: .WORD   0
003364  000000  E.CS:   .WORD   0       ; REGISTERS AFTER FUNCTION.
003366  000000  E.BA:   .WORD   0
003370  000000  E.DA:   .WORD   0
003372  000000  E.MP:   .WORD   0
003374  000000  E.MP1:  .WORD   0       ; MAINT MODE CRC CHECK ONLY.
003376  000000  E.BAE:  .WORD   0
003400  000000  CPUTYP: .WORD   0       ; 0 = 11/03, +NZ = 11/23,  1 = UNKNOWN.P
003402  000000  RLTYP:  .WORD   0       ; RL TYPE  - 0 = RL11, 1 = RLV11, 2(3) = RLV12.
003404  120001  XPOLY:  .WORD   120001
003406  000000  BCCFBK: .WORD   0               ;LOCATION USED BY "SIM8CC"
003410  000000  CALBCC: .WORD   0               ;LOCATION USED BY "SIM8CC"
003412  000000  TEMP2:  .WORD   0               ;LOCATION USED BY "SIM8CC"
003414  000000  TEMP3:  .WORD   0               ;LOCATION USED BY "SIM8CC"
003416  000000  TEMP4:  .WORD   0               ;LOCATION USED BY "SIM8CC"
003420  000000  TEMP5:  .WORD   0               ;       DITTO
003422  000000  TEMP1:  .WORD   0               ;       DITTO
003424  000000  TMP0:   .WORD   0
003426  000000  TMP1:   .WORD   0
003430  000000  TMP2:   .WORD   0
003432  000000  GDDAT:  .WORD   0
003434  000000  BDDAT:  .WORD   0
003436  000000  INIMP:  .WORD   0               ; HOLDS INITIAL MP WORD COUNT.
003440  000000  INIDA:  .WORD   0               ;HOLDS CURRENT DA TEST WORD.
003442  000000  GDCRC3: .WORD   0               ; HOLDS CRC OF DA+3
003444  000000  GDCRC4: .WORD   0               ; HOLDA CRC OF CRC OF DA+4
003446  000233  OPIMN:  .WORD   155.
003450  001212  OPIMX:  .WORD   650.
003452  176543  HINUM:  .WORD   176543
003454  123456  LONUM:  .WORD   123456
003456  000000  TEMLO:  .WORD   0
003460  000000  TEMHI:  .WORD   0
003462  000000  DLYCNT: .WORD   0               ; 1 MSEC DELAY COUNTER.
003464  000000  DROPPED: .WORD  0               ; UNITS DROPPED COUNTER.
003466  000000  ERPOINT: .WORD  0               ; POINTS TO ONE OF THE FOLLOWING:
003470  000100  ERCOUNT: .BLKW  64              ; ERROR COUNTERS (ENOUGH FOR 64 UNITS).
003670  000000  CACREG: .WORD   0               ;IF 1, CACHE INSTALLED BUT DISABLED (11 /3).
                ;
```

```
                                ;PATTERNS USED FOR LOADING/READING REGISTERS
                                ;
003672  000000          BEGPAT: 000000                  ;GROWING 1
003674  000001                  000001
003676  000003                  000003
003700  000007                  000007
003702  000017                  000017
003704  000037                  000037
003706  000077                  000077
003710  000177                  000177
003712  000377                  000377
003714  000777                  000777
003716  001777                  001777
003720  003777                  003777
003722  007777                  007777
003724  017777                  017777
003726  037777                  037777
003730  077777                  077777
003732  177777                  177777
003734  177776                  177776                  ;GROWING 0
003736  177774                  177774
003740  177770                  177770
003742  177760                  177760
003744  177740                  177740
003746  177700                  177700
003750  177600                  177600
003752  177400                  177400
003754  177000                  177000
003756  176000                  176000
003760  174000                  174000
003762  170000                  170000
003764  160000                  160000
003766  140000                  140000
003770  100000                  100000
003772  000000                  000000
003774  000001                  000001                  ;WALKING 1
003776  000002                  000002
004000  000004                  000004
004002  000010                  000010
004004  000020                  000020
004006  000040                  000040
004010  000100                  000100
004012  000200                  000200
004014  000400                  000400
004016  001000                  001000
004020  002000                  002000
004022  004000                  004000
004024  010000                  010000
004026  020000                  020000
004030  040000                  040000
004032  100000                  100000
004034  177777                  177777                  ;WALKING 0
004036  177776                  177776
004040  177775                  177775
004042  177773                  177773
004044  177767                  177767
```

```
                                                177757
                                                177737
                                                177677
                                                177577
                                                177377
                                                176777
                                                175777
                                                173777
                                                167777
                                                157777
                                                137777
                                                077777
                                                177777
                                ENDPAT:         000000
                                ;
                                ; PATTERNS FOR TESTING THE READ/WRITE BITS <9:1> OF THE CSR.
                                ;
                                CSPAT:  .WORD   0               ;SHIFTING 1
                                        .WORD   BIT1
                                        .WORD   BIT2
                                        .WORD   BIT3
                                        .WORD   BIT4
                                        .WORD   BIT5
                                        .WORD   BIT6
                                        .WORD   BIT8
                                        .WORD   BIT9
                                        .WORD   1576            ;GROWING 0
                                        .WORD   1574
                                        .WORD   1570
                                        .WORD   1560
                                        .WORD   1540
                                        .WORD   1500
                                        .WORD   1400
                                        .WORD   1576            ;SHIFT 0
                                        .WORD   1574
                                        .WORD   1566
                                        .WORD   1556
                                        .WORD   1536
                                        .WORD   1436
                                        .WORD   1136
                                        .WORD   76
                                        .WORD   6               ;GROWING 1
                                        .WORD   16
                                        .WORD   36
                                        .WORD   76
                                        .WORD   176             ;
                                        .WORD   576
                                        .WORD   1576
                                CSEND:  .WORD   0
                                ;
                                ; TABLE OF DA TEST WORDS FOR MAINTENANCE MODE CRC CALCULATIONS.
                                ;
                                PATCRC: 155552
                                        133330
                                        066663
                                        125247
```

```
   397  004212  052522                      052522
   398  004214  177774                      177774
   399  004216  000374                      000374
   400  004220  022217                      022217
   401  004222  044441                      044441
   402  004224  166663                      166663
   403  004226  144441                      144441
   404  004230  033330                      033330
   405  004232  011106                      011106
   406  004234  070704                      070704
   407  004236  107065                      107065
   408  004240  111106                      111106
   409  004242  167353                      167353
   410  004244  156732                      156732
   411  004246  146311                      146311
   412  004250  135670                      135670
   413  004252  114626                      114626
   414  004254  104205                      104205
   415  004256  073564                      073564
   416  004260  063143                      063143
   417  004262  042101                      042101
   418  004264  031460                      031460
   419  004266  021037                      021037
   420  004270  010416                      010416
   421  004272  000000              CRCEND: 000000          ; 28 TEST WORDS IN THE TABLE.
   422                                      ;
   423                                      ; TABLE OF DATA PATTERNS FOR MAINTENANCE MODE FIFO TESTS.
   424                                      ;
   425  004274  155555              PATDAT: 155555
   426  004276  133333                      133333
   427  004300  066666                      066666
   428  004302  125252                      125252
   429  004304  052525                      052525
   430  004306  177777                      177777
   431  004310  000000                      000000
   432  004312  107070                      107070
   433  004314  070707                      070707
   434  004316  144444                      144444
   435  004320  033333                      033333
   436  004322  011111                      011111
   437  004324  022222                      022222
   438  004326  044444                      044444
   439  004330  111111                      111111
   440  004332  166666                      166666
   441  004334  010421                      010421
   442  004336  021042                      021042
   443  004340  031463                      031463
   444  004342  042104                      042104
   445  004344  063146                      063146
   446  004346  073567                      073567
   447  004350  104210                      104210
   448  004352  114631                      114631
   449  004354  135673                      135673
   450  004356  146314                      146314
   451  004360  156735                      156735
   452  004362  167356                      167356
```

```
   453  004364  000000                ENDDAT: 000000          ; 28 OF THESE TOO.
   454                                ;
   455                                ; BUFFERS FOR RLV11 MAINTENANCE FUNCTION
   456                                ;
   457  004366  000400                BUF1:   .BLKW   256.            ;MAINTENANCE MODE, DMA BUF1 => FIFO...
   458  005366  000400                BUF2:   .BLKW   256.            ;...AND FIFO => BUF2.
   459  006366  000000                BUFEND: 0
```

```
                        .SBTTL  INITIALIZATION CODE
                        ;
                        ; LOAD DEVICE PROTECTION NOT REQUIRED.
                        ;
                                BGNPROT
                                                                L$PROT::
                                .WORD   1               ;CSR OFFSET MAKE NOP
                                .WORD   1               ;MASS BUS OFFSET MAKE NOP
                                .WORD   1               ;DRIVE OFFSET MAKE NOP
                                ENDPROT
                        ;
                        ; ENTER HERE FROM DRS ON START, RESTART, CONTINUE, ETC...
                        ;
                                BGNINIT
                                                                L$INIT::
                                READEF  #EF.PWR         ; POWER UP ??
                                                                        MOV     #EF.PWR,R0
                                                                        TRAP    C$REFG
                                BCOMPLETE RESTART
                                                                        BCS     RESTART
                                READEF  #EF.START       ; START ??
                                                                        MOV     #EF.STAPT,R0
                                                                        TRAP    C$REFG
                                BCOMPLETE START
                                                                        BCS     START
                                READEF  #EF.RESTART     ; RESTART ??
                                                                        MOV     #EF.RESTART,R0
                                                                        TRAP    C$REFG
                                BCOMPLETE RESTART
                                                                        BCS     RESTART
                                READEF  #EF.NEW         ; NEW PASS ??
                                                                        MOV     #EF.NEW,R0
                                                                        TRAP    C$REFG
                                BCOMPLETE NEWPAS
                                                                        BCS     NEWPAS
                                READEF #EF.CONTINUE     ; CONTINUE ??
                                                                        MOV     #EF.CONTINUE,R0
                                                                        TRAP    C$REFG
                                BCOMPLETE 1$
                                                                        BCS     1$
                                BR      NXTU            ; NONE OF THE ABOVE.
007114          1$:     JMP     CONT

                        START:RESTART:
                                RESET
003306                  TST     PDSW            ; PROM DUMP ??
                        BEQ     1$              ; BR IF NOT.
024660                  JMP     ROMDUMP         ; *** PROM DUMPER, NO RETURN ***
003452          1$:     MOV     #176543,HINUM   ;RANDOM GEN. PRIMES.
003454                  MOV     #123456,LONUM
003464                  CLR     DROPPED         ; CLEAR UNITS DROPPED COUNTER.
003470                  MOV     #ERCOUNT,R1     ; GET ERROR COUNTER POINTER.
000100                  MOV     #64.,R0
                2$:     CLR     (R1)+           ; CLEAR ALL ERROR COUNTERS.
                        DEC     R0
                        BNE     2$
```

```
 500  006526  013746  000004          ENVIRN: MOV     @#4, (SP)         ; SAVE VECTOR 4...
 501  006532  013746  000010                  MOV     @#10, (SP)        ;...AND 10...
 502  006536  010605                          MOV     SP,R5             ;...AND THE STACK POINTER.
 503  006540  012737  006576  000004          MOV     #LSI,@#4          ; SET BUS TRAP.
 504  006546  005000                          CLR     R0
 505  006550  005737  177776                  TST     @#177776          ; PSW ADDRESS VALID ??
 506  006554  000240                          NOP                       ; TRAP THRU 4 IF NOT (LSI11 OR 11/2).
 507  006556  012737  006572  000010          MOV     #NLSI,@#10        ; SET ILLEGAL TRAP.
 508          000007                          MFPT=   7
 509  006564  000007                          MFPT                      ;GET PROCESSOR TYPE (IF POSSIBLE).
 510  006566  000240                          NOP                       ; TRAP THRU 10 IF NOT (NOT 11/23).
 511  006570  000402                          SKP2
 512  006572  012700  177777          NLSI:   MOV     #-1,R0            ; CPU TYPE UNKNOWN.
 513  006576  010037  003400          LSI:    MOV     R0,CPUTYP         ; CPU IS LSI SOMETHING 'R OTHER.
 514  006602  010506                          MOV     R5,SP             ; RESTORE STACK...
 515  006604  012637  000010                  MOV     (SP)+,@#10        ;...AND VECTORS.
 516  006610  012637  000004                  MOV     (SP)+,@#4
 517  006614  004737  011306                  JSR     PC,.SIZE          ; SIZE AVAILABLE MEMORY.
 518  006620                                  DORPT                     ; REPORT OPERATING ENVIRONMENT.
                                                                                  TRAP    C$DRPT
(3)   006620  104424
 519
 520  006622  023737  003464  002012  NEWPAS: CMP     DROPPED,L$UNIT    ; UNITS STILL ALIVE ??
 521  006630  002401                          BLT     1$
 522  006632                                  DOCLN                     ; NO, ABORT
                                                                                  TRAP    C$DCLN
(3)   006632  104444
 523  006634  012737  003466  003466  1$:     MOV     #ERCOUNT-2,ERPOINT ;INIT THE UNIT ERROR POINTER.
 524  006642  013737  003454  003456          MOV     LONUM,TEMLO
 525  006650  013737  003452  003460          MOV     HINUM,TEMHI       ; NEW PRIMES FOR NEW PASS.
 526  006656  012737  177777  003322          MOV     #-1,UNITST        ; RESET UNIT NUMBER.
 527  006664  005237  003322          NXTU:   INC     UNITST            ; BUMP  NIT NUMBER...
 528  006670  062737  000002  003466          ADD     #2,ERPOINT        ;...AND ERROR COUNT POINTER.
 529  006676  023737  003322  002012          CMP     UNITST,L$UNIT
 530  006704  002346                          BGE     NEWPAS            ;
 531  006706                          1$:     GPHARD  UNITST,R0
                                                                                  MOV     UNITST,R0
                                                                                  TRAP    C$GPHRD
(3)   006706  013700  003322
(3)   006712  104442
 532  006714                                  BNCOMPLETE NXTU           ; BR IF UNIT NOT THERE (DROPPED).
                                                                                  BCC     NXTU
(2)   006714  103363
 533  006716  012037  003336          2$:     MOV     (R0)+,BCSR        ; SET UP RUN TIME P TABLE...
 534  006722  005737  036756                    TST     MIMIC             ; ****** IF MIMIC
 535  006726  001403                          BEQ     3$                ; ******
 536  006730  012737  037276  003336          MOV     #DUMMY,BCSR       ; ****** USE DUMMY REGISTERS
 537  006736  012037  003342          3$:     MOV     (R0)+,BVEC        ;...FOR THIS UNIT.
 538  006742  012037  003340                  MOV     (R0)+,BPRIOR
 539  006746  012037  003346                  MOV     (R0)+,DRIVE
 540  006752  012037  003402                  MOV     (R0)+,RLTYP       ; SET CONTROLLER TYPE.
 541
 542  006756  013737  003316  003344          MOV     TLMF,TCSR         ; RUNNING WITH TLM'S ??
 543  006764  001412                          BEQ     5$                ; BR IF NOT.
 544  006766  013737  003320  003344          MOV     TCS0,TCSR         ; YES, GET BASE TLM CSR...
 545  006774  013700  003322                  MOV     UNITST,R0         ;...AND CURRENT UNIT NUMBER.
 546  007000  001404                          BEQ     5$                ; BR IF UNIT IS ZERO.
 547  007002  062737  000010  003344  4$:     ADD     #10,TCSR          ; OTHERWISE, ADJUST FOR CURRENT UNIT.
 548  007010  077004                          SOB     R0,4$
 549                                  ;
 550                                  ;THE FOLLOWING CODE WAS DELETED IN ORDER TO CHANGE THE SIZING FOR        ;LWL01
```

```
                                        ;CPU TYPE SO THAT KDJ11-CPU TIMING LOOP COULD BE ACCOMODATED.          ;LWL01
                                        ;
                                        ;LWL01 5$:      TST     CPUTYP
                                        ;LWL01  BGT     6$              ; BR IF 11/23.
                                        ;LWL01  BEQ     7$              ; BR IF LSI 11 OR 11/2.
                                        ;LWL01  MOV     #500.,R0        ; IF NEITHER, DELAY IS UNCALIBRATED.
                                        ;LWL01  BR      8$
                                        ;LWL01 6$:      MOV     #291.,R0        ; 1MS DELAY FOR 11/23.
                                        ;LWL01  SKP2
                                        ;LWL01 7$:      MOV     #120.,R0        ; 1MS DELAY FOR LSI11 OR 11/2.
                                        ;LWL01 8$:      MOV     R0,DLYCNT       ; SET DELAY COUNTER.
007012  005000                          5$:     CLR     R0              ; START WITH CLEAR R0                  ;LWL01
007014  005737  003400                          TST     CPUTYP                                                 ;LWL01
007020  001427                                 BEQ     6$              ; BR IF LSI 11 OR 11/2                 ;LWL01
007022  100422                                 BMI     8$              ; IF MINUS, DELAY IS UNCALIBRATED      ;LWL01
007024  022737  000003  003400                  CMP     #3,CPUTYP       ; IS IT AN 11/23?                      ;LWL01
007032  001420                                 BEQ     7$              ; BR IF IT IS                          ;LWL01
007034  013746  000004                          MOV     @#4,-(SP)       ;  STORE LOC 4 CONTENTS                ;LWL01
007040  012737  007062  000004                  MOV     #9$,@#4         ;  PREPARE FOR NON-EXISTANT TRAP       ;LWL01
007046  052737  001000  177746                  BIS     #1000,177746    ;  TURN OF CACHE                       ;LWL01
007054  012737  000001  003670                  MOV     #1,CACREG       ;  SET CACHE OFF INDICATOR             ;LWL01
007062  012637  000004          9$:     MOV     (SP)+,@#4       ;  RESTORE LOC 4                       ;LWL01
007066  000402                                 BR      7$              ; IT MUST BE A KDJ11 (11/73)           ;LWL01
007070  062700  000321          8$:     ADD     #209.,R0        ; TO MAKE 500.  (UNCALIBRATED)         ;LWL01
007074  062700  000253          7$:     ADD     #171.,R0        ; TO MAKE 291.  (11/23 + 11/73) (1MSEC) ;LWL01
007100  062700  000170          6$:     ADD     #120.,R0        ; TO MAKE 120.  (LSI-11 + 11/2) (1MSEC) ;LWL01
007104  010037  003462          10$:    MOV     R0,DLYCNT       ; SET DELAY COUNTER.                   ;LWL01
007110  004737  026052                  JSR     PC,ADJTN        ; ADJUST THE NUMBER OF TESTS TO RUN...
                                                                ;...ACCORDING TO CURRENT CONFIGURATION.
007114  013737  003456  003454  CONT:   MOV     TEMLO,LONUM     ;RESTORE RANDOM FOR NEXT UUT
007122  013737  003460  003452          MOV     TEMHI,HINUM     ;RESTORE PRIME FOR NEXT UUT
007130  012737  004366  010416          MOV     #BUF1,BA16      ; INIT 16 BIT BUFFER ADDRESS...
007136  005037  010420                  CLR     BA22            ;...AND 6 BIT EXTENSION (22 BITS).
007142  013700  003336                  MOV     BCSR,R0
007146  010037  003324                  MOV     R0,RLCS         ; SET UNIT'S ADDRESSES.
007152  062700  000002                  ADD     #2,R0
007156  010037  003326                  MOV     R0,RLBA
007162  062700  000002                  ADD     #2,R0
007166  010037  003330                  MOV     R0,RLDA
007172  062700  000002                  ADD     #2,R0
007176  010037  003332                  MOV     R0,RLMP
007202  062700  000002                  ADD     #2,R0
007206  010037  003334                  MOV     R0,RLBAE
007212  013700  003342                  MOV     BVEC,R0
007216  012720  010676                  MOV     #RLINT,(R0)+    ; SET RL VECTOR.
007222  013710  003340                  MOV     BPRIOR,(R0)
007226  012737  010670  000004          MOV     #TRAP4,ERRVEC   ; SET TIME OUT TRAP CATCHER.
007234  012737  000340  000006          MOV     #PRI07,ERRVEC+2
007242  012737  010702  000100          MOV     #CLKRTI,@#100   ; NULL THE CLOCK VECTOR.
007250  012737  000340  000102          MOV     #PRI07,@#102
007256                                  ENDINIT
007256                                                                  L10005:
(3) 007256                                                                      TRAP    C$INIT
(3) 007256  104411
                                        ;
                                        ; AUTO DROP IF FLA:ADR AND UNIT DOESN'T RESPOND.
                                        ;
```

```
   605  007260                                  BGNAUTO                                                 L$AUTO::
   (3)  007260
   606  007260  023737  003322  002012          CMP     UNITST,L$UNIT   ; VALID UNIT NUMBER ??
   607  007266  002022                          BGE     1$              ; NO, DON'T TRY IT !!!
   608  007270  005037  010672                  CLR     TRPFLG          ; CLEAR TRAP FLAG.
   609  007274  005777  174024                  TST     @RLCS           ; TRY TO ACCESS CONTROLLER.
   610  007300  000240                          240
   611  007302  005737  010672                  TST     TRPFLG          ; DID IT TRAP ??
   612  007306  001412                          BEQ     1$              ; NO, WE'RE OK.
   613  007310  013737  003324  003432          MOV     RLCS,GDDAT
   614  007316                                  SFERR   EMO,ERR1        ; REPORT NO CONTROLLER...
                                                                                           TRAP    C$ERSF
   (5)  007316  104454                                                                     .WORD   1
   (6)  007320  000001                                                                     .WORD   EMO
   (6)  007322  030710                                                                     .WORD   ERR1
   (6)  007324  026242
   615  007326                                  DODU    UNITST          ;...AND TELL SUPER TO DROP UNIT.
   (3)  007326  013700  003322                                                             MOV     UNITST,R0
   (3)  007332  104451                                                                     TRAP    C$DODU
   616  007334                          1$:     ENDAUTO
   (3)  007334                                                                         L10006:
   (3)  007334  104461                                                                     TRAP    C$AUTO
   617                                  ;
   618                                  ; CLEAN-UP CODING SECTION (DO AT END-PASS (OR SUB PASS)).
   619                                  ;
   620  007336                                  BGNCLN                                          L$CLEAN::
   (3)  007336
   621  007336  012700  000012                  MOV     #10.,R0
   622  007342  032777  000200  173754  1$:     BIT     #CRDY,@RLCS     ; GIVE HIM ABOUT 100 MSEC...
   623  007350  001004                          BNE     2$              ;...TO FINISH UP.
   624  007352  004537  010224                  JSR     R5,WDELAY
   625  007356  000012                          10.
   626  007360  077010                          SOB     R0,1$
   627  007362  012777  000200  173734  2$:     MOV     #CRDY,@RLCS     ; THEN CLEAR ALL OPTION BITS.
   628  007370  023727  003402  000003          CMP RLTYP,#RLV12X       ; BAE IN USE ??
   629  007376  001002                          BNE     3$
   630  007400  005077  173730                  CLR     @RLBAE          ; IF SO, MAKE SURE IT'S CLEAR.
   631  007404                          3$:     SETPRI  #PRI07
                                                                                           MOV     #PRI07,R0
   (3)  007404  012700  000340                                                             TRAP    C$SPRI
   (3)  007410  104441
   632  007412                                  ENDCLN
                                                                                       L10007:
   (3)  007412                                                                             TRAP    C$CLEAN
   (3)  007412  104412
   633                                  ;
   634                                  ; DROP UNITS -- AND KEEP TRACK OF 'EM.
   635                                  ;
   636  007414                                  BGNDU                                           L$DU::
   (3)  007414
   637  007414  023737  002012  003464          CMP     L$UNIT,DROPPED  ; ALL UNITS DROPPED ??
   638  007422  001424                          BEQ     2$              ; YUP, DO NOTHING.
   639  007424  005237  003464                  INC     DROPPED         ; NOT YET, BUMP COUNT...
   640  007430                                  PRINTF  #1$             ;...AND TELL THE MAN.
                                                                                           MOV     #1$,-(SP)
   (7)  007430  012746  007452                                                             MOV     #1,-(SP)
   (6)  007434  012746  000001                                                             MOV     SP,R0
   (3)  007440  010600                                                                     TRAP    C$PNTF
   (4)  007442  104417                                                                     ADD     #4,SP
   (4)  007444  062706  000004
```

```
                                        BR      2$
                                1$:     .ASCIZ  /%AUNIT DROPPED%N/
                                        .EVEN
                                2$:     ENDDU
                                                                        L10010:
                                                                                TRAP    C$DU
                                ;
                                ; IF THEY'RE PICKED UP AGAIN, TWEAK THE COUNTER.
                                ;
                                        BGNAU
                                                                        L$AU::
                                        TST     DROPPED         ; ALL UNITS BACK IN PLACE ??
                                        BEQ     2$              ; JUST EXIT IF SO.
                                        DEC     DROPPED         ; NOT YET, ADJUST COUNT...
                                        PRINTF  #1$             ....AND TELL HIM.
                                                                                MOV     #1$, (SP)
                                                                                MOV     #1,-(SP)
                                                                                MOV     SP,R0
                                                                                TRAP    C$PNTF
                                                                                ADD     #4,SP
                                        BR      2$
                                1$:     .ASCIZ  /%AUNIT ADDED%N/
                                        .EVEN
                                2$:     ENDAU
                                                                        L10011:
                                                                                TRAP    C$AU
```

```
                        .SBTTL  GLOBAL SUBROUTINES
                        ;
                        ;SUBROUTINE TO CHECK FOR CONTROLLER ERRORS.
                        ;TRANSLATE THE ERROR BITS INTO PLAIN LANGUAGE AND MERGE THEM
                        ;INTO THE ERROR BUFFER (EM99) FOR SUBSEQUENT PRINTING.
                        ;DRIVE ERROR IS INCLUDED, BUT IS IGNORED IN THE DISKLESS TESTS.
                        ;
                        ;CALL:  JSR     R5,GETERR
                        ;       BR      XX      ; NO ERRORS FOUND, RETURN.
                        ;       ERRXX           ; ERROR, RETURN.
                        ;
007554  010146          GETERR: MOV     R1,-(SP)        ; SAVE R1.
007556  005037  003362          CLR     DERFLG          ;CLEAR OUT DRIVE ERROR FLAG
007562  012701  034456          MOV     #EM99,R1        ;SET TEXT BUFFER POINTER.
007566  032737  176000  003364  1$:     BIT     #176000,E.CS    ; ANY ERRORS THERE ??
007574  001004                  BNE     1$              ; BR IF SO.
007576  004537  010050          JSR     R5,FIX          ; NO, JUST SAY "NONE"...
007602  030702                  NON
007604  000516                  BR      10$             ;...AND RETURN.
                        ;
007606  005737  003364  1$:     TST     E.CS            ;IS COMPOSITE ERROR SET ? (BETTER BE)
007612  100003                  BPL     2$              ;IF NOT SOMETHING'S WRONG !!!
007614  004537  010050          JSR     R5,FIX          ;YES, PUT "CERR" IN STRING.
007620  030623                  CERR
007622  032737  040000  003364  2$:     BIT     #DERR,E.CS      ;DRIVE ERROR SET?
007630  001411                  BEQ     3$              ; BR IF NOT.
007632  005237  003362          INC     DERFLG          ;YES, SET DRV ERROR FLAG
007636  004537  010050          JSR     R5,FIX          ; ADD "DRV" TO STRING.
007642  030630                  DEMES
007644  032737  036000  003364  3$:     BIT     #036000,E.CS    ; ANY OTHERS ???
007652  001473                  BEQ     10$             ; NO, IGNORE THE DRIVE ERROR (DISKLESS).
007654  005725                  TST     (R5)+           ; YES, BUMP PC TO TAKE ERROR RETURN.
007656  032737  020000  003364  4$:     BIT     #NXM!PAR,E.CS   ; NON-EX OR PARITY ??
007664  001415                  BEQ     5$              ; BR IF NOT.
007666  012737  030635  007716          MOV     #NXMMES,4$
007674  032737  002000  003364          BIT     #OPI,E.CS
007702  001403                  BEQ     .+10
007704  012737  030642  007716          MOV     #PARMES,4$
007712  004537  010050          JSR     R5,FIX          ; ADD "NXM" OR "PAR".
007716  030635                  NXMMES
007720  032737  010000  003364  5$:     BIT     #DLT!HNF,E.CS   ; DATA LATE OR HEADER NOT FOUND ??
007726  001415                  BEQ     7$              ; BR IF NOT.
007730  012737  030647  007760          MOV     #DLTMES,6$
007736  032737  002000  003364          BIT     #OPI,E.CS
007744  001403                  BEQ     .+10
007746  012737  030654  007760          MOV     #HNFMES,6$
007754  004537  010050          JSR     R5,FIX          ; ADD "DLT" OR "HNF".
007760  030647                  DLTMES
007762  032737  004000  003364  7$:     BIT     #DCRC!HCRC,E.CS ; EITHER CRC ??
007770  001415                  BEQ     9$              ; BR IF NOT.
007772  012737  030661  010022          MOV     #DCRCMES,8$
010000  032737  002000  003364          BIT     #OPI,E.CS
010006  001403                  BEQ     .+10
010010  012737  030667  010022          MOV     #HCRCMES,8$
010016  004537  010050          JSR     R5,FIX          ; ADD "DCRC' OR "HCRC".
010022  030661                  DCRCMES
```

```
   714  010024  032737  002000  003364  9$:     BIT     #OPI,E.CS       ; "OPI" SET ??
   715  010032  001403                          BEQ     10$
   716  010034  004537  010050                  JSR     R5,FIX          ; ADD "OPI" TO STRING.
   717  010040  030675                          OPIMES
   718  010042  105011                  10$:    CLRB    (R1)            ; TERMINATE ERROR LIST...
   719  010044  012601                          MOV     (SP)+,R1        ;...AND RESTORE R1.
   720  010046  000205                          RTS     R5              ; RETURN.
   721                                  ;
   722                                  ;ROUTINE TO MOVE ASCII STRINGS
   723                                  ;USES REGISTERS R1 - WHERE STRING IS BEING BUILT
   724                                  ;
   725                                  ;       CALL    JSR     R5,FIX
   726                                  ;                       .WORD           ;ADDRESS OF STRING TO MOVE
   727                                  ;
   728  010050  012500                  FIX:    MOV     (R5)+,R0        ;GET ADDRESS AND MOVE RETURN
   729  010052  112021                  1$:     MOVB    (R0)+,(R1)+     ;GET BYTE AND UPDATE
   730  010054  001376                          BNE     1$              ;WATCH 0 BYTE TERMINATOR
   731  010056  105741                          TSTB    -(R1)           ;BACK UP OVER ZERO BYTE
   732  010060  000205                          RTS     R5              ;EXIT
   733                                  ;
   734                                  ;LOAD REGISTERS BEFORE FUNCTION
   735                                  ;CALL:  JSR     R5,BEFORE
   736                                  ;
   737  010062  017737  173236  003350  BEFORE: MOV     @RLCS,B.CS      ;READ CS...
   738  010070  042737  176000  003350          BIC     #176000,B.CS    ;...ERRORS WILL BE CLEARED ON XCT.
   739  010076  017737  173224  003352          MOV     @RLBA,B.BA      ;READ BA
   740  010104  017737  173220  003354          MOV     @RLDA,B.DA      ;READ DA
   741                                  ;LWL01  MOV     INIMP,B.MP      ; INITIAL MP IS THE WORD COUNT.
   742  010112  017737  173214  003356          MOV     @RLMP,B.MP      ;READ MP                        ;LWL01
   743  010120  023727  003402  000003          CMP     RLTYP,#RLV12X
   744  010126  001003                          BNE     1$
   745  010130  017737  173200  003360          MOV     @RLBAE,B.BAE    ; READ BAE IF ENABLED.
   746  010136  000205                  1$:     RTS     R5
   747                                  ;
   748                                  ;LOAD REGISTERS AT ERROR OR DONE.
   749                                  ;CALL:  JSR     R5,AFTER
   750                                  ;
   751  010140  017737  173160  003364  AFTER:  MOV     @RLCS,E.CS      ;READ CS
   752  010146  017737  173154  003366          MOV     @RLBA,E.BA      ;READ BA
   753  010154  017737  173150  003370          MOV     @RLDA,E.DA      ;READ DA
   754  010162  017737  173144  003372          MOV     @RLMP,E.MP      ;READ MP
   755  010170  005737  036756                    TST   MIMIC           ; ****** IF MIMIC
   756  010174  001003                            BNE   1$              ; ****** BYPASS 2ND MP READ
   757  010176  017737  173130  003374          MOV     @RLMP,E.MP1     ;READ MP (MAINT 2ND CRC CHECK ONLY).
   758  010204  023727  003402  000003  1$:     CMP     RLTYP,#RLV12X
   759  010212  001003                          BNE     2$
   760  010214  017737  173114  003376          MOV     @RLBAE,E.BAE    ; READ BAE IF ENABLED.
   761  010222  000205                  2$:     RTS     R5
   762                                  ;
   763                                  ; ROUTINE TO DELAY IN 1 MSEC INCREMENTS.
   764                                  ; CALIBRATED FOR LSI'S ONLY.
   765                                  ; DELAY COUNT IS 291. (443B) FOR LSI 11/23.
   766                                  ;                120. (170B) FOR LSI 11 OR 11/2.
   767                                  ;                500. (764B) IF CPU TYPE IS UNKNOWN.
   768                                  ;
   769                                  ; CALL: JSR R5,WDELAY
```

```
                                        ;       N               ; DELAY N MSECS.
                                        ;
                                        WDELAY: MOV     R1,-(SP)
                                                MOV     R2,-(SP)
                                                MOV     (R5)+,R2        ;APPROX MSEC DELAY
010224  010146                          2$:     MOV     DLYCNT,R1       ; GET 1 MSEC TIMER.
010226  010246                          3$:     DEC     R1              ;START LOOP
010230  012502                                  BNE     3$
010232  013701  003462                          DEC     R2              ;CHECK ON MSECS REQUESTED
010236  005301                                  BNE     2$              ;BRANCH AND DO ANOTHER LOOP
010240  001376                          4$:     MOV     (SP)+,R2        ;SETUP FOR RETURN AFTER DELAY
010242  005302                                  MOV     (SP)+,R1
010244  001372                                  RTS     R5
010246  012602
010250  012601
010252  000205
                                        ;
                                        ;ROUTINE TO LOAD RLCS WITH RLV11/12 MAINTENANCE FUNCTION
                                        ;EITHER FLAG DRIVEN OR INTERRUPT MODE.
                                        ;
                                        ;CALL:  JSR     R5,LDFUN
                                        ;       .WORD   MAINT   ; OR MAINT!INTEN
                                        ;       .WORD    N      ; WORD COUNT.
                                        ;
                                        ; LOCATIONS "BA16" AND "BA22" COMPRISE A 22 BIT PHYSICAL BUS ADDRESS
                                        ; AND MUST BE SET BY THE CALLING ROUTINE PRIOR TO ENTRY.
                                        ;
010254  012500                          LDFUN:  MOV     (R5)+,R0        ;BUILD THE FUNCTION IN R0.
010256  012537  003436                          MOV     (R5)+,INIMP     ; SAVE WORD COUNT FOR LATER.
010262  042700  177661                          BIC     #177661,R0      ;MASK GARBAGE BITS.
010266  053700  003346                          BIS     DRIVE,R0        ;INSERT DRIVE (0)...
010272  052700  000200                          BIS     #CRDY,R0        ;...AND THE READY BITS.
010276  010077  173022                          MOV     R0,@RLCS        ; LOAD UP THE CSR.
010302  013777  010416  173016                  MOV     BA16,@RLBA      ; LOAD BUS ADDRESS <15:0>.
010310  023727  003402  000003                  CMP     RLTYP,#RLV12X   ; RLV12 WITH BAE ??
010316  001413                                  BEQ     1$              ; BR IF SO.
010320  013700  010420                          MOV     BA22,R0         ; NO, GET EXTENSION IF ANY...
010324  042700  177774                          BIC     #^C3,R0         ;...KEEP <17:16> ONLY...
010330  006300                                  ASL     R0
010332  006300                                   ASL    R0
010334  006300                                    ASL   R0
010336  006300                                     ASL  R0              ;...MOVE 'EM TO <5:4>...
010340  050077  172760                          BIS     R0,@RLCS        ;...AND INSERT INTO CS.
010344  000403                                  BR      2$
010346  013777  010420  172760  1$:     MOV     BA22,@RLBAE     ; RLV12X, SET BA EXTENSION <21:16>.
010354  013777  003440  172746  2$:     MOV     INIDA,@RLDA     ; LOAD DISK ADDRESS.
010362  013777  003436  172742          MOV     INIMP,@RLMP     ; LOAD WORD COUNT.
010370  004537  010062                  JSR     R5,BEFORE       ; SAVE STATE BEFORE FUNCTION.
010374  042777  000200  172722          BIC     #CRDY,@RLCS     ; XCT MAINT FUNCTION.
010402  005737  036756                    TST   MIMIC           ; ****** IF MIMIC
010406  001402                            BEQ   3$              ; ******
010410  004737  036760                    JSR   PC,EMURLV       ; ****** EMULATE THE RLV FUNCTION
010414  000205                  3$:     RTS     R5              ;RETURN
                                        BA16:   BUF1            ; 16 BIT BUFFER ADDRESS <15:0>.
010416  004366                          BA22:   0               ; 6 BIT EXTENSION <21:16> IN <5:0>.
010420  000000                          ;
                                        ;ROUTINE TO FILL BUFFER WITH DATA PATTERNS FOR RLV MAINTENANCE.
                                        ;BUF1 IS FILLED WITH 256 WORD PATTERN (OR COMPLIMENTING PATTERN).
```

```
                        ;BUF2 IS FILLED WITH 255 ZEROS AND 123456.
                        ;
                        ;CALL:  JSR     R5,SETPAT(SETCMP)
                        ;       .WORD   N       ;PATTERN FOR BUFFER
                        ;
010422  005000          SETPAT: CLR     R0              ; SET NO COMPLIMENT...
010424  000402                  BR      .+6             ;...AND SKIP NEXT.
010426  012700  177777  SETCMP: MOV     #-1,R0          ; SET COMPLIMENT.
010432  010146                  MOV     R1,-(SP)
010434  010246                  MOV     R2,-(SP)
010436  012537  003424          MOV     (R5)+,TMPC      ; DATA TO STORE.
010442  012701  004366          MOV     #BUF1,R1        ;BUFFER POINTER.
010446  012702  000400          MOV     #256.,R2        ;WORD COUNT
010452  013721  003424  1$:     MOV     TMPC,(R1)+
010456  005700                  TST     R0              ; ARE WE COMPLIMENTING ??
010460  001402                  BEQ     2$              ; NO, SKIP NEXT.
010462  005137  003424          COM     TMPC            ; YES, COMPLIMENT IT.
010466  005302  2$:     DEC     R2
010470  001370                  BNE     1$
010472  012702  000377          MOV     #255.,R2        ; NOW CLEAR THE REST OF...
010476  005021  3$:     CLR     (R1)+           ;...THE BUFFER.
010500  005302                  DEC     R2
010502  001375                  BNE     3$
010504  012721  123456          MOV     #123456,(R1)+   ;STORE IN LAST BUFFER WORD.
010510  012602                  MOV     (SP)+,R2
010512  012601                  MOV     (SP)+,R1
010514  000205                  RTS     R5
                        ;
                        ;ROUTINE TO SETUP BUFFER WITH RANDOM NUMBERS FOR RLV11 MAINT. FUNCTION
                        ;SAME PATTERN IS USED FOR EACH CONTROLLER
                        ;END OF PASS WILL CHANGE RANDOM PATTERN PRIMES
                        ;       CALL    JSR     R5,SETRAN
                        ;
010516  010146          SETRAN: MOV     R1,-(SP)
010520  010246                  MOV     R2,-(SP)
010522  012701  004366          MOV     #BUF1,R1        ;FIRST BUFFER START
010526  012702  000400          MOV     #256.,R2        ;BUFFER COUNT
010532  004537  010572  1$:     JSR     R5,RAND         ;GET RANDOM NUMBER
010536  013721  003452          MOV     HINUM,(R1)+     ;STORE IN BUFFER
010542  005302                  DEC     R2
010544  001372                  BNE     1$
010546  012702  000377          MOV     #255.,R2        ; NOW CLEAR THE REST.
010552  005021  2$:     CLR     (R1)+
010554  005302                  DEC     R2
010556  001375                  BNE     2$
010560  012721  123456          MOV     #123456,(R1)+   ;STORE IN LAST BUFFER WORD
010564  012602                  MOV     (SP)+,R2
010566  012601                  MOV     (SP)+,R1
010570  000205                  RTS     R5
                        ;
                        ;THIS ROUTINE IS A DOUBLE PRECISION PSEUDO RANDOM NUMBER GENERATOR
                        ;WITH A RANGE OF 0 TO 2(+33) 1.
                        ;CALL:
                        ;       JSR     R5,RAND         ;CALL THE ROUTINE
                        ;       RETURN                  ;RETURN HERE THE RANDOM NUMBER
                        ;                               ;WILL BE IN HINUM,LONUM
```

```
                                                ;
010572  010146                        RAND:   MOV     R1, (SP)        ;PUSH R1 ON STACK
010574  010246                                MOV     R2,-(SP)        ;PUSH R2 ON STACK
010576  010346                                MOV     R3, (SP)        ;PUSH R3 ON STACK
010600  013703  003454                        MOV     LONUM,R3        ;SET R3 WITH LOW
010604  013701  003452                        MOV     HINUM,R1        ;SET R1 WITH HIGH
010610  012702  177771                        MOV     #-7,R2          ;SET SHIFT COUNTER
010614  006303                        1$:     ASL     R3              ;SHIFT R3 LEFT AND
010616  006101                                ROL     R1              ;ROTATE CARRY INTO R1 AND
010620  005202                                INC     R2              ;CHECK FOR DONE
010622  001374                                BNE     1$              ;CONTINUE SHIFT LOOP
010624  063703  003454                        ADD     LONUM,R3        ;ADD NUMBER TO MAKE X 129
010630  005501                                ADC     R1              ;PROPOGATE CARRY
010632  063701  003452                        ADD     HINUM,R1        ;ADD NUMBER TO MAKE X 129
010636  062703  001057                        ADD     #1057,R3        ;ADD LOW CONSTANT
010642  005501                                ADC     R1              ;PROPOGATE CARRY
010644  062701  047401                        ADD     #47401,R1       ;ADD HIGH CONSTANT
010650  010337  003454                        MOV     R3,LONUM        ;SAVE R3
010654  010137  003452                        MOV     R1,HINUM        ;SAVE R1
010660  012603                                MOV     (SP)+,R3        ;POP STACK INTO R3
010662  012602                                MOV     (SP)+,R2        ;POP STACK INTO R2
010664  012601                                MOV     (SP)+,R1        ;POP STACK INTO R1
010666  000205                                RTS     R5              ;RETURN
                                                ;
                                                ; ROUTINES TO SET A FLAG ON BUS ERROR AND/OR RL INTERRUPT.
                                                ;
010670  005227                        TRAP4:  INC     (PC)+
010672  000000                        TRPFLG: 0
010674  000002                                RTI

010676  005227                        RLINT:  INC     (PC)+
010700  000000                        INTFLG: 0
010702  000002                        CLKRTI: RTI                     ; USE TO DISMISS FREE RUNNING CLOCK.
                                                ;
                                                ;ROUTINE TO WAIT FOR CONTROLLER READY
                                                ; THE 800 MSEC INTERVAL APPLIES TO LSI'S ONLY !!!
                                                ; IN ANY CASE, IT'S JUST A KEEP-ALIVE TIMER.
                                                ;  ON EXIT.  4(SP) HOLDS THE REMNANTS OF THE 800. MS COUNT.
                                                ;
010704  012746  001440                WTCRDY: MOV     #800.,-(SP)     ;SET 800 MSEC TIMER.
010710  032777  000200  172406        1$:     BIT     #CRDY,@RLCS     ;CONTROLLER READY ??
010716  001014                                BNE     2$              ;YES, EXIT
010720  004537  010224                        JSR     R5,WDELAY       ;WAIT A WHILE
010724  000001                                1                       ;APPROX A MILLISECOND
010726  005316                                DEC     (SP)            ;CHECK IF TIME UP
010730  001367                                BNE     1$              ;NO GO BACK
010732  004537  010140                        JSR     R5,AFTER        ; GET REGISTERS FOR ERROR.
010736                                        DFERR   CRTIM,ERRO      ;CONTROLLER TIMED OUT
(5) 010736  104455                                                              TRAP    C$ERDF
(6) 010740  000144                                                              .WORD   100
(6) 010742  030550                                                              .WORD   CRTIM
(6) 010744  026236                                                              .WORD   ERRO
010746  000402                                SKP2
010750  004537  010140                2$:     JSR     R5,AFTER        ;GET REGISTERS
010754  005726                                TST     (SP)+           ; CLEAN THE STACK...
010756  000205                                RTS     R5              ;...AND RETURN.
```

```
                                        ;
                                        ;RLV11 MAINTENANCE SUBROUTINE FOR CRC CALCULATIONS
                                        ;ROUTINE TO RETRIEVE PATTERN AND CALCULATE CRC OF PATTERN+3
                                        ;AND CRC OF CRC OF PATTERN+4.
                                        ;PATTERN IS SAVED IN "INIDA" FOR SUBSEQUENT LOADING FOR DA.
                                        ;CRC OF PATTERN+3 WILL BE STORED IN "GDCRC3".
                                        ;CRC OF CRC OF PATTERN+4 WILL BE STORED IN "GDCRC4'.
                                        ;
                                        ;CALL:  JSR     R5,CALCRC
                                        ;       .WORD   N       ;PATTERN FOR INITIAL DA
                                        ;
010760  012537  003440          CALCRC: MOV     (R5)+,INIDA     ;STORE PATTERN
010764  013737  003440  003422          MOV     INIDA,TEMP1
010772  113737  003422  003420          MOVB    TEMP1,TEMP5
011000  062737  000003  003420          ADD     #3.,TEMP5       ;ADD 3 TO PATTERN
011006  113737  003420  003422          MOVB    TEMP5,TEMP1
011014  013737  003422  011030          MOV     TEMP1,1$
011022  004537  011124                  JSR     R5,SIMBCC       ;CALCULATE EXPECTED CRC
011026  000020                          16.                     ;DATA BITS
011030  000000                  1$:     .WORD   0               ;INITIAL PATTERN+3
011032  000000                          .WORD   0
011034  013737  003410  003442          MOV     CALBCC,GDCRC3   ;SAVE CRC OF PATTERN+3
011042  005237  003420                  INC     TEMP5           ;VALUE=PATTERN+4
011046  113737  003420  003422          MOVB    TEMP5,TEMP1
011054  013737  003422  011070          MOV     TEMP1,2$
011062  004537  011124                  JSR     R5,SIMBCC       ;CALCULATE EXPECTED CRC
011066  000020                          16.                     ;DATA BITS
011070  000000                  2$:     .WORD   0               ;INITIAL PATTERN+4
011072  000000                          .WORD   0               ;STARTING CRC=0
011074  013737  003410  011110          MOV     CALBCC,3$       ;STORE CRC FOR NEXT CALL
011102  004537  011124                  JSR     R5,SIMBCC       ;CAL. CRC OF CRC OF DA+4
011106  000020                          16.                     ;DATA BITS
011110  000000                  3$:     .WORD   0               ;CRC OF DA+4
011112  000000                          .WORD   0               ;STARTING CRC=0
011114  013737  003410  003444          MOV     CALBCC,GDCRC4   ;SAVE CRC OF CRC OF DA+4
011122  000205                          RTS     R5
                                        ;
                                        ; SUBROUTINE TO CALCULATE A CRC.
                                        ;ROUTINE WILL CALCULATE A CRC-16 CRC ON A WORD OF
                                        ;1 16 BITS IN LENGTH, RESULT IS RETURNED IN "CALBCC"
                                        ;
                                        ;       CALL:   JSR     R5,SIMBCC
                                        ;               .WORD           ;NUMBER OF BITS (1 16)
                                        ;               .WORD           ;DATA FOR CRC CALCULATION
                                        ;               .WORD           ;PREVIOUS OR STARTING CRC
                                        ;                               (SHOULD BE ZEROED FOR START)
                                        ;
011124  010046                  SIMBCC: MOV     R0, (SP)        ;SAVE R0
011126  010146                          MOV     R1,-(SP)        ;SAVE R1
011130  010246                          MOV     R2,-(SP)        ;SAVE R2
011132  012537  003412                  MOV     (R5)+,TEMP2     ;GET NUMBER OF BITS
011136  012537  003414                  MOV     (R5)+,TEMP3     ;GET DATA FOR CRC CALCULATION
011142  012537  003416                  MOV     (R5)+,TEMP4     ;GET STARTING CRC
011146  005037  003406          1$:     CLR     BCCFBK          ;
011152  013700  003416                  MOV     TEMP4,R0        ;GET PRESENT CRC
011156  006037  003414                  ROR     TEMP3           ;ROTATE NEW DATA
```

```
  990  011162  005500                          ADC     R0              ;MERGE NEW WITH OLD
  991  011164  032700  000001                  BIT     #1,R0           ;BIT 0 SET
  992  011170  001402                          BEQ     2$              ;IF NOT CONTINUE
  993  011172  005137  003406                  COM     BCCFBK          ;
  994  011176  013700  003404          2$:     MOV     XPOLY,R0        ;GET CRC POLYNOMIAL (CRC 16)
  995  011202  005100                          COM     R0              ;COMPLIMENT POLYNOMIAL
  996  011204  040037  003406                  BIC     R0,BCCFBK
  997  011210  000241                          CLC                     ;CLEAR CARRY
  998  011212  006037  003416                  ROR     TEMP4
  999  011216  013700  003406                  MOV     BCCFBK,R0
 1000  011222  013701  003416                  MOV     TEMP4,R1
 1001  011226  010102                          MOV     R1,R2
 1002  011230  040100                          BIC     R1,R0
 1003  011232  043702  003406                  BIC     BCCFBK,R2
 1004  011236  050200                          BIS     R2,R0
 1005  011240  043737  003404  003416          BIC     XPOLY,TEMP4
 1006  011246  050037  003416                  BIS     R0,TEMP4
 1007  011252  005337  003412                  DEC     TEMP2
 1008  011256  001333                          BNE     1$
 1009  011260  013737  003416  003410          MOV     TEMP4,CALBCC
 1010  011266  012602                          MOV     (SP)+,R2
 1011  011270  012601                          MOV     (SP)+,R1
 1012  011272  012600                          MOV     (SP)+,R0
 1013  011274  000205                          RTS     R5              ;RETURN
```

```
                                .SBTTL  MEMORY SIZER
                                ;*****************************************************************
                                ;
                                ; ROUTINE TO SIZE AVAILABLE MEMORY.
                                ; FREELY ADAPTED FROM ".$SIZE" IN SYSMAC.SML (C3).
                                ; THIS ROUTINE MUST RESIDE WITHIN THE FIRST 24K (0-137776).
                                ;
                                ; USE KT IF IT'S AVAILABLE, OTHERWISE SIZE UP TO 30K IN THE
                                ; TRADITIONAL FASHION.  RETURN WITH:
                                ;
011276  000000                  .MSIZE: .WORD   0       ; TOTAL MEMORY SIZE (K WORDS).
011300  000000                  .LSTPG: .WORD   0       ; PAGE ADDRESS (PAF) OF LAST 1K PAGE...
                                                        ;...OR ZERO IF KT NOT AVAILABLE.
011302  000000                  .LSTAD: .WORD   0       ; LAST VIRTUAL ADDRESS IN LAST PAGE...
                                                        ;...OR LAST ADDRESS UNDER 30K (IF NO KT).
011304  000020                  .ABUSW: .WORD   16.     ; ADDRESS BUS WIDTH, 16, 18, OR 22.
                                ;
                                ; ALL GENERAL REGISTERS ARE USED BUT NOT SAVED.
                                ; MEMORY PARITY ERRORS (IF ANY) ARE IGNORED.
                                ;
        177572                  MMR0=   177572          ; KT CONTROL REGISTERS.
        177574                  MMR1=   177574
        177576                  MMR2=   177576
        172516                  MMR3=   172516
        172340                  KIPAR0= 172340          ; KERNAL, I SPACE, PAR 0.
        172300                  KIPDR0= KIPAR0-40       ;                  PDR 0.
                                ;
                                ;*****************************************************************

011306  012737  000020  011304  .SIZE:  MOV     #16.,.ABUSW     ; ASSUME 16 BIT ADDRESSING.
011314  013746  000004                  MOV     @#4,-(SP)       ; SAVE BUS-ERROR...
011320  013746  000006                  MOV     @#6,-(SP)
011324  013746  000114                  MOV     @#114,-(SP)     ;...AND PARITY VECTORS.
011330  013746  000116                  MOV     @#116,-(SP)
011334  010605                          MOV     SP,R5           ; SAVE STACK POINTER IN R5.

011336  012737  000116  000114          MOV     #116,@#114      ; IGNORE PARITY ERRORS.
011344  012737  000002  000116          MOV     #RTI,@#116
011352  012737  011376  000004          MOV     #1$,@#4         ; SIZE USING "1$" IF KT ISN'T THERE.
011360  012737  000340  000006          MOV     #340,@#6
011366  005737  177572                  TST     MMR0
011372  000240                          240
011374  000417                          BR      .SIZKT          ; OTHERWISE, SIZE USING THE KT.

011376  012737  011424  000004  1$:     MOV     #3$,@#4         ; NO KT -  SET TRAP CATCHER.
011404  005002                          CLR     R2              ; FIRST ADDRESS (0).
011406  005003                          CLR     R3
011410  005712                  2$:     TST     (R2)            ; SIZE FROM 0 UP...
011412  000240                          240
011414  062702  004000                  ADD     #4000,R2        ;...IN 1K STEPS...
011420  005203                          INC     R3
011422  000772                          BR      2$              ;...UNTIL WE TRAP.
011424  162702  000002          3$:     SUB     #2,R2           ; R2 = LAST VIRTUAL ADDRESS.
011430  005001                          CLR     R1              ; R1 = 0 (PAF DOESN'T APPLY).
011432  000513                          BR      .SIZXIT         ; RETURN.
```

```
1071  011434  012701  172340          .SIZKT: MOV     #KIPAR0,R1      ; 1ST "PAR" ADDRESS...
1072  011440  012702  172300                  MOV     #KIPDR0,R2      ; ...AND IT'S "PDR'...
1073  011444  012703  000010                  MOV     #8.,R3          ;...AND THERE ARE 8 OF EACH.
1074  011450  005000                          CLR     R0              ; 1ST PAGE IS ZERO.
1075  011452  010021                  1$:     MOV     R0,(R1)+        ; SET PAR'S = 0, 4K, 8K ... 28K.
1076  011454  012722  077406                  MOV     #77406,(R2)+    ; SET PDR'S = 4K, EX-UP, RFAD/WRITE.
1077  011460  062700  000200                  ADD     #200,R0         ; SET NEXT PAGE PAF (+4K)...
1078  011464  077306                          SOB     R3,1$           ; ...AND LOOP UNTIL ALL LOADED.
1079  011466  012741  177600                  MOV     #177600,-(R1)   ; PAR7 IS THE I/O PAGE (PAF).
1080  011472  005041                          CLR     -(R1)           ; PAR6 WILL DO THE SIZING.
1081  011474  005003                          CLR     R3              ; R3 WILL COUNT THE K'S.
1082
1083  011476  012737  011550  000004          MOV     #2$,@#4         ; TRAP TO 2$ IF NO 22 BIT SUPPORT.
1084  011504  005737  172516                  TST     MMR3            ; 22 BITS SUPPORTED ??
1085  011510  012737  000020  172516          MOV     #20,MMR3        ; MUST BE, SET 22 BIT MODE...
1086  011516  012737  011564  000004          MOV     #3$,@#4         ;...TRAP TO 3$ IF 22 BIT ADDRESS IS NXM.
1087  011524  005237  177572                  INC     MMR0            ;****** KT ON **************************
1088  011530  012711  010000                  MOV     #10000,(R1)     ; SET PAR6 AT START OF 22 BIT LAND...
1089  011534  023737  000200  140200          CMP     @#200,140200    ;...AND LOOK FOR WRAP-AROUND.
1090  011542  001010                          BNE     3$              ; WE'RE HERE IF IT DIDN'T TRAP...
1091                                                                  ;...BRANCH IF IT DIDN'T WRAP AROUND.
1092  011544  005037  172516                  CLR     MMR3            ; WRAP-AROUND -  MUST BE 18 BITS ONLY.
1093  011550  012737  000022  011304  2$:     MOV     #18.,.ABUSW     ; SET THE BUS WIDTH = 18.
1094  011556  012704  007600                  MOV     #7600,R4        ; SET SIZER LIMIT = 124K.
1095  011562  000405                          BR      4$
1096  011564  012737  000026  011304  3$:     MOV     #22.,.ABUSW     ; WE HAVE A REAL 22 BIT ADDRESS SPACE.
1097  011572  012704  170000                  MOV     #170000,R4      ; SET SIZER LIMIT = 1920K.
1098  011576                          4$:
1099  011576  012737  011624  000004  .SIZMEM: MOV     #2$,@#4         ; TRAP TO 2$ WHEN DONE SIZING.
1100  011604  005011                          CLR     (R1)            ; SET PAR6 AT 1ST PAGE (0).
1101  011606  005737  140000          1$:     TST     140000          ; SIZE USING PAR6 (+0)...
1102  011612  062711  000040                  ADD     #40,(R1)        ;...IN 1K STEPS.
1103  011616  005203                          INC     R3
1104  011620  021104                          CMP     (R1),R4         ; REACHED LIMIT ??
1105  011622  103771                          BLO     1$              ; LOOP IF NOT.
1106  011624  011100                  2$:     MOV     (R1),R0         ; DONE, SAVE FINAL PAR6...
1107  011626  012711  001400                  MOV     #1400,(R1)      ;...AND RESET IT TO BANK 6 (24K).
1108  011632  005037  177572                  CLR     MMR0            ;****** KT OFF **************************
1109  011636  012737  011650  000004          MOV     #3$,@#4         ; THERE MAY NOT BE AN MMR3                  ;LWL01
1110  011644  005037  172516                  CLR     MMR3            ; 22 BIT ADDRESSING OFF                     ;LWL01
1111  011650  010001                  3$:     MOV     R0,R1           ; RECOVER SIZING RESULT.
1112  011652  162701  000040                  SUB     #40,R1          ; R1 = LAST 1K PAGE (PAF).
1113  011656  012702  003776                  MOV     #3776,R2        ; R2 = LAST ADDR IN THAT PAGE.
1114
1115  011662  010137  011300          .SIZXIT: MOV    R1,.LSTPG       ; RETURN LAST PAGE (PAF)...
1116  011666  010237  011302                  MOV     R2,.LSTAD       ;...LAST VIRTUAL ADDRESS...
1117  011672  010337  011276                  MOV     R3,.MSIZE       ;...AND TOTAL MEMORY SIZE (K).
1118  011676  010506                          MOV     R5,SP           ; RECOVER OUR STACK POINTER...
1119  011700  012637  000116                  MOV     (SP)+,@#116     ;...AND THE ERROR VECTORS.
1120  011704  012637  000114                  MOV     (SP)+,@#114
1121  011710  012637  000006                  MOV     (SP)+,@#6
1122  011714  012637  000004                  MOV     (SP)+,@#4
1123  011720  000207                          RTS     PC              ;...AND RETURN.
```

```
                                        .SBTTL  REPORT ENVIRONMENT
                                        ;
                                        ; SUBROUTINE TO DISPLAY THE CURRENT OPERATING ENVIRONMENT.
                                        ; CALLED ON EVERY START/RESTART, OR DIRECTLY VIA "PRI".
                                        ;
                                                BGNRPT
                                                                                        L$RPT::
                                        1$:     CLRB    MSGNOT
                                                TST     .LSTPG
                                                BNE     2$
                                                MOVB    #40,MSGNOT
                                        2$:     PRINTF  #MSG2,#MSGNOT   ; MMU
                                                                                MOV     #MSGNOT,-(SP)
                                                                                MOV     #MSG2, (SP)
                                                                                MOV     #2,-(SP)
                                                                                MOV     SP,R0
                                                                                TRAP    C$PNTF
                                                                                ADD     #6,SP
                                                PRINTF  #MSG3,.MSIZE    ; MEM SIZE.
                                                                                MOV     .MSIZE,-(SP)
                                                                                MOV     #MSG3, (SP)
                                                                                MOV     #2,-(SP)
                                                                                MOV     SP,R0
                                                                                TRAP    C$PNTF
                                                                                ADD     #6,SP
                                        3$:     PRINTF  #MSG4,.ABUSW    ; ADDRESS SPACE.
                                                                                MOV     .ABUSW, (SP)
                                                                                MOV     #MSG4, (SP)
                                                                                MOV     #2, (SP)
                                                                                MOV     SP,R0
                                                                                TRAP    C$PNTF
                                                                                ADD     #6,SP
                                                EXIT    RPT
                                                                                .WORD   J$JMP
                                                                                .WORD   L10012 2 .
012042 047045 040445 020040             MSG2:   .ASCIZ  '%N%A  MMU%T%A AVAILABLE'
012050 046515 022525 022524
012056 020101 053101 044501
012064 040514 046102 000105
012072 047045 040445 020040             MSG3:   .ASCIZ  '%N%A  MEMORY SIZE %D4%A KW'
012100 042515 047515 054522
012106 051440 055111 020105
012114 042045 022464 020101
012122 053513    000
012125    045 022516 020101             MSG4:   .ASCIZ  '%N%A  %D2%A BIT ADDRESSING%N'
012132 022440 031104 040445
012140 041040 052111 040440
012146 042104 042522 051523
012154 047111 022507 000116
012162 047040 052117    000   MSGNOT: .ASCIZ  ' NOT'
012170                                  .EVEN
                                        ENDRPT
                                                                        L10012:
012170 104425                                                                   TRAP    C$RPT
```

```
                                .SBTTL
                                .SBTTL  RL DISKLESS CONTROLLER TESTS.
                                .SBTTL
                                .SBTTL    1 -  RLCS ADDRESSABILITY.

012172                          STARS
                                ;;*****************************************************************
                                ;TEST TO SEE IF WE CAN ADDRESS THE CONTROL
                                ;AND STATUS REGISTER   IF WE TRAP WE WILL REPORT
                                ;THE ERROR AND ABORT.  AFTER THIS TEST WE ONLY KNOW
                                ;THAT WE CAN ADDRESS THE REGISTER.
012172                          STARS
                                ;;*****************************************************************
                                        BEGIN.TEST
012172                                                                          T1::
012172  005037  010672      1$:       CLR     TRPFLG          ;CLEAR TRAP OCCURANCE
012176  012777  177777  171120        MOV     #177777,@RLCS   ; WRITE RLCS.
012204  000240  000240                240,240
012210  005777  171110                TST     @RLCS           ; READ RLCS.
012214  000240  000240                240,240
012220  005737  010672                TST     TRPFLG          ; EITHER ONE TRAP ??
012224  001413                        BEQ     3$              ; NO, PROCEED.
012226  013737  003324  003432        MOV     RLCS,GDDAT      ;SET UP ERROR DATA
012234                                SFERR   EM1,ERR1        ;BUS TIMEOUT IN ADDRESSING RLCS
012234  104454                                                                  TRAP    C$ERSF
012236  000002                                                                  .WORD   2
012240  030760                                                                  .WORD   EM1
012242  026242                                                                  .WORD   ERR1
012244                                  DODU    UNITST          ; DROP...
012244  013700  003322                                                          MOV     UNITST,R0
012250  104451                                                                  TRAP    C$DODU
012252                                  DOCLN                   ;...AND ABORT.
012252  104444                                                                  TRAP    C$DCLN
012254                          3$:     ENDTST
012254                                                                          L10013:
012254  104401                                                                  TRAP    C$ETST
```

```
                                .SBTTL    2 -- RLBA ADDRESSABILITY.

                                STARS
                                ;;*****************************************************************
                                ;TEST TO SEE IF WE CAN ADDRESS THE BUS ADDRESS
                                ;REGISTER.  IF WE TRAP WE WILL REPORT THE ERROR
                                ;AND ABORT.  AFTER THIS TEST WE ONLY KNOW THAT
                                ;WE CAN ADDRESS THE REGISTER.
                                STARS
                                ;;*****************************************************************
                                        BEGIN.TEST
                                                                                        T2::
                                1$:     CLR     TRPFLG          ;CLEAR TRAP OCCURANCE
                                        MOV     #177777,@RLBA   ; WRITE RLBA.
                                        240,240
                                        TST     @RLBA           ; READ RLBA.
                                        240,240
                                        TST     TRPFLG          ; ANY TRAPS ??
                                        BEQ     3$              ;NO, CONTINUE
                                        MOV     RLBA,GDDAT      ;SETUP ERROR DATA
                                        SFERR   EM2,ERR1        ;BUS TIMEOUT IN ADDRESSING RLBA
                                                                                TRAP    C$ERSF
                                                                                .WORD   3
                                                                                .WORD   EM2
                                                                                .WORD   ERR1
                                        DODU    UNITST          ; DROP...
                                                                                MOV     UNITST,R0
                                                                                TRAP    C$DODU
                                        DOCLN                   ;...AND ABORT.
                                                                                TRAP    C$DCLN
                                3$:     ENDTST
                                                                        L10014:
                                                                                TRAP    C$ETST
```

```
                                .SBTTL    3 -- RLDA ADDRESSABILITY.

                                STARS
                                ;;*****************************************************************
                                ;TEST TO SEE IF WE CAN ADDRESS THE DISK ADDRESS
                                ;REGISTER IF WE TRAP WE WILL REPORT THE ERROR
                                ;AND ABORT.  AFTER THIS TEST WE ONLY KNOW THAT
                                ;WE CAN ADDRESS THE REGISTER.
                                STARS
                                ;;*****************************************************************
                                        BEGIN.TEST
                                                                                T3::
                                1$:     CLR     TRPFLG          ;CLEAR TRAP OCCURANCE
                                        MOV     #177777,@RLDA   ; WRITE RLDA
                                        240,240
                                        TST     @RLDA           ; READ RLDA
                                        240,240
                                        TST     TRPFLG          ; ANY TRAPS ??
                                        BEQ     3$              ;NO, CONTINUE
                                        MOV     RLDA,GDDAT      ;SETUP ERROR INFO
                                        SFERR   EM3,ERR1        ;BUS TIMEOUT IN ADDRESSING RLDA
                                                                                TRAP    C$ERSF
                                                                                .WORD   4
                                                                                .WORD   EM3
                                                                                .WORD   ERR1
                                        DODU    UNITST          ; DROP...
                                                                                MOV     UNITST,R0
                                                                                TRAP    C$DODU
                                        DOCLN                   ;...AND ABORT.
                                                                                TRAP    C$DCLN
                                3$:     ENDTST
                                                                        L10015:
                                                                                TRAP    C$ETST
```

```
                                .SBTTL    4 -- RLMP ADDRESSABILITY.

                                STARS
                                ;;*****************************************************************
                                ;TEST TO SEE IF WE CAN ADDRESS THE MULTIPURPOSE
                                ;REGISTER.  IF WE TRAP WE WILL REPORT THE ERROR AND
                                ;ABORT.  AFTER THIS TEST WE ONLY KNOW THAT WE CAN
                                ;ADDRESS THE REGISTER.
                                STARS
                                ;;*****************************************************************
                                        BEGIN.TEST
                                                                                        T4::
012426  005037  010672          1$:     CLR     TRPFLG          ;CLEAR TRAP OCCURANCE
012432  012777  177777  170672          MOV     #177777,@RLMP   ;WRITE RLMP
012440  000240  000240                  240,240
012444  005777  170662                  TST     @RLMP           ; READ RLMP
012450  000240  000240                  240,240
012454  005737  010672                  TST     TRPFLG          ; ANY TRAPS ??
012460  001413                          BEQ     3$              ;NO, CONTINUE
012462  013737  003332  003432          MOV     RLMP,GDDAT      ;SET UP ERROR INFO
012470                                  SFERR   EM4,ERR1        ;BUS TIMEOUT IN ADDRESSING RLMP
                                                                                        TRAP    C$ERSF
012470  104454                                                                        .WORD   5
012472  000005                                                                         WORD    EM4
012474  031057                                                                        .WORD   ERR1
012476  026242
                                        DODU    UNITST          ; DROP...
012500                                                                                  MOV     UNITST,R0
012500  013700  003322                                                                 TRAP    C$DODU
012504  104451
                                        DOCLN                   ;...AND ABORT.
012506                                                                                  TRAP    C$DCLN
012506  104444
                                3$:     ENDTST
012510                                                                          L10C16:
012510                                                                                  TRAP    C$ETST
012510  104401
```

```
                                .SBTTL    5 -  RLBAE ADDRESSABILITY (RLV12 ONLY).

                                STARS
                                ;;*************************************************************
                                ; THE DEFAULT (SHIP) CONFIGURATION REQUIRES THAT THE
                                ; BAE REGISTER BE ENABLED.  CHECK IT AND REPORT ACCORDINGLY.
                                STARS
                                ;;*************************************************************
                                        BEGIN.TEST
                                                                                T5::
012512 023727 003402 000002             CMP     RLTYP,#RLV12    ; RLV12 ??
012520 103444                           BLO     4$              ; NO, SKIP THIS TEST.
012522 005037 010672            1$:     CLR     TRPFLG          ;CLEAR TRAP OCCURANCE
012526 013737 003334 003432             MOV     RLBAE,GDDAT     ; SET ADDRESS IN CASE OF ERROR.
012534 012777 177777 170572             MOV     #-1,@RLBAE      ; WRITE BAE.
012542 000240 000240                    240,240
012546 005777 170562                    TST     @RLBAE          ; READ BAE.
012552 000240 000240                    240,240
012556 023727 003402 000003             CMP     RLTYP,#RLV12X   ; DEFAULT CONFIG (W/BAE) ??
012564 001013                           BNE     3$              ; BR IF NOT.

012566 005737 010672            2$:     TST     TRPFLG          ; BAE SHOULD HAVE ANSWERED  - DID IT ??
012572 001417                           BEQ     4$              ; BR IF SO.
012574                                  SFERR   EM4A,ERR1       ;BUS TIMEOUT IN ADDRESSING RLBAE
                                                                        TRAP    C$ERSF
012574 104454                                                   (5)
012576 000006                                                   (6)     .WORD   6
012600 031104                                                   (6)     .WORD   EM4A
012602 026242                                                   (6)     .WORD   ERR1
012604                                  DODU    UNITST          ; DROP...
                                                                        MOV     UNITST,R0
012604 013700 003322                                            (3)
012610 104451                                                           TRAP    C$DODU
012612                                  DOCLN                   ;...AND ABORT.
                                                                        TRAP    C$DCLN
012612 104444                                                   (3)

012614 005737 010672            3$:     TST     TRPFLG          ; BAE SHOULD HAVE TRAPPED    DID IT ??
012620 001004                           BNE     4$              ; BR IF SO.
012622                                  DFERR   EM4B,ERR1       ; BAE IS NOT DISABLED.
                                                                        TRAP    C$ERDF
012622 104455                                                   (5)
012624 000145                                                   (6)     .WORD   101
012626 031132                                                   (6)     .WORD   EM4B
012630 026242                                                   (6)     .WORD   ERR1
012632                          4$:     ENDTST
                                                                L10017:
012632                                                                  TRAP    C$ETST
012632 104401                                                   (3)
```

```
                                .SBTTL    6  - BUS RESET OF ALL REGISTERS.

                                STARS
                                ;;*****************************************************************
                                ;TEST THAT A BUS RESET WILL CLEAR THE PROPER BITS.
                                ;IN THE CONTROL AND STATUS REGISTER, THOSE BITS ARE
                                ;1-6,8,9,10,11,12,13,15.  BIT 15 WILL CLEAR ONLY
                                ;IF BIT 14 (DRIVE ERROR IS NOT SET).  BIT 0 (DRIVE READY)
                                ;IS A DON'T CARE.  IF AT THE START UP THIS TEST BIT
                                ;14 (DRIVE ERROR) IS SET WE WILL INSIST IF IS THERE AFTER
                                ;THE "RESET" ALONG WITH BIT 15 (COMPOSITE ERROR).  BITS
                                ;15-10 ARE NOT WRITEABLE.
                                ; THE OTHER REGISTERS SHOULD GO TO ZERO.
                                STARS
                                ;;*****************************************************************
                                        BEGIN.TEST
                                                                                        T6::
                                        SETPRI  #PRI07          ;PRIORITY TO SEVEN
                                                                                                MOV     #PRI07,R0
                                                                                                TRAP    C$SPRI
                                        MOV     #377,@RLCS      ;LOAD ALL RLCS LOADABLE BITS
                                        MOV     #CRDY,GDDAT     ;SETUP EXPECTED CSR.
                                        BIT     #DERR,@RLCS     ;DRIVE ERR SET?
                                        BEQ     1$              ;IF NOT DON'T EXPECT IT
                                        BIS     #DERR!ERR,GDDAT  ;IT'S SET, INIT BETTER NOT CLR
                                1$:     MOV     #-1,@RLBA       ; LOAD ALL BITS IN THE OTHERS.
                                        MOV     #-1,@RLDA
                                        CMP     RLTYP,#RLV12X   ; RLV12X ??
                                        BNE     2$              ; NO, SKIP NEXT.
                                        MOV     #-1,@RLBAE
                                2$:     JSR     R5,WDELAY       ; DELAY BEFORE...
                                        250.
                                        RESET
                                3$:     JSR     R5,WDELAY       ;...AND AFTER.
                                        250.
                                        MOV     @RLCS,BDDAT     ;READ RLCS
                                        BIC     #DRDY,BDDAT     ;CLEAR OUT DRDY - DON'T CARE
                                        CMP     BDDAT,GDDAT     ;DID INIT WORK ON CSR.
                                        BEQ     4$              ;YES, BRANCH
                                        DFERR   EM69,ERR2       ;BUS INIT FAILED ON CSR.
                                                                                TRAP    C$ERDF
                                                                                .WORD   102
                                                                                .WORD   EM69
                                                                                .WORD   ERR2
                                4$:     CLR     GDDAT           ; EXPECT 0 IN THE OTHERS.
                                        MOV     @RLBA,BDDAT
                                        BEQ     5$
                                        DFERR   EM70,ERR2       ; BUS-INIT FAILED ON RLBA.
                                                                                TRAP    C$ERDF
                                                                                .WORD   103
                                                                                .WORD   EM70
                                                                                .WORD   ERR2
                                5$:     MOV     @RLDA,BDDAT
                                        BEQ     6$
                                        DFERR   EM71,ERR2       ; BUS-INIT FAILED ON RLDA.
                                                                                TRAP    C$ERDF
```

```
                                                                                .WORD   104
                                                                                .WORD   EM71
                                                                                .WORD   ERR2
 1308  013044  023727  003402  000003  6$:     CMP     RLTYP,#RLV12X   ; RLV12X ??
 1309  013052  001010                          BNE     7$              ; WE'RE DONE IF NOT.
 1310  013054  017737  170254  003434          MOV     @RLBAE,BDDAT
 1311  013062  001404                          BEQ     7$
 1312  013064                                  DFERR   EM71A,ERR2      ; BUS INIT FAILED ON RLBAE.
                                                                                TRAP    C$ERDF
                                                                                .WORD   105
                                                                                .WORD   EM71A
                                                                                .WORD   ERR2
 1313  013074                          7$:     ENDTST
                                                                        L10020:
                                                                                TRAP    C$ETST
```

```
                                .SBTTL    7 -  READ WRITE OF RLCS.

                                STARS
                                ;;*****************************************************************
                                ;TEST THAT WE CAN WRITE/READ BITS 8,9 AND BITS 6-1
                                ;OF THE CONTROL AND STATUS REGISTER.  BITS 15-10 AND 0
                                ;ARE DON'T CARE BITS AT THIS TIME AND BIT 7
                                ;(CONTROLLER READY) IS ALWAYS WRITTEN TO A ONE.
                                STARS
                                ;;*****************************************************************
                                        BEGIN.TEST
                                                                                        T7::
                                        MOV     #CSPAT,R3       ;SET UP TABLE POINTER OF PATTERNS
                                        BGNSEG                  ;****START OF SEGMENT****
                                                                                TRAP    C$BSEG
                                1$:     MOV     (R3),GDDAT      ;GET PATTERN INTO GDDAT
                                        BIS     #200,GDDAT      ;INSURE GO IS SET
                                        MOV     GDDAT,@RLCS     ;LOAD RLCS (CONTROL AND STATUS)
                                        BIT     #DERR,@RLCS     ;IF DRIVE ERROR PRESENT
                                        BEQ     2$              ;THEN EXPECT DRIVE AND
                                        BIS     #ERR!DERR,GDDAT ;COMPOSITE ERROR
                                2$:     MOV     @RLCS,BDDAT     ;READ RLCS BACK
                                        BIC     #DRDY,BDDAT     ;IGNORE DRIVE READY
                                        CMP     GDDAT,BDDAT     ;DID WE READ WHAT WE LOADED
                                        BEQ     3$              ;YES, THEN BRANCH
                                        DFERR   EM5,ERR2        ;WRONG DATA IN RLCS
                                                                                TRAP    C$ERDF
                                                                                .WORD   106
                                                                                .WORD   EM5
                                                                                .WORD   ERR2
                                3$:     ESCAPE  SEG             ; ESCAPE AND LOOP (IF FLA:LOE).
                                                                                TRAP    C$ESCAPE
                                                                                .WORD   10000$ .
                                        TST     (R3)+           ;BUMP FOR NEXT PATTERN
                                        CMP     R3,#CSEND       ;CHECK FOR END
                                        BNE     1$              ;NOT END, LOAD NEXT PATTERN
                                        ENDSEG                  ;****END OF SEGMENT****
                                                                10000$:
                                                                                TRAP    C$ESEG
                                        ENDTST
                                                                L10021:
                                                                                TRAP    C$ETST
```

```
                        .SBTTL    8    READ WRITE OF RLBA.

                        STARS
                        ;;*****************************************************************
                        ;TEST THAT WE CAN WRITE/READ BITS 15 THRU 1 OF THE
                        ;BUS ADDRESS REGISTER.  FOUR PATTERNS ARE USED: GROWING 1, SHIFTING 1,
                        ;GROWING 0 AND SHIFTING 0.  BIT 0 IS ALSO LOADED BUT
                        ;SHOULD ALWAYS COME BACK AS 0
                        STARS
                        ;;*****************************************************************
                                BEGIN.TEST
                                                                                T8::
013216  012703  003672          MOV     #BEGPAT,R3      ;GET START OF PATTERN LIST
013222                          BGNSEG                  ;****START OF SEGMENT****
                                                                        TRAP    C$BSEG
013224  011337  003432  1$:     MOV     (R3),GDDAT      ;GET PATTERN TO SEND
013230  023727  003402  000000  CMP     RLTYP,#RL11     ; RL11 ??
013236  001003                  BNE     2$              ;NO.
013240  042737  000001  003432  BIC     #BIT0,GDDAT     ;YES, KEEP RLBA EVEN (UNIBUS)
013246  013777  003432  170052  2$:     MOV     GDDAT,@RLBA     ;LOAD PATTERN TO BUS ADDRESS
013254  017737  170046  003434  MOV     @RLBA,BDDAT     ;READ IT BACK
013262  023737  003432  003434  CMP     GDDAT,BDDAT     ;IS IT CORRECT?
013270  001404                  BEQ     3$              ;IF SO, BRANCH
013272                          DFERR   EM6,ERR2        ;DATA WRONG IN RLBA
                                                                        TRAP    C$ERDF
013274  000153                                                          .WORD   107
013276  031252                                                          .WORD   EM6
013300  026272                                                          .WORD   ERR2
013302                  3$:     ESCAPE  SEG             ; ESCAPE AND LOOP (IF FLA;LOE).
                                                                        TRAP    C$ESCAPE
013304  000012                                                          .WORD   10000$ .
013306  005723                  TST     (R3)+           ;BUMP FOR NEXT PATTERN
013310  020327  004100          CMP     R3,@ENDPAT      ;CHECK FOR END
013314  001343                  BNE     1$              ; LOOP TIL DONE.
013316                          ENDSEG                  ;****END OF SEGMENT****
                                                                10000$:
                                                                        TRAP    C$ESEG
                                ENDTST
                                                                L10022:
                                                                        TRAP    C$ETST
```

```
                                .SBTTL    9 -- READ WRITE OF RLDA.

                                STARS
                                ;;*****************************************************************
                                ;TEST THAT WE CAN WRITE/READ THE DISK ADDRESS REGISTER
                                ;ALL BIT POSITIONS ARE WRITTEN USING FOUR PATTERNS:
                                ;GROWING 1, SHIFTING 1. GROWING 0 AND SHIFTING 0
                                STARS
                                ;;*****************************************************************
                                        BEGIN.TEST
                                                                                        T9::
                                        MOV     #BEGPAT,R3      ;SET UP POINTER TO PATTERN LIST
                                        BGNSEG                  ;****START OF SEGMENT****
                                                                                TRAP    C$BSEG
                                1$:     MOV     (R3),GDDAT      ;GET PATTERN
                                        MOV     GDDAT,@RLDA     ;LOAD PATTERN IN DA
                                        MOV     @RLDA,BDDAT     ;READ PATTERN BACK
                                        CMP     GDDAT,BDDAT     ;IS IT CORRECT?
                                        BEQ     2$              ;BRANCH IF CORRECT
                                        DFERR   EM7,ERR2        ;WRONG DATA IN RLDA
                                                                                TRAP    C$ERDF
                                                                                .WORD   108
                                                                                .WORD   EM7
                                                                                .WORD   ERR2
                                2$:     ESCAPE  SEG             ; ESCAPE AND LOOP (IF FLA:LOE).
                                                                                TRAP    C$ESCAPE
                                                                                .WORD   10000$ .
                                        TST     (R3)+           ;BUMP POINTER
                                        CMP     R3,#ENDPAT      ;AT END OF PATTERNS?
                                        BNE     1$              ;NO, BRANCH BACK
                                        ENDSEG                  ;****END OF SEGMENT****
                                                                                10000$:
                                                                                TRAP    C$ESEG
                                        ENDTST
                                                                                L10023:
                                                                                TRAP    C$ETST
```

```
                                        .SBTTL   10 -- READ WRITE OF RLBAE (RLV12 ONLY).

                                        STARS
                                        ;;*****************************************************************
                                        ;TEST THAT WE CAN WRITE/READ THE BUS ADDRESS EXTENSION REGISTER.
                                        ;ALL BIT POSITIONS ARE WRITTEN USING FOUR PATTERNS:
                                        ;GROWING 1, SHIFTING 1, GROWING 0 AND SHIFTING 0
                                        ; ONLY THE LOW 6 BITS ARE TESTED RLBAE<5:0>
                                        STARS
                                        ;;*****************************************************************
                                                BEGIN.TEST
                                                                                                T10::
013410  023727  003402  000003                 CMP     RLTYP,#RLV12X   ; BAE ENABLED ??
013416  001035                                BNE     3$              ; NO, DON'T EVEN TRY.
013420  012703  003672                        MOV     #BEGPAT,R3      ;SET UP POINTER TO PATTERN LIST
013424                                        BGNSEG                  ;****START OF SEGMENT****
                                                                                        TRAP    C$BSEG
013424  104404
013426  011337  003432          1$:           MOV     (R3),GDDAT      ;GET PATTERN
013432  013777  003432  167674                MOV     GDDAT,@RLBAE    ;LOAD PATTERN IN BAE
013440  017737  167670  003434                MOV     @PLBAE,BDDAT    ;READ PATTERN BACK
013446  042737  177700  003432                BIC     #^C77,GDDAT     ; ** ONLY 5:0 ARE VALID BITS.
013454  023737  003432  003434                CMP     GDDAT,BDDAT     ;IS IT CORRECT?
013462  001404                                BEQ     2$              ;BRANCH IF CORRECT
013464                                        DFERR   EM8,ERR2        ;WRONG DATA IN RLBAE
                                                                                        TRAP    C$ERDF
013464  104455                                                                          .WORD   109
013466  000155                                                                          .WORD   EM8
013470  031326                                                                          .WORD   ERR2
013472  026272
013474                                  2$:           ESCAPE SEG                ; ESCAPE AND LOOP (IF FLA;LOE).
                                                                                        TRAP    C$ESCAPE
013474  104410                                                                          .WORD   10000$ .
013476  000012
013500  005723                                TST     (R3)+           ;BUMP POINTER
013502  020327  004100                        CMP     R3,#ENDPAT      ;AT END OF PATTERNS?
013506  001347                                BNE     1$              ;NO, BRANCH BACK
013510                                        ENDSEG                  ;****END OF SEGMENT****
                                                                                10000$:
013510                                                                          TRAP    C$ESEG
013510  104405
013512                                  3$:           ENDTST
                                                                                L10024:
013512                                                                          TRAP    C$ETST
013512  104401
```

```
                                .SBTTL   11 -- BIS AND BIC OF RLCS.

                                STARS
                                ;;*****************************************************************
                                ;TEST THAT WE CAN USE THE "BIS" AND "BIC" INSTRUCTIONS ON THE CONTROL
                                ;AND STATUS REGISTER.  BITS 8,9 AND 6-1 ARE TESTED TO
                                ;SET INDIVIDUALLY AS WELL AS COLLECTIVELY WITHOUT DESTROYING
                                ;ANY PREVIOUS DATA PATTERN
                                STARS
                                ;;*****************************************************************
                                        BEGIN.TEST
                                                                                        T11::
                                        MOV     #CSPAT,R3       ;GET BEGINNING OF LIST
                                        BGNSEG                  ;**** START SEGMENT *****
                                                                                TRAP    C$BSEG
                                1$:     MOV     #CRDY,@RLCS     ;INSURE GO IS THERE
                                        MOV     (R3),GDDAT      ;SET UP EXPECTED RLCS...
                                        BIS     #CRDY,GDDAT     ;...IN GDDAT.
                                        BIS     (R3),@RLCS      ; *** BIT SET PATTERN IN RLCS
                                        BIT     #DERR,@RLCS     ;IF ERROR BIT SET THEN...
                                        BEQ     2$              ;...EXPECT IT ON THE READ BACK.
                                        BIS     #ERR!DERR,GDDAT
                                2$:     MOV     @RLCS,BDDAT     ;READ RLCS TO CHECK "BIS"
                                        BIC     #DRDY,BDDAT     ;CLEAR OUT DRIVE READY
                                        CMP     BDDAT,GDDAT     ;DID BIS WORK?
                                        BEQ     3$              ;BRANCH IF OKAY
                                        DFERR   EM61,ERR2       ;WRONG DATA IN RLCS ON BIS.
                                                                                TRAP    C$ERDF
                                                                                .WORD   110
                                                                                .WORD   EM61
                                                                                .WORD   ERR2
                                3$:     ESCAPE  SEG             ; ESCAPE AND LOOP (IF FLA;LOE).
                                                                                TRAP    C$ESCAPE
                                                                                .WORD   10000$ .
                                4$:     MOV     #1776,@RLCS     ;SET ALL SETTABLE BITS
                                        MOV     #1776,GDDAT     ;SET UP EXPECT DATA IN...
                                        BIC     (R3),GDDAT      ;...GDDAT
                                        BIC     (R3),@RLCS      ; *** XCT BIC ON RLCS.
                                        BIT     #DERR,@RLCS     ;IF DRIVE ERROR BIT SET...
                                        BEQ     5$              ;...EXPECT IT SET WHEN WE READ.
                                        BIS     #ERR!DERR,GDDAT
                                5$:     MOV     @RLCS,BDDAT     ;MOVE RLCS TO BDDAT FOR COMPARE
                                        BIC     #DRDY,BDDAT     ;CLEAR DRIVE READY
                                        CMP     BDDAT,GDDAT     ;DID "BIC" WORK PROPERLY
                                        BEQ     6$              ;BRANCH IF OKAY
                                        DFERR   EM62,ERR2       ;WRONG DATA IN RLCS ON BIC.
                                                                                TRAP    C$ERDF
                                                                                .WORD   111
                                                                                .WORD   EM62
                                                                                .WORD   ERR2
                                6$:     ESCAPE  SEG             ; ESCAPE AND LOOP (IF FLA;LOE).
                                                                                TRAP    C$ESCAPE
                                                                                .WORD   10000$ .
                                        TST     (R3)+           ;GET NEXT PATTERN
                                        CMP     R3,#CSEND       ;AT END OF LIST
                                        BNE     1$              ;NO, GO BACK WITH NEXT PATTERN
```

```
 1461  013736                          ENDSEG
  (3)  013736
  (3)  013736  104405
 1462  013740                          ENDTST
  (3)  013740
  (3)  013740  104401

                                    10000$:
                                            TRAP    C$ESEG
                                    L10025:
                                            TRAP    C$ETST
```

```
                        .SBTTL   12 -  BIS AND BIC OF RLBA.

                        STARS
                        ;;*****************************************************************
                        ;TEST THAT THE "BIS" AND "BIC" INSTRUCTIONS WILL WORK ON THE
                        ;BUS ADDRESS REGISTER.  BITS 15-0 ARE LOADED, ONLY BITS 15-1
                        ;ARE EXPECTED BACK.  FOUR PATTERNS ARE USED: GROWING 1, SHIFTING 1,
                        ;GROWING 0, AND SHIFTING 0.
                        STARS
                        ;;*****************************************************************
                                BEGIN.TEST
                                                                                T12::
013742  012703  003672            MOV     #BEGPAT,R3      ;GET START OF LIST
                                BGNSEG                  ;**** START SEGMENT ****
                                                                        TRAP    C$BSEG
013746  104404
013750  005077  167352    1$:     CLR     @RLBA           ;CLEAR "BA"
013754  011337  003432            MOV     (R3),GDDAT      ;SET EXPECTED
013760  023727  003402  000000    CMP     RLTYP,#RL11     ; RL11 ??
013766  001003                    BNE     2$              ; NO.
013770  042737  000001  003432    BIC     #1,GDDAT        ;BIT 0 CAN'T SET IN RLBA (UNIBUS)
014002  017737  167324    2$:     MOV     @RLBA,BDDAT     ; XCT BIS RLBA WITH PATTERN
014010  023737  003434  003432    CMP     BDDAT,GDDAT     ;READ "BA"
014016  001404                    BEQ     3$              ;DID RLBA LOAD PROPERLY?
                                DFERR   EM63,ERR2       ;BRANCH IF YES
014020                                                  ;WRONG DATA IN RLBA ON BIS.
                                                                        TRAP    C$ERDF
014020  104455                                                         .WORD   112
014022  000160                                                         .WORD   EM63
014024  033007                                                         .WORD   ERR2
014026  026272
014030                  3$:     ESCAPE  SEG             ; ESCAPE AND LOOP (IF FLA:LOE).
                                                                        TRAP    C$ESCAPE
014030  104410                                                         .WORD   10000$ .
014032  000070
014034  012777  177776  167264 4$:     MOV     #-2,@RLBA       ;SET RLBA TO ALL 1'S (BIT 0=0)
014042  012737  177776  003432        MOV     #-2,GDDAT       ;SET UP EXPECTED RESULTS
014050  041337  003432                BIC     (R3),GDDAT      ;IN GDDAT
014054  041377  167246                BIC     (R3),@RLBA      ; XCT BIC RLBA
014060  017737  167242  003434        MOV     @RLBA,BDDAT     ;READ RLBA
014066  023737  003434  003432        CMP     BDDAT,GDDAT     ;BIC WORK OKAY?
014074  001404                        BEQ     5$              ;IF YES BRANCH
014076                              DFERR   EM64,ERR2       ;WRONG DATA IN RLBA ON BIC.
                                                                        TRAP    C$ERDF
014076  104455                                                         .WORD   113
014100  000161                                                         .WORD   EM64
014102  033055                                                         .WORD   ERR2
014104  026272
014106                  5$:     ESCAPE  SEG             ; ESCAPE AND LOOP (IF FLA:LOE).
                                                                        TRAP    C$ESCAPE
014106  104410                                                         .WORD   10000$ .
014110  000012
014112  005723                  TST     (R3)+           ;GET NEXT PATTERN
014114  020327  004100          CMP     R3,#ENDPAT      ;HAVE WE COMPLETED LIST
014120  001313                  BNE     1$              ;NO, GO BACK FOR NEXT
                                ENDSEG
                                                                10000$:
                                                                        TRAP    C$ESEG
                                ENDTST
                                                                L10026:
                                                                        TRAP    C$ETST
```

```
                                .SBTTL   13 -  BIS AND BIC OF RLDA.

                                STARS
                                ;;*****************************************************************
                                ;TEST THAT THE "BIS" AND "BIC' INSTRUCTIONS WILL WORK ON THE DISK
                                ;ADDRESS REGISTER.  BITS 15 0 ARE TESTED WITH 4 PATTERNS, GROWING 1,
                                ;SHIFTING 1, GROWING 0, AND SHIFTING 0.
                                STARS
                                ;;*****************************************************************
                                        BEGIN.TEST
                                                                                        T13::
                                        MOV     #BEGPAT,R3      ;GET START OF LIST
                                        BGNSEG                  ; **** START SEGMENT ****
                                                                                TRAP    C$BSEG
                                1$:     CLR     @RLDA           ;CLEAR "DA"
                                        MOV     (R3),GDDAT      ;SET EXPECTED
                                        BIS     (R3),@RLDA      ; XCT BIS RLDA
                                        MOV     @RLDA,BDDAT     ;READ RLDA
                                        CMP     BDDAT,GDDAT     ;IS RLDA CORRECT
                                        BEQ     2$              ;IF OKAY BRANCH
                                        DFERR   EM65,ERR2       ;WRONG DATA IN RLDA ON BIS.
                                                                                TRAP    C$ERDF
                                                                                .WORD   114
                                                                                .WORD   EM65
                                                                                .WORD   ERR2
                                2$:     ESCAPE  SEG             ; ESCAPE AND LOOP (IF FLA;LOE).
                                                                                TRAP    C$ESCAPE
                                                                                .WORD   10000$ .
                                3$:     MOV     #-1,@RLDA       ;SET RLDA TO ALL 1'S
                                        MOV     #-1,GDDAT       ;SET EXPECTED DATA
                                        BIC     (R3),GDDAT      ;SET EXPECTED DATA
                                        BIC     (R3),@RLDA      ; XCT "BIC" RLDA
                                        MOV     @RLDA,BDDAT     ;READ RLDA
                                        CMP     GDDAT,BDDAT     ;DID "BIC" WORK?
                                        BEQ     4$              ;IF IT DID BRANCH
                                        DFERR   EM66,ERR2       ;WRONG DATA IN RLDA ON BIC.
                                                                                TRAP    C$ERDF
                                                                                .WORD   115
                                                                                .WORD   EM66
                                                                                .WORD   ERR2
                                4$:     ESCAPE  SEG             ; ESCAPE AND LOOP (IF FLA;LOE).
                                                                                TRAP    C$ESCAPE
                                                                                .WORD   10000$ .
                                        TST     (R3)+           ;GET NEXT PATTERN
                                        CMP     R3,#ENDPAT      ;DONE?
                                        BNE     1$              ;NO GO BACK
                                        ENDSEG
                                                                        10000$:
                                                                                TRAP    C$ESEG
                                        ENDTST
                                                                        L10027:
                                                                                TRAP    C$ETST
```

```
                                .SBTTL   14    BIS AND BIC OF RLBAE (RLV12 ONLY).

                                STARS
                                ;;*****************************************************************
                                ;TEST THAT THE "BIS" AND "BIC" INSTRUCTIONS WILL WORK ON THE
                                ;BUS ADDRESS EXTENSION REGISTER.  ALL BITS ARE LOADED BUT ONLY <5:0>
                                ;ARE EXPECTED BACK.  FOUR PATTERNS ARE USED: GROWING 1, SHIFTING 1,
                                ;GROWING 0, AND SHIFTING 0.
                                STARS
                                ;;*****************************************************************
                                        BEGIN.TEST
                                                                                        T14::
                                        CMP     RLTYP,#RLV12X   ; BAE ENABLED ??
                                        BNE     5$              ; SKIP IT IF NOT.
                                        MOV     #BEGPAT,R3      ;GET START OF LIST
                                        BGNSEG                  ; **** START SEGMENT ****
                                                                                TRAP    C$BSEG
                                1$:     CLR     @RLBAE          ;CLEAR "BAE"
                                        MOV     (R3),GDDAT      ;SET EXPECTED...
                                        BIC     #^C77,GDDAT     ;...ONLY <5:0> ARE VALID.
                                        BIS     (R3),@RLBAE     ; XCT BIS RLBAE WITH PATTERN
                                        MOV     @RLBAE,BDDAT    ;READ "BAE"
                                        CMP     BDDAT,GDDAT     ;DID IT LOAD PROPERLY?
                                        BEQ     2$              ;BRANCH IF YES
                                        DFERR   EM67,ERR2       ;WRONG DATA IN RLBAE ON BIS.
                                                                                TRAP    C$ERDF
                                                                                .WORD   116
                                                                                .WORD   EM67
                                                                                .WORD   ERR2
                                2$:     ESCAPE  SEG             ; ESCAPE AND LOOP (IF FLA;LOE).
                                                                                TRAP    C$ESCAPE
                                                                                .WORD   10000$ .
                                3$:     MOV     #-1,@RLBAE      ;SET RLBAE TO ALL 1'S
                                        MOV     #-1,GDDAT       ;SET UP EXPECTED RESULTS...
                                        BIC     (R3),GDDAT      ;...IN GDDAT...
                                        BIC     #^C77,GDDAT     ;...<5:0> ONLY.
                                        BIC     (R3),@RLBAE     ; XCT BIC RLBAE
                                        MOV     @RLBAE,BDDAT    ;READ RLBAE
                                        CMP     BDDAT,GDDAT     ;BIC WORK OKAY?
                                        BEQ     4$              ;IF YES BRANCH
                                        DFERR   EM68,ERR2       ;WRONG DATA IN RLBAE ON BIC
                                                                                TRAP    C$ERDF
                                                                                .WORD   117
                                                                                .WORD   EM68
                                                                                .WORD   ERR2
                                4$:     ESCAPE  SEG             ; ESCAPE AND LOOP (IF FLA;LOE).
                                                                                TRAP    C$ESCAPE
                                                                                .WORD   10000$ .
                                        TST     (R3)+           ;GET NEXT PATTERN
                                        CMP     R3,#ENDPAT      ;HAVE WE COMPLETED LIST
                                        BNE     1$              ;NO, GO BACK FOR NEXT
                                        ENDSEG
                                                                        10000$:
                                                                                TRAP    C$ESEG
                                5$:     ENDTST
                                                                        L10030:
```

(3) 014464 104401 TRAP C$ETST

```
                                .SBTTL   15 -- UNIQUENESS OF RLCS.

                                STARS
 (2)                            ;;*****************************************************************
                                ;TEST THE UNIQUENESS OF THE CONTROL AND STATUS
                                ;REGISTER.  THE RLBA AND RLDA ARE PRELOADED WITH
                                ;177776 AND 177777 RESPECTIVELY.  THE RLCS IS THEN
                                ;LOADED TO INSURE THAT NEITHER THE RLBA OR RLDA
                                ;ARE MODIFIED BY THE WRITING OF THE RLCS.
                                ; IF RLV12, CHECK THE BAE ALSO, NOTING THAT CSR<5:4> SHOULD
                                ; BE MIRRORED IN BAE<1:0>.
                                STARS
 (2)                            ;;*****************************************************************
                                        BEGIN.TEST
 (4)                                                                                    T15::
1584  014466  012777  177776  166632          MOV     #-2,@RLBA               ;SET RLBA TO ALL 1'S
1585  014474  012777  177777  166626          MOV     #-1,@RLDA               ;SET RLDA TO ALL 1'S
1586  014502  023727  003402  000003          CMP     RLTYP,#RLV12X
1587  014510  001003                          BNE     1$
1588  014512  012777  000077  166614          MOV     #77,@RLBAE              ; SET BAE TO ALL 1'S.
1589  014520  012777  000200  166576  1$:     MOV     #CRDY,@RLCS             ;WRITE RLCS
1590  014526  012737  177776  003432          MOV     #-2,GDDAT       ;SET UP EXPECTED BA.
1591  014534  017737  166566  003434          MOV     @RLBA,BDDAT     ;READ RLBA
1592  014542  023737  003432  003434          CMP     GDDAT,BDDAT
1593  014550  001405                          BEQ     2$              ; BR IF BA UNCHANGED.
1594  014552                                  DFERR   EM72,ERR2       ;CS MODIFIED BA
 (5)  014552  104455                                                            TRAP    C$ERDF
 (6)  014554  000166                                                            .WORD   118
 (6)  014556  033544                                                            .WORD   EM72
 (6)  014560  026272                                                            .WORD   ERR2
                                        CKLOOP
1595  014562                                                                    TRAP    C$CLP1
 (3)  014562  104406
1596  014564  012737  177777  003432  2$:     MOV     #-1,GDDAT       ;SET UP EXPECTED DA.
1597  014572  017737  166532  003434          MOV     @RLDA,BDDAT     ;READ DA
1598  014600  023737  003432  003434          CMP     GDDAT,BDDAT
1599  014606  001405                          BEQ     3$              ; BR IF DA UNCHANGED.
1600  014610                                  DFERR   EM73,ERR2       ;CS MODIFIED DA
 (5)  014610  104455                                                            TRAP    C$ERDF
 (6)  014612  000167                                                            .WORD   119
 (6)  014614  033577                                                            .WORD   EM73
 (6)  014616  026272                                                            .WORD   ERR2
                                        CKLOOP
1601  014620                                                                    TRAP    C$CLP1
 (3)  014620  104406
1602  014622  023727  003402  000003  3$:     CMP     RLTYP,#RLV12X
1603  014630  001016                          BNE     4$
1604  014632  012737  000074  003432          MOV     #74,GDDAT       ; SET EXPECTED BAE.
1605  014640  017737  166470  003434          MOV     @RLBAE,BDDAT    ; READ IT.
1606  014646  023737  003432  003434          CMP     GDDAT,BDDAT
1607  014654  001404                          BEQ     4$              ; BR IF BAE IS RIGHT.
1608  014656                                  DFERR   EM73A,ERR2      ; BAE WRONG AFTER WRITING CS.
 (5)  014656  104455                                                            TRAP    C$ERDF
 (6)  014660  000170                                                            .WORD   120
 (6)  014662  033632                                                            .WORD   EM73A
 (6)  014664  026272                                                            .WORD   ERR2
1609  014666                          4$:     ENDTST
 (7)  014666                                                            L10031:
```

(3) 014666 104401 TRAP C$ETST

```
                                .SBTTL   16 -  UNIQUENESS OF RLBA.

                                STARS
                                ;;*****************************************************************
                                ;TEST THE UNIQUENESS OF THE BUS ADDRESS REGISTER.  THE
                                ;RLCS AND RLDA ARE LOADED WITH XXX20X AND 177777
                                ;RESPECTIVELY.  THE RLBA IS THEN WRITTEN TO INSURE
                                ;THAT NEITHER THE RLCS OR RLDA ARE MODIFIED.
                                ; IF RLV12, CHECK THAT BAE IS UNAFFECTED ALSO.
                                STARS
                                ;;*****************************************************************
                                        BEGIN.TEST
                                                                                        T16::
014670  012737  000200  003432          MOV     #CRDY,GDDAT     ;CONTROLLER READY
014676  032777  040000  166420          BIT     #DERR,@RLCS     ;IF DRIVE ERROR IS SET...
014704  001403                        1$:     BEQ     1$
014706  052737  140000  003432          BIS     #ERR!DERR,GDDAT ;...EXPECT IT BACK.
014714  013777  003432  166402          MOV     GDDAT,@RLCS     ;LOAD RLCS
014722  012777  177777  166400          MOV     #-1,@RLDA       ;LOAD RLDA
014730  023727  003402  000003          CMP     RLTYP,#RLV12X
014736  001003                          BNE     2$
014740  012777  000074  166366          MOV     #74,@RLBAE      ;LOAD RLBAE.
014746  005077  166354                2$:     CLR     @RLBA           ; WRITE TO RLBA
014752  017737  166346  003434          MOV     @RLCS,BDDAT     ;READ RLCS
014760  042737  000001  003434          BIC     #DRDY,BDDAT     ;IGNORE DRIVE READY
014766  023737  003432  003434          CMP     GDDAT,BDDAT
014774  001405                          BEQ     3$              ; BR IF CS UNCHANGED.
014776                                  DFERR   EM74,ERR2       ;BA MODIFIED CS
                                                                                TRAP    C$ERDF
104455                                                                          .WORD   121
000171                                                                          .WORD   EM74
033671                                                                          .WORD   ERR2
026272
                                        CKLOOP
                                                                                TRAP    C$CLP1
104406
177777  003432  3$:     MOV     # 1,GDDAT       ; SET EXPECTED DA.
166306  003434          MOV     @RLDA,BDDAT     ; READ IT.
003432  003434          CMP     GDDAT,BDDAT
001405                  BEQ     4$              ; BR IF DA UNCHANGED.
                        DFERR   EM75,ERR2       ;BA MODIFIED DA
                                                                                TRAP    C$ERDF
104455                                                                          .WORD   122
000172                                                                          .WORD   EM75
033723                                                                          .WORD   ERR2
026272
                                        CKLOOP
                                                                                TRAP    C$CLP1
104406
003402  000003  4$:     CMP     RLTYP,#RLV12X
001016                  BNE     5$
000074  003432          MOV     #74,GDDAT       ; SET EXPECTED BAE.
166244  003434          MOV     @RLBAE,BDDAT    ; READ IT.
003432  003434          CMP     GDDAT,BDDAT
001404                  BEQ     5$              ; BR IF BAE UNCHANGED.
                        DFERR   EM75A,ERR2      ; BA MODIFIED BAE
                                                                                TRAP    C$ERDF
104455                                                                          .WORD   1^3
000173                                                                          .WORD   EM75A
033755                                                                          .WORD   ERR2
026272
```

```
 1650  015112                          5$:     ENDTST
  (3)  015112                                                  L10032:
  (3)  015112  104401                                                 TRAP    C$ETST
```

```
                        .SBTTL   17 -  UNIQUENESS OF RLDA.

                        STARS
                        ;;*****************************************************************
                        ;TEST THE UNIQUENESS OF THE DISK ADDRESS REGISTER.  THE RLCS
                        ;AND RLBA ARE LOADED WITH XXX20X AND 177776 RESPECTIVELY.
                        ;THE RLDA IS THEN WRITTEN TO INSURE THAT
                        ;NEITHER THE RLCS OR THE RLBA ARE MODIFIED.
                        ; IF RLV12, CHECK THAT RLBAE IS UNAFFECTED ALSO.
                        STARS
                        ;;*****************************************************************
                                BEGIN.TEST
                                                                                T17::
015114  012737  000200  003432          MOV     #CRDY,GDDAT     ;CONTROLLER READY
015122  032777  040000  166174          BIT     #DERR,@RLCS     ;IF DRIVE ERROR IS SET...
015130  001403                          BEQ     1$
015132  052737  140000  003432          BIS     #ERR!DERR,GDDAT ;...EXPECT IT BACK.
015140  013777  003432  166156  1$:     MOV     GDDAT,@RLCS     ;LOAD CS
015146  012777  177776  166152          MOV     #-2,@RLBA       ;LOAD BA WITH ALL 1'S
015154  023727  003402  000003          CMP     RLTYP,#RLV12X
015162  001003                          BNE     2$
015164  012777  000074  166142          MOV     #74,@RLBAE      ; LOAD BAE.
015172  005077  166132          2$:     CLR     @RLDA           ; WRITE TO RLDA.
015176  017737  166122  003434          MOV     @RLCS,BDDAT     ;READ RLCS
015204  042737  000001  003434          BIC     #DRDY,BDDAT     ;IGNORE DRIVE READY
015212  023737  003432  003434          CMP     GDDAT,BDDAT
015220  001405                          BEQ     3$              ; BR IF CS UNCHANGED.
015222                                  DFERR   EM76,ERR2       ;DA MODIFIED CS
 (5)    015222  104455                                                  TRAP    C$ERDF
 (6)    015224  000174                                                  .WORD   124
 (6)    015226  034011                                                  .WORD   EM76
 (6)    015230  026272                                                  .WORD   ERR2
                                CKLOOP
 (3)    015232  104406                                                  TRAP    C$CLP1
015234  012737  177776  003432  3$:     MOV     #-2,GDDAT       ; SET EXPECTED BA.
015242  017737  166060  003434          MOV     @RLBA,BDDAT     ; READ IT.
015250  023737  003432  003434          CMP     GDDAT,BDDAT
015256  001405                          BEQ     4$              ; BR IF BA UNCHANGED.
015260                                  DFERR   EM77,ERR2       ;DA MODIFIED BA
 (5)    015260  104455                                                  TRAP    C$ERDF
 (6)    015262  000175                                                  .WORD   125
 (6)    015264  034044                                                  .WORD   EM77
 (6)    015266  026272                                                  .WORD   ERR2
                                CKLOOP
 (3)    015270  104406                                                  TRAP    C$CLP1
015272  023727  003402  000003  4$:     CMP     RLTYP,#RLV12X
015300  001016                          BNE     5$
015302  012737  000074  003432          MOV     #74,GDDAT       ; SET EXPECTED BAE.
015310  017737  166020  003434          MOV     @RLBAE,BDDAT    ; READ IT.
015316  023737  003432  003434          CMP     GDDAT,BDDAT
015324  001404                          BEQ     5$              ; BR IF BAE UNCHANGED.
015326                                  DFERR   EM77A,ERR2      ; DA MODIFIED BAE.
 (5)    015326  104455                                                  TRAP    C$ERDF
 (6)    015330  000176                                                  .WORD   126
 (6)    015332  034077                                                  .WORD   EM77A
 (6)    015334  026272                                                  .WORD   ERR2
```

```
 1691  015336                          5$:     ENDTST
  (3)  015336                                                  L10033:
  (3)  015336  104401                                                 TRAP    C$ETST
```

```
                                .SBTTL   18    UNIQUENESS OF RLMP.

                                STARS
                                ;;*****************************************************************
                                ;TEST THE UNIQUENESS OF THE MULTI PURPOSE REGISTER
                                ;WE WILL WRITE THE RLCS, RLBA, AND THE RLDA, THEN THE
                                ;RLMP IS WRITTEN. WE THEN GO BACK AN VERIFY THE CONTENTS
                                ;OF THE RLCS, RLBA, RLDA.
                                ; IF RLV12, INCLUDE THE RLBAE ALSO.
                                STARS
                                ;;*****************************************************************
                                        BEGIN.TEST
                                                                                        T18::
015340  012737  000200  003432          MOV     #CRDY,GDDAT     ;CONTROLLER READY
015346  032777  040000  165750          BIT     #DERR,@RLCS     ;IF DRIVE ERROR IS SET...
015354  001403                        BEQ     1$
015356  052737  140000  003432          BIS     #ERR!DERR,GDDAT ;...EXPECT IT BACK LATER.
015364  013777  003432  165732  1$:     MOV     GDDAT,@RLCS     ;LOAD CS
015372  012777  177776  165726          MOV     #-2,@RLBA       ;LOAD BA WITH ALL 1'S
015400  012777  177777  165722          MOV     #-1,@RLDA       ;LOAD RLDA
015406  023727  003402  000003          CMP     RLTYP,#RLV12X
015414  001003                        BNE     2$
015416  012777  000074  165710          MOV     #74,@RLBAE      ;LOAD RLBAE.
015424  005077  165702          2$:     CLR     @RLMP           ;WRITE TO RLMP
015430  017737  165670  003434          MOV     @RLCS,BDDAT     ;READ RLCS
015436  042737  000001  003434          BIC     #DRDY,BDDAT     ;IGNORE DRIVE READY
015444  023737  003432  003434          CMP     GDDAT,BDDAT
015452  001405                        BEQ     3$              ; BR IF CS OK.
015454                                  DFERR   EM44,ERR2       ;MP MODIFIED CS
                                                                                TRAP    C$ERDF
015454  104455                                                                  .WORD   127
015456  000177                                                                  .WORD   EM44
015460  032405                                                                  .WORD   ERR2
015462  026272
                                        CKLOOP
015464                                                                          TRAP    C$CLP1
015464  104406
015466  012737  177776  003432  3$:     MOV     #-2,GDDAT       ; SET EXPECTED BA.
015474  017737  165626  003434          MOV     @RLBA,BDDAT     ; READ IT.
015502  023737  003432  003434          CMP     GDDAT,BDDAT
015510  001405                        BEQ     4$              ; BR IF BA OK.
015512                                  DFERR   EM45,ERR2       ;MP MODIFIED BA
                                                                                TRAP    C$ERDF
015512  104455                                                                  .WORD   128
015514  000200                                                                  .WORD   EM45
015516  032440                                                                  .WORD   ERR2
015520  026272
                                        CKLOOP
015522                                                                          TRAP    C$CLP1
015522  104406
015524  012737  177777  003432  4$:     MOV     #-1,GDDAT       ; SET EXPECTED DA.
015532  017737  165572  003434          MOV     @RLDA,BDDAT     ; READ IT.
015540  023737  003432  003434          CMP     GDDAT,BDDAT
015546  001405                        BEQ     5$              ; BR IF DA OK.
015550                                  DFERR   EM46,ERR2       ;MP MODIFIED DA
                                                                                TRAP    C$ERDF
015550  104455                                                                  .WORD   129
015552  000201                                                                  .WORD   EM46
015554  032473                                                                  .WORD   ERR2
015556  026272
                                        CKLOOP
015560
```

```
 (3)  01556.   104406                                                                  TRAP    C$CLP1
1732  015562   023727  003402  000003  5$:    CMP     RLTYP,#RLV12X
1733  015570   001016                         BNE     6$
1734  015572   012737  000074  003432         MOV     #74,GDDAT        ; SET EXPECTED BAE.
1735  015600   017737  165530  003434         MOV     @RLBAE,BDDAT     ; READ IT.
1736  015606   023737  003432  003434         CMP     GDDAT,BDDAT
1737  015614   001404                         BEQ     6$               ; BR IF BAE OK.
1738  015616                                  DFERR   EM47,ERR2        ; MP MODIFIED BAE.
 (5)  015616   104455                                                                  TRAP    C$ERDF
 (6)  015620   000202                                                                  .WORD   130
 (6)  015622   032526                                                                  .WORD   EM47
 (6)  015624   026272                                                                  .WORD   ERR2
1739  015626                          6$:     ENDTST
 (3)  015626                                                                  L10034:
 (3)  015626   104401                                                                  TRAP    C$ETST
```

```
                                        .SBTTL   19 -- UNIQUENESS OF RLBAE (RLV12 ONLY).

                                        STARS
                                        ;;*****************************************************************
                                        ;TEST THAT WRITING TO THE RLBAE HAS NO AFFECT ON
                                        ;THE RLBA AND RLDA REGISTERS.  THE RLCS REGISTER WILL
                                        ;BE AFFECTED, BUT ONLY IN THE EXTENDED ADDRESS BITS <5:4>,
                                        ;WHICH SHOULD MIRROR RLBAE<1:0>.
                                        STARS
                                        ;;*****************************************************************
                                                BEGIN.TEST
                                                                                                T19::
015630  023727  003402  000003          CMP     RLTYP,#RLV12X   ; RLV12 WITH BAE ??
015636  001071                          BNE     4$              ; EXIT IF NOT.
015640  012737  000200  003432          MOV     #CRDY,GDDAT     ;CONTROLLER READY
015646  032777  040000  165450          BIT     #DERR,@RLCS     ;IF DRIVE ERROR IS SET...
015654  001403                          BEQ     1$
015656  052737  140000  003432          BIS     #ERR!DERR,GDDAT ;...EXPECT IT BACK LATER.
015664  013777  003432  165432  1$:     MOV     CDDAT,@RLCS     ;LOAD CS, NOTE THAT <5:4> = 0
015672  005077  165430                  CLR     @RLBA           ; 0 => BA
015676  005077  165426                  CLR     @RLDA           ; 0 => DA
015702  012777  000077  165424          MOV     #77,@RLBAE      ; WRITE TO RLBAE.
015710  052737  000060  003432          BIS     #60,GDDAT       ; SET EXPECTED CS.
015716  017737  165402  003434          MOV     @RLCS,BDDAT     ; READ IT.
015724  042737  000001  003434          BIC     #DRDY,BDDAT     ; IGNORE DRIVE READY BIT.
015732  023737  003432  003434          CMP     GDDAT,BDDAT
015740  001405                          BEQ     2$              ; BR IF CS IS RIGHT.
015742                                  DFERR   EM50,ERR2       ; CS WRONG AFTER WRITING BAE.
                                                                                        TRAP    C$ERDF
                                                                                        .WORD   131
                                                                                        .WORD   EM50
                                                                                        .WORD   ERR2
                                        CKLOOP
                                                                                        TRAP    C$CLP1
015754  005037  003432          2$:     CLR     GDDAT           ; EXPECT ZERO ON THE REST.
015760  017737  165342  003434          MOV     @RLBA,BDDAT     ; READ BA
015766  001405                          BEQ     3$              ; BR IF UNAFFECTED.
015770                                  DFERR   EM51,ERR2       ; BAE MODIFIED BA.
                                                                                        TRAP    C$ERDF
                                                                                        .WORD   132
                                                                                        .WORD   EM51
                                                                                        .WORD   ERR2
                                        CKLOOP
                                                                                        TRAP    C$CLP1
016002  017737  165322  003434  3$:     MOV     @RLDA,BDDAT     ; READ DA.
016010  001404                          BEQ     4$              ; BR IF UNAFFECTED.
016012                                  DFERR   EM52,ERR2       ; BAE MODIFIED DA.
                                                                                        TRAP    C$ERDF
                                                                                        .WORD   133
                                                                                        .WORD   EM52
                                                                                        .WORD   ERR2
016022                          4$:     ENDTST
                                                                                L10035:
                                                                                        TRAP    C$ETST
```

```
                                .SBTTL   20  - FUNCTION CODE 0, NOP (RL11), OR MAINT (RLV11/12).

                                STARS
                                ;;*****************************************************************
                                ; TEST FUNCTION CODE 0.
                                ; IF RL11 -- NOP.  EXPECT CS<13:10> CLEAR, OTHER REGISTERS UNAFFECTED.
                                ; IF RLVXX -- MAINT.  SETUP IN NORMAL FASHION, BUT ONLY CHECK FOR
                                ;             FUNCTION COMPLETE (NO ERRORS AND DA = INITIAL DA+6).
                                ;             WE'LL CHECK THE REST OF THE MAINT FUNCTION LATER.
                                ;
                                STARS
                                ;;*****************************************************************
                                        BEGIN.TEST
                                                                                        T20::
                                ;
                                ; INITIAL SETUP ASSUMES THAT WE HAVE AN RLV.
                                ; IF NOT -- NOT TO WORRY -- IT SHOULD JUST NO-OP.
                                ; ALL WE CARE ABOUT IS THAT WE GET NO ERRORS (OR HUNG RL).
                                ;
016024  004537  010760          1$:     JSR     R5,CALCRC       ; MAKE A CRC EVEN THO WE WON'T CHECK IT.
016030  000000                          .WORD   0               ; THIS WILL BE THE INITIAL DA WORD.
016032  004537  010254                  JSR     R5,LDFUN        ; LOAD UP THE FUNCTION.
016036  000000  177001                  0,  511.                ; FUNCTION 0, WC -511.
016042  004537  010704                  JSR     R5,WTCRDY       ; WAIT FOR CONTROLLER.
016046  023727  003402  000000          CMP     RLTYP,#RL11     ; NOW ARE WE RL11 ??
016054  001045                          BNE     6$              ;CHECK "MAINT" FINAL STATE IF NOT.
                                ;
                                ; RL11 -- CHECK FOR ERRORS AFTER THE NO OP.
                                ;
                                ;LWL0i 2$:      CLR     B.MP            ; MPR WILL BE 0.
016056  013737  003350  003432  2$:     MOV     B.CS,GDDAT      ; EXPECT "NO-OP" SHOULD HAVE...
016064  042737  036000  003432          BIC     #036000,GDDAT   ;...CLEARED ANY ERROR BITS <13:10>...
016072  013737  003364  003434          MOV     E.CS,BDDAT      ;...THAT MIGHT HAVE BEEN ON.
016100  023737  003432  003434          CMP     GDDAT,BDDAT     ; IS THAT WHAT WE HAVE ??
016106  001405                          BEQ     3$              ; YES.
016110                                  DFERR   EM14,ERR2       ; CS WRONG AFTER NOP.
                                                                                TRAP    C$ERDF
016110  104455                                                                  .WORD   134
016112  000206                                                                  .WORD   EM14
016114  031457                                                                  .WORD   ERR2
016116  026272
                                        CKLOOP
016120                                                                          TRAP    C$CLP1
016120  104406
016122  023737  003366  003352  3$:     CMP     E.BA,B.BA       ; BA UNALTERED ??
016130  001010                          BNE     4$
016132  023737  003370  003354          CMP     E.DA B.DA       ; DA UNALTERED ??
016140  001004                          BNE     4$
016142  023737  003372  003356          CMP     E.MP,B.MP       ; MP UNALTERED ??
016150  001405                          BEQ     5$              ; EXIT IF ALL THREE WERE OK.
016152                          4$:     DFERR   EM14A,ERR0      ; REGISTERS ALTERED BY NOP.
                                                                                TRAP    C$ERDF
016152  104455                                                                  .WORD   135
016154  000207                                                                  .WORD   EM14A
016156  031512                                                                  .WORD   ERR0
016160  026236
                                        CKLOOP
016162                                                                          TRAP    C$CLP1
016162  104406
                                5$:     EXIT    TST             ; RL NOP TEST DONE.
016164                                                                          TRAP    C$EXIT
016164  104432
```

```
  (3)  016166  000042                                                                    .WORD   L10036 .
1819                                    ;
1820                                    ; RLV11 OR 12 -- CHECK SEQUENCER STATE AFTER INTERNAL DIAGNOSTIC.
1821                                    ;
1822  016170  013737  003370  003434  6$:     MOV     E.DA,BDDAT      ; GET FINAL SEQUENCER STATE.
1823  016176  023727  003434  000C06          CMP     BDDAT,#6        ; FINAL STATE RIGHT ??
1824  016204  001004                          BNE     7$              ;NO, ERROR.
1825  016206  032737  002000  003364          BIT     #OPI,E.CS       ; YES, OPI SHOULD BE CLEAR.
1826  016214  001405                          BEQ     8$              ; IF IT IS, WE'RE FAT !!
1827  016216                          7$:     DFERR   EM14B,ERR3      ; MAINT FAILURE, DA = SEQUENCER STATE.
                                                                                       TRAP    C$ERDF
  (5)  016216  104455                                                                  .WORD   136
  (6)  016220  000210                                                                  .WORD   EM14B
  (6)  016222  031554                                                                  .WORD   ERR3
  (6)  016224  026326
1828  016226                                  CKLOOP
                                                                                       TRAP    C$CLP1
  (3)  016226  104406
1829  016230                          8$:     ENDTST
                                                                               L10036:
  (3)  016230                                                                          TRAP    C$ETST
  (3)  016230  104401
```

```
 1831                                   .SBTTL   21 -- TEST INTERRUPT ON FUNCTION (0) COMPLETE.
 1832
 1833  016232                           STARS
  (2)                                   ;;*****************************************************************
 1834                                   ;TEST THAT THE RL CAN INTERRUPT THE CPU.
 1835                                   ;WE'LL SET CPU PRIORITY AT 0, AND EXECUTE NOP/MAINT, AS BEFORE.
 1836                                   ;THE INTERRUPT SERVICE DOES NOTHING BUT SET A FLAG.
 1837                                   ;WE'LL WAIT 800 MSEC FOR THAT FLAG, BEFORE DECLARING AN ERROR.
 1838                                   ;WRONG VECTORS UNDER 1000 ARE TRAPPED BY THE DRS.
 1839                                   ;WRONG VECTORS ABOVE 1000 ARE BIG TROUBLE !!!!
 1840  016232                           STARS
  (2)                                   ;;*****************************************************************
 1841  016232                                   BEGIN.TEST
  (4)  016232                                                                      T21::
 1842  016232  005037  010700                   CLR     INTFLG          ;CLEAR INTERRUPT FLAG
 1843  016236                                   SETPRI  #PRI00          ;SET PSW TO 0
  (3)  016236  012700  000000                                                              MOV     #PRI00,R0
  (3)  016242  104441                                                                      TRAP    C$SPRI
 1844  016244  004537  010760                   JSR     R5,CALCRC       ; AGAIN, CRC WON'T BE CHECKED.
 1845  016250  000000                           .WORD   0
 1846  016252  004537  010254                   JSR     R5,LDFUN        ; LOAD UP AND EXECUTE...
 1847  016256  000100  177001                   INTEN!0.  511.          ; NOP/MAINT AND INTERRUPT.
 1848  016262  004537  010704                   JSR     R5,WTCRDY       ;WAIT FOR CONTROLLER READY.
 1849  016266  005737  010700                   TST     INTFLG          ;DID INTERRUPT OCCUR ??
 1850  016272  001006                           BNE     1$              ; BR IF SO.
 1851  016274  005037  003424                   CLR     TMP0            ; CPU LEVEL FOR ERROR MSG.
 1852  016300                                   DFERR   EM15,ERR7       ; INTERRUPT NOT REC'D.
  (5)  016300  104455                                                                      TRAP    C$ERDF
  (6)  016302  000211                                                                      .WORD   137
  (6)  016304  031616                                                                      .WORD   EM15
  (6)  016306  026442                                                                      .WORD   ERR7
 1853  016310                           1$:     SETPRI  #PRI07
  (3)  016310  012700  000340                                                              MOV     #PRI07,R0
  (3)  016314  104441                                                                      TRAP    C$SPRI
 1854  016316                                   ENDTST
  (3)  016316                                                                      L10037:
  (3)  016316  104401                                                                      TRAP    C$ETST
```

```
                                .SBTTL   22 -- TEST INTERRUPT PRIORITY BR LEVEL.

                                STARS
                                ;;*****************************************************************
                                ;TEST THAT PRIORITY GIVEN IS ACTUAL PRIORITY OF CONTROLLER.
                                ;WE ALREADY KNOW THAT THE CONTROLLER CAN INTERRUPT.  WE'LL START
                                ;AT CPU LEVEL 7 AND WORK DOWN 'TIL THE INTERRUPT COMES IN.
                                ; AS BEFORE, WE'RE USING THE NOP/MAINT FUNCTION.
                                ; NOTE THAT RLV11 IS FIXED AT BR4, RL11 AND RLV12 ARE PROGRAMABLE
                                ; AND DEFAULT TO BR5.  LOC "BPRIOR" IS PROPERLY SET AT INIT TIME.
                                STARS
                                ;;*****************************************************************
                                        BEGIN.TEST
                                                                                        T22::
1867  016320  012737  000340  003434        MOV     #PRI07,BDDAT    ;SET UP INITIAL OF 7
1868  016326  012737  000007  003424        MOV     #7,TMP0         ; A COPY FOR ERROR MSG.
1869  016334  013737  003340  003432        MOV     BPRIOR,GDDAT    ;GET GIVEN PRIORITY
1870  016342                                BGNSEG                  ; **** START SEGMENT ****
 (3)  016342  104404                                                                    TRAP    C$BSEG
1871  016344                          1$:   SETPRI  BDDAT           ; SET CURRENT PRIORITY...
 (3)  016344  013700  003434                                                            MOV     BDDAT,R0
 (3)  016350  104441                                                                    TRAP    C$SPRI
1872  016352  005037  010700                CLR     INTFLG          ;...AND CLEAR INTERRUPT FLAG.
1873  016356  004537  010760                JSR     R5,CALCRC       ; JUST LIKE BEFORE.
1874  016362  000000                        .WORD   0
1875  016364  004537  010254                JSR     R5,LDFUN        ; LOAD AND EXECUTE...
1876  016370  000100  177001                INTEN!0, -511.          ;...NOP/MAINT AND INTERRUPT.
1877  016374  004537  010704                JSR     R5,WTCRDY       ;WAIT FOR CONTROLLER READY.
1878  016400  023737  003434  003432        CMP     BDDAT,GDDAT     ;SHOULD IT INTERRUPT
1879  016406  002004                        BGE     2$              ; BR IF NOT.
1880  016410  005737  010700                TST     INTFLG          ; DID IT INTERRUPT ??
1881  016414  001011                        BNE     4$              ; PROCEED IF SO.
1882  016416  000403                        BR      3$              ; NO, ERROR.
1883  016420  005737  010700          2$:   TST     INTFLG          ; DID IT INTERRUPT ??
1884  016424  001405                        BEQ     4$              ; PROCEED IF NOT.
1885  016426                          3$:   DFERR   EM16,ERR7       ; INTERRUPT PRIORITY FAILURE.
                                                                                        TRAP    C$ERDF
 (5)  016426  104455                                                                    .WORD   138
 (6)  016430  000212                                                                    .WORD   EM16
 (6)  016432  031660                                                                    .WORD   ERR7
 (6)  016434  026442
1886  016436                                CKLOOP                                    TRAP    C$CLP1
 (3)  016436  104406
1887  016440  162737  000040  003434  4$:   SUB     #40,BDDAT       ;LOWER CPU PRIORITY...
1888  016446  005337  003424                DEC     TMP0            ;...TO NEXT LEVEL.
1889  016452  100334                        BPL     1$
1890  016454                                ENDSEG                                10000$:
 (3)  016454                                                                            TRAP    C$ESEG
 (3)  016454  104405
1891  016456                                SETPRI  #PRI07                            MOV     #PRI07,R0
 (3)  016456  012700  000340                                                            TRAP    C$SPRI
 (3)  016462  104441
1892  016464                                ENDTST                                L10040:
 (3)  016464                                                                            TRAP    C$ETST
 (3)  016464  104401
```

```
                                        .SBTTL   23 -  RLV11/12 MAINTENANCE, FORCED OPI (WC <> 511.)

                                        STARS
                                        ;;*****************************************************************
                                        ;EXECUTE MAINTENANCE MODE WITH AN INCORRECT INITIAL WORD COUNT.
                                        ;FIRST PASS WC < 510. AND SECOND PASS WC > 511.  BOTH CASES SHOULD
                                        ;FORCE OPI ERRORS. THE TEST SHOULD FORCE COMPOSITE ERROR(BIT 15),
                                        ;HEADER NOT FOUND(BIT12) AND OPI(BIT 10). DRIVE ERROR IS IGNORED.
                                        STARS
                                        ;;*****************************************************************
                                                BEGIN.TEST
                                                                                                T23::
                                        ;*
                                        ;* NOTE: IF CONTROLLER TYPE IS RL11, YOU HAVE END-PASS AT THIS POINT.
                                        ;* ALL REMAINING TESTS ARE UNIQUE TO RLV11 AND/OR RLV12.
                                        ;*
016466  004537  010760                  1$:     JSR     R5,CALCRC       ;DO CRC CALCULATION FOR...
016472  000000                                  .WORD   0               ;...INITIAL DA OF ZERO.
016474  012737  177003  016524                  MOV     #-509.,3$       ; 1ST WC < 510.
016502  112737  000074  032323                  MOVB    #'<,EM27X       ; ADJUST ERROR TEXT.
016510  112737  000060  032327                  MOVB    #'0,EM27X+4
016516  004537  010254                  2$:     JSR     R5,LDFUN        ;PERFORM MAINT FUNCTION
016522  000000                                  MAINT
016524  177003                          3$:     -509.                   ; TEST WORD COUNT.
016526  004537  010704                          JSR     R5,WTCRDY
016532  012700  112000                          MOV     #ERR!HNF!OPI,R0 ;EXPECT AT LEAST THESE ERRORS.
016536  043700  003364                          BIC     E.CS,R0
016542  001410                                  BEQ     4$              ; EXIT IF WE'RE OK.
016544  004537  007554                          JSR     R5,GETERR       ; OTHERWISE, GET THEM ALL...
016550  000240                                  NOP                     ;...NONE IS EQUALLY BAD NEWS.
016552                                          DFERR   EM27,ERR10      ; STATUS INCORRECT, WC <> 511.
                                                                                        TRAP    C$ERDF
016552  104455                                                                          .WORD   139
016554  000213                                                                          .WORD   EM27
016556  032223                                                                          .WORD   ERR10
016560  026472
                                        CKLOOP
016562                                                                                  TRAP    C$CLP1
016562  104406
016564  023727  016524  177000  4$:     CMP     3$,#-512.       ; 2ND PASS ??
016572  001412                          BEQ     5$              ; WE'RE DONE IF SO.
016574  012737  177000  016524          MOV     #-512.,3$       ; OTHERWISE, SET WC > 511.
016602  112737  000076  032323          MOVB    #'>,EM27X       ; ADJUST ERROR TEXT.
016610  112737  000061  032327          MOVB    #'1,EM27X+4
016616  000737                          BR      2$              ; AND GO 'ROUND.
016620                                  5$:     ENDTST
                                                                                L10041:
016620                                                                          TRAP    C$ETST
016620  104401
```

```
                        .SBTTL   24 -- RLV11/12 MAINTENANCE, FORCED OPI INTERRUPT.

                        STARS
                        ;;*****************************************************************
                        ;PERFORM TEST OF INTERRUPT BY ISSUING RLV11 MAINTENANCE FUNCTION
                        ;WITH A WORD COUNT OF -509. TO FORCE AN OPI ERROR.
                        ;CHECK THAT INTERRUPT OCCURS, REPORT ERROR IF NOT.
                        STARS
                        ;;*****************************************************************
                                BEGIN.TEST
                                                                                T24::
016622 004537 010760    1$:     JSR     R5,CALCRC       ;CALCULATE CRC FOR...
016626 000000                   .WORD   0               ;...INITIAL DA OF ZERO.
                                SETPRI  #PRI00          ;SET PRIORITY TO ZERO
                                                                        MOV     #PRI00,R0
016630 012700 000000                                                    TRAP    C$SPRI
016634 104441
016636 005037 010700            CLR     INTFLG          ;CLEAR INT. FLAG
016642 004537 010254            JSR     R5,LDFUN
016646 000100 177003            MAINT!INTEN, -509.      ; INVALID WC TO FORCE OPI ERROR.
016652 004537 010704            JSR     R5,WTCRDY       ;WAIT FOR READY
016656 005737 010700            TST     INTFLG          ; DID IT INTERRUPT ??
016662 001005                   BNE     4$              ; YES, THAT'S ALL.
                                DFERR   EM17,ERR0       ; NO INTERRUPT RECEIVED.
                                                                        TRAP    C$ERDF
                                                                        .WORD   140
                                                                        .WORD   EM17
                                                                        .WORD   ERR0
                                CKLOOP
                                                                        TRAP    C$CLP1
                        4$:     SETPRI  #PRI07
                                                                        MOV     #PRI07,R0
016676 012700 000340                                                    TRAP    C$SPRI
016702 104441
                                ENDTST
                                                                L10042:
                                                                        TRAP    C$ETST
```

```
                                .SBTTL   25  - RLV11/12 MAINTENANCE, OPI TIMING TEST.

                                STARS
                                ;;*****************************************************************
                                ;NOTE: THE SOFT TIMFR EMPLOYED HERE IS CALIBRATED FOR LSI'S ONLY.
                                ;      IF THE CPU TYPE IS UNKNOWN (NOT LSI), BYPASS THIS TEST.
                                ;
                                ;PERFORM RLV11 MAINTENANCE FUNCTION (0) IN FLAG MODE.
                                ;FORCE AN OPI TIMEOUT BY SETTING AN INVALID WORD COUNT.
                                ;MEASURE THE TIME UNTIL THE ERROR FLAG SETS AND COMPARE THAT
                                ;TIME AGAINST THE SPEC LIMITS (155 TO 650 MSEC).
                                ; NOTE: SINCE THE TIMING LOOP IS SO GROSS, WE'LL GIVE IT
                                ; A SECOND CHANCE BEFORE WE DECLARE AN ERROR.
                                STARS
                                ;;*****************************************************************
                                        BEGIN.TEST
                                                                                        T25::
016706  005737  003400                  TST     CPUTYP          ; LSI CPU ???
016712  100447                          BMI     5$              ; IF NOT, DON'T EVEN TRY !!!
016714  004537  010760          1$:     JSR     R5,CALCRC       ; MAKE CRC FOR ZERO.
016720  000000                          .WORD   0
016722  012704  000002                  MOV     #2,R4
016726  004537  010254          2$:     JSR     R5,LDFUN        ;PERFORM MAINT. FUNCTION
016732  000000  177003                  MAINT,  509.            ; MAINT WITH INVALID WC.
016736  004537  010704                  JSR     R5,WTCRDY       ; WAIT FOR DONE.
016742  012737  001440  003434          MOV     #800.,BDDAT     ; CALCULATE OPI TIME...
016750  166637  177774  003434          SUB      4(SP),BDDAT    ;...IN BDDAT.
016756  032777  002000  164340          BIT     #OPI,@RLCS      ; OPI ERROR ??
016764  001005                          BNE     3$              ; YES, CHECK TIMING.
016766                                  DFERR   EM31,ERR0       ; OPI FLAG NOT RECEIVED.
016766  104455                                                          TRAP    C$ERDF
016770  000215                                                          .WORD   141
016772  032332                                                          .WORD   EM31
016774  026236                                                          .WORD   ERR0
016776  000415                          BR      5$
017000  023737  003434  003450  3$:     CMP     BDDAT,OPIMX
017006  003004                          BGT     4$
017010  023737  003434  003446          CMP     BDDAT,OPIMN
017016  002005                          BGE     5$              ; OK IF TIME WITHIN LIMITS.
017020  077436                  4$:     SOB     R4,2$           ; TRY ONCE MORE.
017022                                  DFERR   EM32,ERR11      ;OPI TIMING INCORRECT
017022  104455                                                          TRAP    C$ERDF
017024  000216                                                          .WORD   142
017026  032360                                                          .WORD   EM32
017030  026522                                                          .WORD   ERR11
017032                          5$:     ENDTST
017032                                                          L10043:
017032  104401                                                          TRAP    C$ETST
```

```
                                .SBTTL   26 -- RLV11/12 MAINTENANCE, FIFO DMA AND CRC CHECK.

                                STARS
                                ;;*****************************************************************
                                ;PERFORM RLV11/12 MAINTENANCE FUNCTION 0 IN FLAG MODE AND CHECK
                                ;FOR PROPER INCREMENT OF THE DA AND BA REGISTERS. CHECK THE SERIAL
                                ;WRITE/READ DATA PATHS BY READING OUT OF THE FIFO VIA THE MP REGISTER
                                ;THE CRC OF DA+3 AND THE CRC OF CRC OF DA+4 AND COMPARING WITH EXPECTED
                                ;RESULTS. CHECK THE TRANSFER OF 255 WORDS FROM BUF1 MEMORY THROUGH THE
                                ;FIFO INTO BUF2 MEMORY FOR PROPER DATA.
                                ;CHECK THE PREVIOUSLY WRITTEN DATA IN THE LAST WORD+1 OF BUF2 FOR
                                ;A VALUE:123456 TO INSURE THAT THE TRANSFER WAS NOT MORE THAN 255 WORDS.
                                ;DMA 1 -  USES 28 DATA PATTERNS IN "PATCRC" AND "PATDAT".
                                ;DMA 2 -- USES COMPLIMENT OF THOSE DATA PATTERNS.
                                ;DMA 3 -  USES A RANDOM 256 WORD PATTERN.
                                STARS
                                ;;*****************************************************************
                                        BEGIN.TE,1
                                                                                        T26::

                                ;
                                ; SUBTEST 1    28 DIFFERENT DATA PATTERNS.
                                ;
                                DMA1:   BGNSUB
                                                                                        T26.1:
                                                                                                TRAP    C$BSUB
                                        MOV     #PATCRC,R4      ;SET TABLE POINTER.
                                1$:     MOV     72(R4),2$       ; GET TEST DATA...
                                        JSR     R5,SETPAT       ;...AND FILL THE BUFFER.
                                2$:     .WORD   0
                                        MOV     (R4)+,3$        ; GET DA TEST WORD...
                                        JSR     R5,CALCRC       ;...AND CALCULATE CRC'S.
                                3$:     .WORD   0
                                        JSR     PC,EXECUT       ; XCT MAINT MODE AND CHECK RESULTS.
                                        TST     (R4)            ; LAST PATTERN DONE ??
                                        BNE     1$              ; LOOP IF NOT.
                                        ENDSUB
                                                                                        L10045:
                                                                                                TRAP    C$ESUB
                                ;
                                ; SUBTEST 2 -- THE COMPLIMENT OF THE ABOVE 28 PATTERNS.
                                ;
                                DMA2:   BGNSUB
                                                                                        T26.2:
                                                                                                TRAP    C$BSUB
                                        MOV     #PATCRC,R4      ;RESET TABLE POINTER.
                                1$:     MOV     72(R4),2$
                                        JSR     R5,SETCMP       ; FILL WITH COMPLIMENT DATA.
                                2$:     .WORD   0
                                        MOV     (R4)+,3$
                                        JSR     R5,CALCRC       ; CALCULATE CRC'S.
                                3$:     .WORD   0
                                        JSR     PC,EXECUT       ; XCT
                                        TST     (R4)            ; LAST ONE DONE ??
                                        BNE     1$              ; LOOP IF NOT.
                                        ENDSUB
                                                                                        L10046:
```

```
 (3)  017146  104403                                                                    TRAP    C$ESUB
2036                                ;
2037                                ; SUBTEST 3    ONE RANDOM DATA PATTERN.
2038                                ;
2039  017150                        DMA3:   BGNSUB                                    T26 3:
 (3)  017150                                                                          TRAP    C$BSUB
 (3)  017150  104402
2040  017152  004537  010516                JSR     R5,SETRAN       ;FILL BUFFER WITH RANDOM DATA.
2041  017156  013737  003456  017170        MOV     TEMLO,1$        ; USE TEMLO FOR THE CRC WORD.
2042  017164  004537  010760                JSR     R5,CALCRC       ; CALCULATE CRC'S
2043  017170  000000                1$:     .WORD   0
2044  017172  004737  017204                JSR     PC,EXECUT       ; XCT
2045  017176                                ENDSUB                                    L10047:
 (3)  017176                                                                          TRAP    C$ESUB
 (3)  017176  104403
2046  017200                                EXIT    TST             ; ALL DONE.
 (3)  017200  104432                                                                  TRAP    C$EXIT
 (3)  017202  000530                                                                  .WORD   L10044 .
2047                                ;
2048                                ; THIS SUBROUTINE EXECUTES THE FUNCTION AND VERIFIES RESULTS.
2049                                ;
2050  017204                        EXECUT: BGNSEG                  ; *** SET LOOP SEGMENT ***
 (3)  017204  104404                                                                  TRAP    C$BSEG
2051  017206  004537  010254                JSR     R5,LDFUN        ;PERFORM MAINT. FUNCTION
2052  017212  000000  177001                MAINT, -511.
2053  017216  004537  010704                JSR     R5,WTCRDY       ;WAIT FOR READY
2054  017222  004537  007554                JSR     R5,GETERR       ;CHECK CONTROLLER FOR ERRORS
2055  017226  000405                        BR      11$             ; BR IF NONE.
2056  017230                                DFERR   EM98,ERR6       ;UNEXPECTED CONTROLLER ERRORS.
 (5)  017230  104455                                                                  TRAP    C$ERDF
 (6)  017232  000217                                                                  .WORD   143
 (6)  017234  034421                                                                  .WORD   EM98
 (6)  017236  026412                                                                  .WORD   ERR6
2057  017240                                CKLOOP
 (3)  017240  104406                                                                  TRAP    C$CLP1
2058  017242  032737  022000  003364  11$:   BIT     #OPI!NXM,E.CS   ; OPI OR NXM ??
2059  017250  001402                        BEQ     12$             ; PROCEED IF NOT.
2060  017252                                EXIT    SEG             ; YES, DON'T BOTHER WITH ANY MORE.
 (3)  017252  104432                                                                  TRAP    C$EXIT
 (3)  017254  000452                                                                  .WORD   10000$ .
2061  017256  012737  006364  003432  12$:   MOV     #BUFEND-2,GDDAT
2062  017264  013737  003366  003434        MOV     E.BA,BDDAT
2063  017272  023737  003432  003434        CMP     GDDAT,BDDAT     ;FINAL BA CORRECT ??
2064  017300  001405                        BEQ     1$
2065  017302                                DFERR   EM10,ERR4       ;FINAL BA INCORRECT.
 (5)  017302  104455                                                                  TRAP    C$ERDF
 (6)  017304  000220                                                                  .WORD   144
 (6)  017306  031355                                                                  .WORD   EM10
 (6)  017310  026356                                                                  .WORD   ERR4
2066  017312                                CKLOOP
 (3)  017312  104406                                                                  TRAP    C$CLP1
2067  017314  013737  003354  003432  1$:    MOV     B.DA,GDDAT      ;GET BEFORE DA REGISTER
2068  017322  013737  003370  003434        MOV     E.DA,BDDAT
2069  017330  005037  003424                CLR     TMP0
2070  017334  113737  003354  003424        MOVB    B.DA,TMP0
2071  017342  062737  000006  003424        ADD     #6,TMP0         ;+6 TO DA LOW BYTE
```

```
 2072  017350  113737  003424  003432        MOVB    TMP0,GDDAT      ;STORE LOW BYTE OF DA
 2073  017356  023737  003432  003434        CMP     GDDAT,BDDAT     ; FINAL DA CORRECT ??
 2074  017364  001405                        BEQ     2$
 2075  017366                                DFERR   EM12,ERR4       ; FINAL DA INCORRECT.
   (5) 017366  104455                                                        TRAP    C$ERDF
   (6) 017370  000221                                                        .WORD   145
   (6) 017372  031416                                                        .WORD   EM12
   (6) 017374  026356                                                        .WORD   ERR4
 2076  017376                                CKLOOP                          TRAP    C$CLP1
   (3) 017376  104406
 2077  017400  013737  003442  003432  2$:   MOV     GDCRC3,GDDAT    ;GET EXPECTED CRC OF DA+3 VALUE
 2078  017406  013737  003372  003434        MOV     E.MP,BDDAT      ;GET CONTROLLER CRC OF DA+3
 2079  017414  023737  003432  003434        CMP     GDDAT,BDDAT
 2080  017422  001405                        BEQ     3$
 2081  017424                                DFERR   EM20,ERR4       ;CRC DA+3 INCORRECT.
   (5) 017424  104455                                                        TRAP    C$ERDF
   (6) 017426  000222                                                        .WORD   146
   (6) 017430  031760                                                        .WORD   EM20
   (6) 017432  026356                                                        .WORD   ERR4
 2082  017434                                CKLOOP                          TRAP    C$CLP1
   (3) 017434  104406
 2083  017436  013737  003444  003432  3$:   MOV     GDCRC4,GDDAT
 2084  017444  013737  003374  003434        MOV     E.MP1,BDDAT
 2085  017452  023737  003432  003434        CMP     GDDAT,BDDAT     ; DITTO CRC OF CRC OF DA+4.
 2086  017460  001405                        BEQ     4$
 2087  017462                                DFERR   EM21,ERR4       ;CRC OF CRC OF DA+4 INCORRECT.
   (5) 017462  104455                                                        TRAP    C$ERDF
   (6) 017464  000223                                                        .WORD   147
   (6) 017466  032031                                                        .WORD   EM21
   (6) 017470  026356                                                        .WORD   ERR4
 2088  017472                                CKLOOP                          TRAP    C$CLP1
   (3) 017472  104406
 2089  017474  005037  003430        4$:     CLR     TMP2            ;CLEAR BAD WORD COUNTER
 2090  017500  012703  004366                MOV     #BUF1,R3        ;GOOD DATA STORED IN BUF1
 2091  017504  012702  005366                MOV     #BUF2,R2        ;DATA BUFFER WRITTEN INTO BY MAINT.
 2092  017510  005001                        CLR     R1              ; WORD COUNT.
 2093  017512  011337  003432        5$:     MOV     (R3),GDDAT      ;EXPECTED DATA
 2094  017516  011237  003434                MOV     (R2),BDDAT      ;GET DATA FROM BUFFER
 2095  017522  023737  003432  003434        CMP     GDDAT,BDDAT
 2096  017530  001436                        BEQ     7$              ;BR IF DATA IS RIGHT.
 2097  017532  010237  003424                MOV     R2,TMP0         ; GET ERROR ADDRESS...
 2098  017536  010137  003426                MOV     R1,TMP1         ; ..AND WORD NUMBER.
 2099  017542  005737  003430                TST     TMP2            ; 1ST ERROR ENCOUNTERED ??
 2100  017546  001004                        BNE     6$              ;NO, SKIP THE ERROR HEADER.
 2101  017550                                DFERR   EM22,ERR0       ;ERROR MESSAGE ON 1ST ERROR...
   (5) 017550  104455                                                        TRAP    C$ERDF
   (6) 017552  000224                                                        .WORD   148
   (6) 017554  032111                                                        .WORD   EM22
   (6) 017556  026236                                                        .WORD   ERR0
 2102  017560  005237  003430        6$:     INC     TMP2            ;...FOLLOWED BY FAILING DATA.
 2103  017564                                PRINTX  #FRMT14,TMP1,TMP0,GDDAT,BDDAT
  (11) 017564  013746  003434                                                MOV     BDDAT,-(SP)
  (10) 017570  013746  003432                                                MOV     GDDAT,(SP)
   (9) 017574  013746  003424                                                MOV     TMP0,-(SP)
   (8) 017600  013746  003426                                                MOV     TMP1,-(SP)
   (7) 017604  012746  030103                                                MOV     #FRMT14,(SP)
```

```
                                                                                                                MOV     #5, (SP)
                                                                                                                MOV     SP,R0
                                                                                                                TRAP    C$PNTX
                                                                                                                ADD     #14,SP
                                        CKLOOP                                                                  TRAP    C$CLP1
                                7$:     TST     (R2)+           ;INCREMENT BUFFER POINTERS.
                                        TST     (R3)+
                                        INC     R1              ;AND THE WORD COUNT.
                                        CMP     R1,#255.        ; DONE ALL WORDS ??
                                        BLT     5$              ; NOT YET, CONTINUE.
                                        TST     TMP2            ; YES, ANY ERRORS LOGGED ??
                                        BEQ     8$              ;NO.
                                        PRINTB  #FRMT15,TMP2    ;YES, PRINT SUMMARY.
                                                                                                                MOV     TMP2,-(SP)
                                                                                                                MOV     #FRMT15,-(SP)
                                                                                                                MOV     #2,-(SP)
                                                                                                                MOV     SP,R0
                                                                                                                TRAP    C$PNTB
                                                                                                                ADD     #6,SP
                                8$:     MOV     #123456,GDDAT   ;EXPECTED DATA IN LAST WORD+1
                                        MOV     (R2),BDDAT      ;GET LAST WORD+1 FROM BUF2
                                        CMP     GDDAT,BDDAT
                                        BEQ     9$
                                        DFERR   EM23,ERR4       ; LAST+1 INCORRECT.
                                                                                                                TRAP    C$ERDF
                                                                                                                .WORD   149
                                                                                                                .WORD   EM23
                                                                                                                .WORD   ERR4
                                9$:     ENDSEG                                                          10000$:
                                                                                                                TRAP    C$ESEG
                                        RTS     PC              ; RETURN.

                                10$:    ENDTST                                                          L10044:
                                                                                                                TRAP    C$ETST
```

```
                        .SBTTL   27 -- RLV11/12 MAINTENANCE, FIFO ADDRESSING.

                        STARS
                        ;;*****************************************************************
                        ;TEST THAT FIFO OPERATES CORRECTLY.  STORE ADDRESS PATTERN
                        ;IN BUF1 (0 255) THAT CONTAINS A UNIQUE PATTERN IN EACH LOCATION.
                        ;PERFORM MAINTENANCE FUNCTION AND TEST BUF2 FOR PROPER FIFO
                        ;ADDRESSING.  NOTE THAT CRC'S ARE NOT CHECKED IN THIS TEST.
                        ;REPEAT A SECOND TIME USING A COMPLIMENT ADDRESS PATTERN.
                        ; ALSO USE AND TEST FOR INTERRUPT ON MAINT DONE
                        STARS
                        ;;*****************************************************************
                                BEGIN.TEST
                                                                                T27::
                        ;
                        ; SUBTEST 1 -- FIFO ADDRESS PATTERN.
                        ;
017734                  FIFO1   BGNSUB
                                                                                T27.1:
                                                                                        TRAP    C$BSUB
017736  005001                  CLR     R1
017740  012702  000400          MOV     #256.,R2
017744  012703  004366          MOV     #BUF1,R3        ;SETUP TO STORE PATTERN IN BUF1
017750  010123          1$:     MOV     R1,(R3)+
017752  005201                  INC     R1              ;INC. PATTERN
017754  005302                  DEC     R2
017756  001374                  BNE     1$
017760  004737  020026          JSR     PC,XFIFO        ; EXECUTE AND CHECK FIFO DATA.
                                ENDSUB
                                                                                L10051:
                                                                                        TRAP    C$ESUB
                        ;
                        ; SUBTEST 2 -- FIFO COMPLIMENT ADDRESS PATTERN.
                        ;
                        FIFO2:  BGNSUB
                                                                                T27.2:
                                                                                        TRAP    C$BSUB
                                MOV     #-1,R1
                                MOV     #256.,R2
                                MOV     #BUF1,R3
                        1$:     MOV     R1,(R3)+        ; STORE COMPLIMENT ADDRESS PATTERN.
                                DEC     R1
                                DEC     R2
                                BNE     1$
                                JSR     PC,XFIFO        ; EXECUTE AND CHECK FIFO DATA.
                                ENDSUB
                                                                                L10052:
                                                                                        TRAP    C$ESUB
                                EXIT    TST             ; ALL DONE.
                                                                                        TRAP    C$EXIT
                                                                                        .WORD   L10050 .
                        ;
                        ; THIS SUBROUTINE EXECUTES THE MAINT FUNCTION AND TESTS RESULTS.
                        ;
                        XFIFO:  BGNSEG                  ;*** LOOP SEGMENT ***
                                                                                TRAP    C$BSEG
```

```
 2165  020030  012702  000400                    MOV     #256.,R2        ;SETUP TO CLEAR BUF2
 2166  020034  012703  005366                    MOV     #BUF2,R3
 2167  020040  005023                    1$:     CLR     (R3)+
 2168  020042  005302                            DEC     R2
 2169  020044  001375                            BNE     1$
 2170  020046  005037  010700                    CLR     INTFLG          ;CLEAR INT. FLAG
 2171  020052                                    SETPRI  #PRI00
   (3) 020052  012700  000000                                                    MOV     #PRI00,R0
   (3) 020056  104441                                                            TRAP    C$SPRI
 2172  020060  004537  010254                    JSR     R5,LDFUN        ;LOAD FUNCTION
 2173  020064  000100  177001                    MAINT!INTEN, -511.
 2174  020070  004537  010704                    JSR     R5,WTCRDY       ;WAIT FOR READY
 2175  020074  004537  007554                    JSR     R5,GETERR       ;CHECK CONTROLLER FOR ERRORS
 2176  020100  000405                            BR      2$              ; BR IF NONE.
 2177  020102                                    DFERR   EM98,ERR6       ;UNEXPECTED CONTROLLER ERRORS.
   (5) 020102  104455                                                            TRAP    C$ERDF
   (6) 020104  000226                                                            .WORD   150
   (6) 020106  034421                                                            .WORD   EM98
   (6) 020110  026412                                                            .WORD   ERR6
 2178  020112                                    CKLOOP
   (3) 020112  104406                                                            TRAP    C$CLP1
 2179  020114  032737  022000  003364  2$:      BIT     #OPI!NXM,E.CS   ; OPI OR NXM ??
 2180  020122  001110                            BNE     8$              ; QUIT IF SO.
 2181  020124  005737  010700                    TST     INTFLG          ;CHECK FOR INTERRUPT
 2182  020130  001005                            BNE     4$
 2183  020132                                    DFERR   EM15,ERR0       ; DIDN'T INTERRUPT.
   (5) 020132  104455                                                            TRAP    C$ERDF
   (6) 020134  000227                                                            .WORD   151
   (6) 020136  031616                                                            .WORD   EM15
   (6) 020140  026236                                                            .WORD   ERR0
 2184  020142                                    CKLOOP
   (3) 020142  104406                                                            TRAP    C$CLP1
 2185  020144  005037  003430            4$:     CLR     TMP2            ;CLEAR BAD WORD COUNTER
 2186  020150  012703  004366                    MOV     #BUF1,R3        ;GOOD DATA STORED IN BUF1
 2187  020154  012702  005366                    MOV     #BUF2,R2        ;DATA BUFFER WRITTEN INTO BY MAINT.
 2188  020160  005001                            CLR     R1              ; WORD COUNT.
 2189  020162  011337  003432            5$:     MOV     (R3),GDDAT      ;EXPECTED DATA
 2190  020166  011237  003434                    MOV     (R2),BDDAT      ;GET DATA FROM BUFFER
 2191  020172  023737  003432  003434            CMP     GDDAT,BDDAT
 2192  020200  001436                            BEQ     7$              ;BR IF DATA IS RIGHT.
 2193  020202  010237  003424                    MOV     R2,TMP0         ; GET ERROR ADDRESS...
 2194  020206  010137  003426                    MOV     R1,TMP1         ;...AND WORD NUMBER.
 2195  020212  005737  003430                    TST     TMP2            ; 1ST ERROR ENCOUNTERED ??
 2196  020216  001004                            BNE     6$              ;NO, SKIP THE ERROR HEADER.
 2197  020220                                    DFERR   EM22,ERR0       ;ERROR MESSAGE ON 1ST ERROR...
   (5) 020220  104455                                                            TRAP    C$ERDF
   (6) 020222  000230                                                            .WORD   152
   (6) 020224  032111                                                            .WORD   EM22
   (6) 020226  026236                                                            .WORD   ERR0
 2198  020230  005237  003430            6$:     INC     TMP2            ;...FOLLOWED BY FAILING DATA.
 2199  020234                                    PRINTX  #FRMT14,TMP1,TMP0,GDDAT,BDDAT
  (11) 020234  013746  003434                                                    MOV     BDDAT,(SP)
  (10) 020240  013746  003432                                                    MOV     GDDAT,-(SP)
   (9) 020244  013746  003424                                                    MOV     TMP0,-(SP)
   (8) 020250  013746  003426                                                    MOV     TMP1,-(SP)
   (7) 020254  012746  030103                                                    MOV     #FRMT14,(SP)
```

```
  (6)  020260  012746  000005                                                    MOV     #5,-(SP)
  (3)  020264  010600                                                            MOV     SP,R0
  (4)  020266  104415                                                            TRAP    C$PNTX
  (4)  020270  062706  000014                                                    ADD     #14,SP
 2200  020274                        CKLOOP
  (3)  020274  104406                                                            TRAP    C$CLP1
 2201  020276  005722        7$:     TST     (R2)+           ;INCREMENT BUFFER POINTERS.
 2202  020300  005723                TST     (R3)+
 2203  020302  005201                INC     R1              ;AND THE WORD COUNT.
 2204  020304  020127  000377        CMP     R1,#255.        ; DONE ALL WORDS ??
 2205  020310  002724                BLT     5$              ; NOT YET, CONTINUE.
 2206  020312  005737  003430        TST     TMP2            ; YES, ANY ERRORS LOGGED ??
 2207  020316  001412                BEQ     8$              ;NO.
 2208  020320                        PRINTB  #FRMT15,TMP2    ;YES, PRINT SUMMARY.
  (8)  020320  013746  003430                                                    MOV     TMP2,-(SP)
  (7)  020324  012746  030172                                                    MOV     #FRMT15,-(SP)
  (6)  020330  012746  000002                                                    MOV     #2,-(SP)
  (3)  020334  010600                                                            MOV     SP,R0
  (4)  020336  104414                                                            TRAP    C$PNTB
  (4)  020340  062706  000006                                                    ADD     #6,SP
 2209  020344        8$:     ENDSEG
  (3)  020344                                                            10000$:
  (3)  020344  104405                                                            TRAP    C$ESEG
 2210  020346                        SETPRI  #PRI07
  (3)  020346  012700  000340                                                    MOV     #PRI07,R0
  (3)  020352  104441                                                            TRAP    C$SPRI
 2211  020354  000207                RTS     PC              ; RETURN.
 2212
 2213  020356                        ENDTST
  (3)  020356                                                            L10050:
  (3)  020356  104401                                                            TRAP    C$ETST
```

```
                        .SBTTL   28 -- RLV11/12 MAINTENANCE, BANK 7 SELECT AND NEXM TEST.

020360                  STARS
                        ;;*****************************************************************
                        ;* FOR RLV12:
                        ;* TEST THAT BBS7 WILL SELECT THE I/O PAGE AND THAT ACCESS TO
                        ;* LOCATION 0 IN THAT PAGE WILL GENERATE NXM AND OPI ERRORS.
                        ;* NOTE -- IF BANK 7 IS NOT PROPERLY SELECTED, 1000 BYTES
                        ;*         STARTING AT XXXX1000 WILL PROBABLY GET CRUNCHED !!!!
                        ;* FOR RLV11:
                        ;* RLV11 DOESN'T ASSERT BBS7, SO WE'LL THIS TEST
                        ;* IF PHYSICAL MEMORY SIZE IS 124K OR GREATER.
020360                  STARS
                        ;;*****************************************************************
020360                          BEGIN.TEST
020360                                                                  T28::
020360  023727  003402  000001         CMP     RLTYP,#RLV11
020366  003006                         BGT     1$              ; EXECUTE ALWAYS ON RLV12...
020370  023727  011276  000174         CMP     .MSIZE,#124.
020376  002406                         BLT     2$              ;...AND ON RLV11 IF < 124KW.
020400                          EXIT    TST
020400  104432                                                          TRAP    C$EXIT
020402  000150                                                          .WORD   L10053 .
020404  112737  000054  034164  1$:    MOVB    #',,EM80X       ; ADJUST ERROR TEXT FOR RLV12...
020412  000402                         SKP2
020414  105037  034164          2$:    CLRB    EM80X           ;...OR FOR RLV11.
020420  004537  010760                 JSR     R5,CALCRC       ; DO CRC FOR INITIAL...
020424  000000                         .WORD   0               ;...DA OF 0.
020426  012737  160000  010416         MOV     #160000,BA16    ; POINT TO LOC 0 IN LAST 4K.
020434  012700  000003                 MOV     #3,R0           ; SET AN 18 BIT...
020440  023727  011304  000026         CMP     .ABUSW,#22
020446  001002                         BNE     3$
020450  012700  000077                 MOV     #77,R0          ;...OR 22 BIT EXTENSION.
020454  010037  010420          3$:    MOV     R0,BA22
020460  004537  010254                 JSR     R5,LDFUN        ; XCT MAINTENANCE...
020464  000000  177001                 MAINT,  -511.           ;...WITH VALID WORD COUNT.
020470  004537  010704          BB7:   JSR     R5,WTCRDY
020474  012700  120000                 MOV     #ERR!NXM,R0     ; EXPECT AT LEAST THESE ERRORS.
020500  043700  003364                 BIC     E.CS,R0
020504  001415                         BEQ     4$              ; EXIT IF WE'RE OK.
020506  004537  007554                 JSR     R5,GETERR       ; OTHERWISE, GET WHAT'S THERE.
020512  000240                         NOP
020514  013737  010420  003426         MOV     BA22,TMP1       ; AND GET PHYSICAL ADDRESS.
020522  013737  010416  003430         MOV     BA16,TMP2
020530                          DFERR   EM80,ERR12      ; BBS7 AND/OR NXM FAILURE.
020530  104455                                                          TRAP    C$ERDF
020532  000231                                                          .WORD   153
020534  034133                                                          .WORD   EM80
020536  026552                                                          .WORD   ERR12
020540  012737  004366  010416  4$:    MOV     #BUF1,BA16      ; RESET BA16 AND 22.
020546  005037  010420                 CLR     BA22
020552                          ENDTST
020552                                                          L10053:
020552  104401                                                          TRAP    C$ETST
```

```
                                .SBTTL   29 -- RLV11/12 MAINTENANCE, EXTENDED MEMORY ACCESS TEST.

                                STARS
                                ;;*****************************************************************
                                ;* BYPASS THIS TEST IF NO KT SUPPORT.
                                ;* OTHERWISE, MEMORY HAS ALREADY BEEN SIZED.
                                ;*PAR'S 0 TO 6 ARE MAPPED TO THE 1ST 28K, AND PAR7 TO THE I/O PAGE.
                                ;*
                                ;*NOW ACCESS EXTENDED MEMORY IN 4K INCREMENTS.  STORE A RANDOM DATA
                                ;*PATTERN IN BUF1 (RELOCATED).  EXECUTE MAINTENANCE MODE, AND CHECK
                                ;*BUF2 (RELOCATED) FOR CORRECT DATA TRANSFER.  ALSO CHECK THAT THE FINAL
                                ;*BUS ADDRESS INCREMENTED CORRECTLY (OVERFLOWING INTO THE BAE).
                                ;*WHEN THE END OF PHYSICAL MEMORY IS REACHED, A BUS-ERROR WILL OCCUR
                                ;*DURING THE BUFFER SET-UP PHASE AND WE'LL LOOK FOR A NXM ERROR AT
                                ;*THE SAME PHYSICAL ADDRESS.  CONTINUE UNTIL WE REACH THE I/O PAGE
                                ;*AT 760000 (18 BIT), OR 17760000 (22 BIT).
                                STARS
                                ;;*****************************************************************
 172350                         PAR4=   KIPAR0+10               ; USE KIPAR4 FOR ACCESSING.
                                        BEGIN.TEST
                                                                                        T29::
                                        CLR     TRPFLG          ; CLEAR TRAP FLAG.
                                        TST     MMR0            ; KT AVAILABLE ??
                                        240
                                        TST     TRPFLG
                                        BEQ     EXMTST          ; PROCEED IF SO...
                                1$:     EXIT    TST             ;...EXIT OTHERWISE.
                                                                                TRAP    C$EXIT
                                                                                .WORD   L10054 .
                                EXMTST: MOV     #7400,IOPAG     ; ASSUME 18 BITS, SET LIMIT AT 124K...
                                        CMP     .ABUSW,#22      ; 22 BITS AVAILABLE ??
                                        BNE     1$              ; BR IF NOT.
                                        CMP     RLTYP,#RLV12X   ; CAN WE HANDLE THEM ALL ??
                                        BNE     1$              ; BR IF NOT.
                                        MOV     #20,MMR3        ; YES, SET KT IN 22 BIT MODE...
                                        MOV     #177400,IOPAG   ;...AND RAISE LIMIT TO 2044K.
                                1$:     CLR     BA22
                                        MOV     #177000,BA16    ; SET PHYSICAL ADDRESS AT 32K 256 WORDS.
                                        MOV     #1770,PAR4      ; SET PAR4 TO THE SAME POINT.
                                EXMLUP: JSR     R5,SETRAN       ; RANDOM DATA TO BUF1, ZERO BUF2.
                                        BGNSEG
                                                                                TRAP    C$BSEG
                                        MOV     #BUF1,R1        ; SETUP TO COPY FROM BUF1...
                                        MOV     #100000,R2      ;...TO (PAR4)+0
                                        MOV     #512.,R3
                                        MOV     #22$,ERRVEC     ; SOONER OR LATER WE'LL TRAP.
                                        CLR     TRPFLG
                                        INC     MMR0            ;****** KT ON ******************
                                2$:     MOV     (R1)+,(R2)+     ; COPY BUFFERS VIA PAR4.         *
                                        240,240                 ;                                *
                                        SOB     R3,2$           ; LOOP 'TIL DONE.                *
                                        BR      3$              ;                                *
                                22$:    MOV     R2,TRPFLG       ; NXM TRAP, SAVE ADDRESS...      *
                                        MOV     #3$,(SP)        ;                                *
                                        RTI                     ;...AND CONTINUE.                *
                                3$:     CLR     MMR0            ;****** KT OFF *****************
```

```
 2311  020752  012737  010670  000004          MOV     #TRAP4,ERRVEC   ; RESET TRAP.
 2312  020760  004537  010760                  JSR     R5,CALCRC       ; JUST TO BE CONSISTENT.
 2313  020764  000000                          0
 2314  020766  004537  010254                  JSR     R5,LDFUN
 2315  020772  000000  177001                  MAINT, -511.            ; EXECUTE MAINT MODE DMA TO EXT MEM.
 2316  020776  004537  010704                  JSR     R5,WTCRDY
 2317  021002  023727  003402  000003          CMP     RLTYP,#RLV12X   ; BAE IN USE ??
 2318  021010  001411                          BEQ     33$             ; BR IF SO.
 2319  021012  013700  003364                  MOV     E.CS,R0         ; NO, GET EA<17:16> FROM FINAL CSR.
 2320  021016  006200                          ASR     R0
 2321  021020  006200                           ASR    R0
 2322  021022  006200                            ASR   R0
 2323  021024  006200                             ASR  R0
 2324  021026  042700  177774                  BIC     #^C3,R0
 2325  021032  000402                          SKP2
 2326  021034  013700  003376          33$:    MOV     E.BAE,R0        ; GET EA<21:16> FROM BAE.
 2327  021040  010037  003426                  MOV     R0,TMP1         ; SAVE FINAL PA IN CASE...
 2328  021044  013737  003366  003430          MOV     E.BA,TMP2       ;...WE HAVE A STATUS ERROR.
 2329  021052  005737  010672                  TST     TRPFLG          ; NOW, ARE WE EXPECTING NXM ??
 2330  021056  001415                          BEQ     4$              ; BR IF NOT.
 2331  021060  012700  120000                  MOV     #ERR!NXM,R0     ; YES, DO WE HAVE IT ??
 2332  021064  043700  003364                  BIC     E.CS,R0
 2333  021070  001501                          BEQ     8$              ; BR IF SO.
 2334  021C :  004537  007554                  JSR     R5,GETERR       ; NO, GET WHATEVER'S THERE.
 2335  02  76  000240                          NOP
 2336  021100                                  DFERR   EM90,ERR12      ; EXTENDED NXM STATUS WRONG.
  (5)  021100  104455                                                                    TRAP    C$ERDF
  (6)  021102  000232                                                                    .WORD   154
  (6)  021104  034221                                                                    .WORD   EM90
  (6)  021106  026552                                                                    .WORD   ERR12
 2337  021110  000471                          BR      8$
 2338
 2339  021112  004537  007554          4$:     JSR     R5,GETERR       ; ANY OTHER STATUS ERRORS ??
 2340  021116  000405                          BR      44$             ; BR IF NOT.
 2341  021120                                  DFERR   EM91,ERR13      ; STATUS INCORRECT ON EXT MEMORY ACCESS.
  (5)  021120  104455                                                                    TRAP    C$ERDF
  (6)  021122  000233                                                                    .WORD   155
  (6)  021124  034275                                                                    .WORD   EM91
  (6)  021126  026606                                                                    .WORD   ERR13
 2342  021130  000461                          BR      ^$
 2343
 2344  021132  012701  100000          44$:    MOV     #100000,R1      ; POINT TO BUF1 IN EXT MEMORY.
 2345  021136  012702  101000                  MOV     #101000,R2      ; DITTO BUF2.
 2346  021142  005003                          CLR     R3              ; WORD NUMBER.
 2347  021144  012704  000377                  MOV     #255.,R4        ; LOOP COUNT.
 2348  021150  005237  177572                  INC     MMR0            ;****** KT ON ******************
 2349  021154  012137  003432          5$:     MOV     (R1)+,GDDAT     ;                              *
 2350  021160  012237  003434                  MOV     (R2)+,BDDAT     ;                              *
 2351  021164  023737  003432  003434          CMP     GDDAT,BDDAT     ; COMPARE DATA.                *
 2352  021172  001002                          BNE     6$              ; BR IF WRONG.                 *
 2353  021174  005203                          INC     R3              ; BUMP WORD COUNT.             *
 2354  021176  077412                          SOB     R4,5$           ; LOOP.                        *
 2355  021200  005037  177572          6$:     CLR     MMR0            ;****** KT OFF *****************
 2356  021204  005704                          TST     R4              ; LOOP COMPLETED (NO ERRORS) ??
 2357  021206  001432                          BEQ     8$              ; BR IF SO.
 2358  021210  010337  003424                  MOV     R3,TMP0         ; NO, SAVE FAILING WORD NUMBER.
```

```
 2359  021214  012703  000006                    MOV     #6,R3
 2360  021220  013737  172350  003430            MOV     PAR4,TMP2
 2361  021226  005037  003426                    CLR     TMP1            ; NOW ASSEMBLE BAD PA.
 2362  021232  006337  003430          7$:       ASL     TMP2            ; ADJUST PAGE TO BIT 21...
 2363  021236  006137  003426                     ROL     TMP1
 2364  021242  077305                              SOB     R3,7$
 2365  021244  042702  160000                    BIC     #^C17777,R2     ;...STRIP PAR BITS FROM VA...
 2366  021250  162702  000002                    SUB     #2,R2
 2367  021254  060237  003430                    ADD     R2,TMP2         ;...AND COMBINE THE PIECES.
 2368  021260  005537  003426                     ADC     TMP1
 2369  021264                                    DFERR   EM92,ERR14      ; DATA ERROR IN EXTENDED MEM.
  (5)  021264  104455                                                                TRAP    C$ERDF
  (6)  021266  000234                                                                .WORD   156
  (6)  021270  034352                                                                .WORD   EM92
  (6)  021272  026616                                                                .WORD   ERR14
 2370
 2371  021274                          8$:       CKLOOP
  (3)  021274  104406                                                                TRAP    C$CLP1
 2372  021276                                    ENDSEG
  (3)  021276                                                              10000$:
  (3)  021276  104405                                                                TRAP    C$ESEG
 2373  021300  062737  020000  010416            ADD     #20000,BA16     ; INCR PHYSICAL ADDRESS BY 4K...
 2374  021306  005537  010420                     ADC     BA22            ;...AND OVERFLOW INTO BAE.
 2375  021312  062737  000200  172350            ADD     #200,PAR4       ; INCR PAR4 BY 4K ALSO.
 2376  021320  023727  172350          9$:       CMP     PAR4,(PC)+      ; QUIT AT THE I/O PAGE...
 2377  021324  007400                    IOPAG:  7400                    ;...007400 (124K)...
 2378                                                                      ;...OR 177400 (2044K).
 2379  021326  103002                              BHIS    EXMDUN          ; EXIT IF DONE.
 2380  021330  000137  020662                     JMP     EXMLUP          ; LOOP OTHERWISE.
 2381
 2382  021334  012737  004366  010416  EXMDUN:   MOV     #BUF1,BA16      ; RESET BA16 AND 22.
 2383  021342  005037  010420                     CLR     BA22
 2384  021346                                    ENDTST
  (3)  021346                                                            L10054:
  (3)  021346  104401                                                                TRAP    C$ETST
```

```
                                .SBTTL
                                .SBTTL  RLV12 DRIVE INTERFACE TESTS (G5388 TLM REQUIRED).
                                .SBTTL
021350                          STARS
                                ;;*****************************************************************
                                ;* ALL THESE TESTS REQUIRE THE SERVICES OF THE G5388 TEST LOOP MODULE.
                                ;*
                                .SBTTL   30 -- SYS CLK, PWR OK, DRIVE SELECT, READY, AND ERROR BITS.
                                ;*
                                ;* 1.  TEST SYS CLOCK AND PWR OK FROM THE RLV12.
                                ;* 2.  TEST DRIVE READY AND DRIVE ERROR TO THE RLV12.
                                ;* 3.  TEST DRIVE SELECT BITS FROM THE RLV12.
021350                          STARS
                                ;;*****************************************************************
021350                          TLM1:   BEGIN.TEST
                                                                                        T30::
021350                                  JSR     PC,TLMOK        ; CHECK FOR V12 AND TLM OK...
021354  004737  024034                  BVS     7$              ;...AND EXIT IF NOT.
021356  012777  000001  161760          MOV     #1,@TCSR        ; RESET...
021364  005077  161754                  CLR     @TCSR           ;...AND CLEAR TLM CSR (LO BYTE).
021370  017737  161750  003434          MOV     @TCSR,BDDAT     ; GET TLM STATUS.
021376  012737  004400  003432          MOV     #4400,GDDAT     ; EXPECT SYSCLK<11> AND PWROK<8>.
021404  023737  003432  003434          CMP     GDDAT,BDDAT
021412  001404                          BEQ     1$              ; BR IF STATUS IS RIGHT.
021414                                  DFERR   EM101,ERR2      ; PWR-OK AND/OR SYS-CLK NOT SET IN TLM.
                                                                                        TRAP    C$ERDF
                                                                                        .WORD   157
                                                                                        .WORD   EM101
                                                                                        .WORD   ERR2
021424  017700  161674          1$:     MOV     @RLCS,R0        ; GET RLV12 CSR.
021430  010037  003434                  MOV     R0,BDDAT        ; REC'D RLV12 STATUS...
021434  042700  000001                  BIC     #DRDY,R0        ;...SHOULD HAVE DRDY CLEAR.
021440  010037  003432                  MOV     R0,GDDAT
021444  023737  003432  003434          CMP     GDDAT,BDDAT
021452  001404                          BEQ     2$              ; BR IF SO.
021454                                  DFERR   EM102,ERR2      ; DRIVE READY NOT CLEAR IN RLV12.
                                                                                        TRAP    C$ERDF
                                                                                        .WORD   158
                                                                                        .WORD   EM102
                                                                                        .WORD   ERR2
021464  012777  000200  161652  2$:     MOV     #200,@TCSR      ; SET DRIVE READY IN TLM.
021472  017700  161626                  MOV     @RLCS,R0        ; GET RLV12 AGAIN.
021476  010037  003434                  MOV     R0,BDDAT
021502  052700  000001                  BIS     #DRDY,R0        ; DRDY SHOULD BE SET NOW.
021506  010037  003432                  MOV     R0,GDDAT
021512  023737  003432  003434          CMP     GDDAT,BDDAT
021520  001404                          BEQ     3$              ; BR IF SO.
021522                                  DFERR   EM102,ERR2      ; DRIVE READY NOT SET IN RLV12.
                                                                                        TRAP    C$ERDF
                                                                                        .WORD   159
                                                                                        .WORD   EM102
                                                                                        .WORD   ERR2
021532  012777  000100  161604  3$:     MOV     #100,@TCSR      ; CLEAR DRDY, SET DERR IN TLM.
021540  017700  161560                  MOV     @RLCS,R0        ; ONE MORE TIME.
021544  010037  003434                  MOV     R0,BDDAT
021550  052700  140000                  BIS     #ERR!DERR,R0    ; SHOULD HAVE THESE ERROR BITS.
```

```
 2427  021554  010037  003432                MOV     R0,GDDAT
 2428  021560  023737  003432  003434        CMP     GDDAT,BDDAT
 2429  021566  001404                        BEQ     4$              ; BR IF SO.
 2430  021570                                DFERR   EM103,ERR2      ; DRIVE ERROR STATUS INCORRECT IN RLV12.
  (5)  021570  104455                                                        TRAP    C$ERDF
  (6)  021572  000240                                                        .WORD   160
  (6)  021574  035217                                                        .WORD   EM103
  (6)  021576  026272                                                        .WORD   ERR2
 2431  021600  005077  161540          4$:     CLR     @TCSR           ; CLEAR TLM.
 2432  021604  005001                        CLR     R1              ; INIT DRIVE SELECT BITS<9:8>...
 2433  021606  112737  000060  035307        MOVB    #'0,EM104X      ;...AND ERROR TEXT.
 2434  021614  012703  000004                MOV     #4,R3           ; LOOP CONTROL.
 2435  021620  012777  000200  161476  5$:   MOV     #CRDY,@RLCS     ; INIT RLV CSR...
 2436  021626  050177  161472                BIS     R1,@RLCS        ;...INSERT DRIVE BITS <9:8>.
 2437  021632  017702  161506                MOV     @TCSR,R2        ; GET TLM CSR.
 2438  021636  010237  003434                MOV     R2,BDDAT        ; RECV'D TLM SHOULD ECHO DRIVE...
 2439  021642  042702  003000                BIC     #BIT10!BIT9,R2  ;...SELECTED IN TLM<10:9>.
 2440  021646  006301                        ASL     R1
 2441  021650  050102                         BIS    R1,R2           ; SET EXPECTED VALUE.
 2442  021652  006201                          ASR   R1
 2443  021654  010237  003432                MOV     R2,GDDAT
 2444  021660  023737  003432  003434        CMP     GDDAT,BDDAT
 2445  021666  001404                        BEQ     6$
 2446  021670                                DFERR   EM104,ERR2      ; DRIVE SELECT FAILS IN TLM.
  (5)  021670  104455                                                        TRAP    C$ERDF
  (6)  021672  000241                                                        .WORD   161
  (6)  021674  035301                                                        .WORD   EM104
  (6)  021676  026272                                                        .WORD   ERR2
 2447  021700  062701  000400          6$:     ADD     #DS1,R1         ; BUMP DRIVE SELECT NUMBER...
 2448  021704  105237  035307                INCB    EM104X          ;...AND THE ERROR TEXT.
 2449  021710  077335                        SOB     R3,5$
 2450  021712  012777  000200  161404        MOV     #CRDY,@RLCS     ; RESET DRIVE NUMBER IN RL.
 2451  021720                          7$:     ENDTST
  (3)  021720                                                                L10055:
  (3)  021720  104401                                                        TRAP    C$ETST
```

```
                                .SBTTL   31 -- DRIVE COMMAND, STATUS AND STATUS CLOCK.

                                STARS
                                ;;*****************************************************************
                                ;* NOW TEST DRIVE COMMAND, STATUS, AND STATUS CLOCK
                                ;* USING A "GET STATUS" COMMAND.
                                STARS
                                ;;*****************************************************************
                                TLM2:   BEGIN.TEST
                                                                                        T31::
                                        JSR     PC,TLMOK
                                        BVS     5$              ; EXIT IF NO GOOD.
                                        JSR     PC,CLRTLM       ; RESET TLM, AND SET DRDY.
                                        CLR     INIMP
                                        MOV     #125252,4(R5)   ; SET PHONEY STATUS WORD.
                                        MOV     #CRDY!GSTAT,@RLCS ; SET "GET STATUS" COMMAND...
                                        MOV     #DRST!GSBIT!MK,@RLDA ;...AND RESET STATUS BITS.
                                        JSR     R5,BEFORE
                                        BIC     #CRDY,@RLCS     ; XCT IT.
                                        CLR     R0
                                1$:     MOV     (R5),R1         ; GET TCSR...
                                        BMI     2$              ;...PROCEED WHEN "NEW SKGS" SETS...
                                        SOB     R0,1$           ;...BUT DON'T WAIT FOREVER !!!
                                2$:     MOV     2(R5),BDDAT     ; SAVE RECV'D DRIVE COMMAND (SKGS)...
                                        JSR     R5,WTCRDY
                                        MOV     #DRST!GSBIT!MK,GDDAT ;...SHOULD LOOK LIKE THIS.
                                        CMP     GDDAT,BDDAT
                                        BEQ     3$              ; BR IF STATUS COMMAND WAS RIGHT.
                                        DFERR   EM105,ERR4      ; GET STATUS COMMAND WRONG IN TLM.
                                                                                        TRAP    C$ERDF
                                                                                        .WORD   162
                                                                                        .WORD   EM105
                                                                                        .WORD   ERR4
                                3$:     MOV     E.MP,BDDAT      ; RETURNED DRIVE STATUS...
                                        MOV     #125252,GDDAT   ;...SHOULD = PHONEY.
                                        CMP     GDDAT,BDDAT
                                        BEQ     4$              ; BR IF RETURNED STATUS IS RIGHT.
                                        DFERR   EM106,ERR4      ;RETURNED STATUS INCORRECT IN RLMP.
                                                                                        TRAP    C$ERDF
                                                                                        .WORD   163
                                                                                        .WORD   EM106
                                                                                        .WORD   ERR4
                                4$:     JSR     R5,GETERR       ; FINAL CONTROLLER STATUS...
                                        BR      5$              ;...SHOULD BE ERROR FREE.
                                        MOV     #EXPNON,TMP1
                                        DFERR   EM107,ERR20A    ; RLV12 ERRORS AFTER RESET GET STATUS
                                                                                        TRAP    C$ERDF
                                                                                        .WORD   164
                                                                                        .WORD   EM107
                                                                                        .WORD   ERR20A
                                5$:     ENDTST
                                                                                L10056:
                                                                                        TRAP    C$ETST
```

```
                                .SBTTL   32    DRIVE COMMAND, SEEK DIFF AND SECTOR PULSE.

                                STARS
                                ;;*****************************************************************
                                ;* TEST SECTOR PULSE USING A "SEEK" COMMAND.
                                STARS
                                ;;*****************************************************************
                                TLM3:   BEGIN.TEST
                                                                                        T32::
                                        JSR     PC,TLMOK
                                        BVS     4$              ; BR IF NOT OK.
                                        JSR     PC,CLRTLM       ; RESET TTLM, SET DRDY.
                                        CLR     INIMP
                                        BIS     #24,(R5)        ; ENABLE SECTOR GENERATOR (NOM CLOCK).
                                        MOV     #CRDY!SEEK,@RLCS ; SET "SEEK" COMMAND...
                                        MOV     #77600!MK,@RLDA ;...AND A PHONEY SEEK DIFFERENCE.
                                        JSR     R5,BEFORE
                                        BIC     #CRDY,@RLCS     ; XCT IT.
                                        CLR     R0
                                1$:     MOV     (R5),R1
                                        BMI     2$              ; PROCEED WHEN "NEW SKGS" SETS...
                                        SOB     R0,1$           ;...KEEP ALIVE !!
                                2$:     MOV     2(R5),BDDAT     ; SAVE RECV'D DRIVE COMMAND...
                                        JSR     R5,WTCRDY
                                        MOV     #77600!MK,GDDAT ;...SHOULD = PHONEY DIFFERENCE.
                                        CMP     GDDAT,BDDAT
                                        BEQ     3$              ; BR IF SO.
                                        DFERR   EM110,ERR4      ; DRIVE COMMAND WRONG IN TLM.
                                                                                        TRAP    C$ERDF
                                                                                        .WORD   165
                                                                                        .WORD   EM110
                                                                                        .WORD   ERR4
                                3$:     JSR     R5,GETERR       ; FINAL CONTROLLER STATUS...
                                        BR      4$              ;...SHOULD BE ERROR FREE.
                                        MOV     #EXPNON,TMP1
                                        DFERR   EM111,ERR20A    ; RLV ERRORS AFTER SEEK COMMAND
                                                                                        TRAP    C$ERDF
                                                                                        .WORD   166
                                                                                        .WORD   EM111
                                                                                        .WORD   ERR20A
                                4$:     ENDTST
                                                                                L10057:
                                                                                        TRAP    C$ETST
```

```
                                .SBTTL   33 -  WRITE GATE, WRITE GATE ERROR, AND WRITE DATA.

                                STARS
                                ;;*******************************************************************
                                ;* TEST THE WRITE GATE, WRITE DATA ACTIVE, AND WRITE GATE ERROR.
                                STARS
                                ;;*******************************************************************
022274                          TLM4:   BEGIN.TEST
022274                                                                          T33::
022274  004737  024034                  JSR     PC,TLMOK
022300  102524                          BVS     5$              ; BR IF NOT OK.
022302  004737  024204                  JSR     PC,CLRTLM       ; RESET TLM, SET DRDY.
022306  052715  000024                  BIS     #24,(R5)        ; ENABLE SECTOR GEN (NOM CLOCK).
022312  004537  010224                  JSR     R5,WDELAY       ; DELAY SO THAT WE ENTER THE TLM...
022316  000002                          2                       ;...SEQUENCE ASYNCHRONOUSLY.
022320  012777  000212  160776          MOV     #CRDY!WRITE,@RLCS ; SET COMMAND TO WRITE...
022326  012737  177600  003436          MOV     #-128.,INIMP
022334  013777  003436  160770          MOV     INIMP,@RLMP     ;...128 WORDS...
022342  012777  004366  160756          MOV     #BUF1,@RLBA     ;...FROM BUF1...
022350  012777  000205  160752          MOV     #205,@RLDA      ;...TO CYL 1, SECT 5.
022356  004537  010062                  JSR     R5,BEFORE
022362  042777  000200  160734          BIC     #CRDY,@RLCS     ; XCT IT.
022370  005000                          CLR     R0
022372  011501                  1$:     MOV     (R5),R1         ; TLM STATUS => R1.
022374  010137  003434                  MOV     R1,BDDAT        ; RECV'D TLM STATUS...
022400  052701  030000                  BIS     #BIT13!BIT12,R1 ;...WILL GET WRITE GATE AND DATA ACTIVE.
022404  010137  003432                  MOV     R1,GDDAT
022410  023737  003432  003434          CMP     GDDAT,BDDAT
022416  001410                          BEQ     2$              ; BR IF AND WHEN THAT OCCURS...
022420  077014                          SOB     R0,1$           ;...WITHIN REASON -  OF COURSE.
022422  004537  010704                  JSR     R5,WTCRDY
022426                                  DFERR   EM112,ERR4      ; WRITE GATE AND/OR DATA ACTIVE NOT SET.
                                                                                TRAP    C$ERDF
022426  104455                                                                  .WORD   167
022430  000247                                                                  .WORD   EM112
022432  035716                                                                  .WORD   ERR4
022434  026356
022436  000402                          SKP2
022440  004537  010704          2$:     JSR     R5,WTCRDY
022444  011537  003434                  MOV     (R5),BDDAT      ; FINAL TLM STATUS...
022450  013737  003434  003432          MOV     BDDAT,GDDAT
022456  042737  060000  003432          BIC     #BIT14!BIT13,GDDAT ;...ERROR AND GATE SHOULD BE CLEAR.
022464  023737  003432  003434          CMP     GDDAT,BDDAT
022472  001415                          BEQ     4$              ; BR IF SO.
022474  032737  020000  003434          BIT     #BIT13,BDDAT    ; IT'S NOT, IS GATE STILL SET ??
022502  001405                          BEQ     3$              ;
022504                                  DFERR   EM113A,ERR4     ; WRITE GATE STILL SET AFTER DONE.
                                                                                TRAP    C$ERDF
022504  104455                                                                  .WORD   168
022506  000250                                                                  .WORD   EM113A
022510  036062                                                                  .WORD   ERR4
022512  026356
022514  000404                          BR      4$
022516                          3$:     DFERR   EM113,ERR4      ; WRITE GATE ERROR IN TLM.
                                                                                TRAP    C$ERDF
022516  104455                                                                  .WORD   169
022520  000251                                                                  .WORD   EM113
022522  036010                                                                  .WORD   ERR4
022524  026356
```

```
 2562  022526  004537  007554          4$:     JSR     R5,GETERR       ; FINAL RLV STATUS...
 2563  022532  000407                          BR      5$              ;...SHOULD BE ERROR FREE.
 2564  022534  012737  036742  003426          MOV     #EXPNON,TMP1
 2565  022542                                  DFERR   EM114,ERR20A    ; RL ERROR AFTER WRITE.
                                                                                 TRAP    C$ERDF
  (5)  022542  104455                                                            .WORD   170
  (6)  022544  000252                                                            .WORD   EM114
  (6)  022546  036140                                                            .WORD   ERR20A
  (6)  022550  026740
 2566  022552                          5$:     ENDTST
                                                                         L10060:
  (3)  022552                                                                    TRAP    C$ETST
  (3)  022552  104401
```

```
                                        .SBTTL   34  - READ DATA, READ HEADER, AND READ DATA W/O HEADER.

                                        STARS
                                        ;;*****************************************************************
                                        ;* READ AND VERIFY DATA ON EACH OF 6 TLM SECTORS.
                                        ;* SECTOR 3 GETS A READ HEADER AND READ DATA W/O HEADER SEQUENCE.
                                        ;* REPEAT USING ALTERNATE VCO SETTINGS (WITH MAX AND MIN PEAK SHIFT).
                                        ;* VARIOUS PEAK SHIFT, CLOCK, AND SECTOR OPTIONS MAY BE SELECTED VIA
                                        ;* THE "CHANGE SOFTWARE" DIALOGUE AT START/RESTART TIME.
                                        STARS
                                        ;;*****************************************************************
                                        TLM5:   BEGIN.TEST
                                                                                                T34::
                                                JSR     PC,TLMPID       ; VERIFY TLM OK AND PROM ID.
                                                BVS     8$              ; EXIT IF NOT OK.
                                                MOV     #-128.,INIMP    ; INIT WORD COUNT.
                                                MOV     SNGLSEC,12$     ; GET SECTOR NUMBER (IF ANY).
                                                BIC     #^C7,12$
                                                BNE     11$             ; NZ = SINGLE SECTOR MODE.
                                        10$:    INC     12$             ; OTHERWISE, USE ALL STARTING WITH 1.
                                        11$:    JSR     PC,PSX          ; SET BUFFERS AND DISK ADDRESS...
                                        12$:    1                       ;...FOR THIS SECTOR NUMBER.
                                                BVC     1$              ; BR IF SECTOR FOUND.
                                                MOVB    TSECX,EM119X    ; SET ASCII SECTOR NUMBER.
                                                DFERR   EM119,NOSIG     ; CAN'T FIND SECTOR.
                                                                                        TRAP    C$ERDF
                                                                                        .WORD   171
                                                                                        .WORD   EM119
                                                                                        .WORD   NOSIG
                                                BR      7$
                                        1$:     BIT     #BIT2,MPXCLK    ; NOMINAL CLOCK ENABLED ??
                                                BNE     2$              ; BR IF NOT.
                                                MOV     #224,(R5)       ; YES, SET NOMINAL CLOCK, NO PEAK SHIFT.
                                                MOV     #TCLK0,TMP2
                                                BR      4$
                                        2$:     BIT     #BIT1,MPXCLK    ; FAST CLOCK ENABLED ??
                                                BNE     3$              ; BR IF NOT.
                                                MOV     #230,(R5)       ; YES, SET FAST CLOCK, NO PEAK SHIFT.
                                                MOV     #TCLK1,TMP2
                                                BR      4$
                                        3$:     BIT     #BIT0,MPXCLK    ; SLOW CLOCK ENABLED ??
                                                BNE     7$              ; BR IF NOT.
                                                MOV     #220,(R5)       ; YES, SET SLOW CLOCK, NO PEAK SHIFT.
                                                MOV     #TCLK2,TMP2

                                        4$:     BIT     #BIT14,MPXCLK   ; MIN PEAK SHIFT ENABLED ??
                                                BNE     5$              ; BR IF NOT.
                                                CLRB    TPEAK           ; YES, PEAK SHIFT IS OFF...
                                                JSR     PC,READSEC      ;...READ SECTOR AND VERIFY DATA.
                                        5$:     TST     MPXCLK          ; MAX PEAK SHIFT ENABLED ??
                                                BMI     6$              ; BR IF NOT.
                                                BIS     #40,(R5)        ; YES, MAX PEAK SHIFT ON...
                                                MOVB    #40,TPEAK       ;...EXTEND CLOCK MESSAGE...
                                                JSR     PC,READSEC      ;...DO IT ALL AGAIN.

                                        6$:     BIT     #4,(R5)         ; NOMINAL DONE ??
```

```
2617  023004  001330                        BNE     2$              ; LOOP TO "FAST" IF SO.
2618  023006  032715  000010                BIT     #10,(R5)        ; FAST DONE ??
2619  023012  001337                        BNE     3$              ; LOOP TO "SLOW" IF SO...
2620                                                                 ;...OTHERWISE, THIS SECTOR IS DONE.
2621
2622  023014  032737  000007  003314  7$:   BIT     #7,SNGLSEC      ; SINGLE SECTOR MODE ??
2623  023022  001004                        BNE     8$              ; WE'RE DONE IF SO.
2624  023024  023727  022616  000006        CMP     12$,#6          ; NO, LAST SECTOR DONE ??
2625  023032  103665                        BLO     10$             ; GO "ROUND AGAIN IF NOT...
2626  023034                        8$:     EXIT    TST             ;...OTHERWISE, NEXT TEST.
                                                                                TRAP    C$EXIT
 (3)  023034  104432                                                            .WORD   L10061 .
 (3)  023036  000376
2627                                        ;
2628                                        ; SUBROUTINE TO READ DATA FROM TLM TO BUF2 AND VERIFY (AGAINST BUF1).
2629                                        ; DISK ADDRESS AND EXPECTED DATA (BUF1) MUST BE PRESET BEFORE CALL.
2630                                        ; WORD COUNT ( 128.) IS PRESET FOR ALL.
2631                                        ;
2632  023040                                READSEC: BGNSEG
                                                                                TRAP    C$BSEG
 (3)  023040  104404
2633  023042  012700  005366                        MOV     #BUF2,R0
2634  023046  012701  000200                        MOV     #128.,R1
2635  023052  012720  177777        1$:     MOV     #-1,(R0)+       ; CLEAR RECEIVING BUFFER.
2636  023056  077103                        SOB     R1,1$
2637  023060  105037  036257                CLRB    EM115X          ; INIT ERROR TEXT FOR "READ".
2638  023064  105037  036427                CLRB    EM117X
2639  023070  012777  000214  160226        MOV     #CRDY!READ,@RLCS ; SET COMMAND TO READ...
2640  023076  013777  003436  160226        MOV     INIMP,@RLMP     ;...128 WORDS...
2641  023104  013777  003440  160216        MOV     INIDA,@RLDA     ;...FROM CYL X, SECT Y...
2642  023112  012777  005366  160206        MOV     #BUF2,@RLBA     ;...TO BUF2.
2643  023120  004537  010062        2$:     JSR     R5,BEFORE
2644  023124  042777  000200  160172        BIC     #CRDY,@RLCS     ; XCT.
2645  023132  004537  010704                JSR     R5,WTCRDY       ; WAIT FOR RL DONE.
2646  023136  123737  024560  003365        CMPB    PSERR,E.CS+1    ; FINAL STATUS RIGHT ??
2647  023144  001412                        BEQ     3$              ; BR IF SO.
2648  023146  004537  007554                JSR     R5,GETERR       ; NO, GET WHATEVER'S THERE.
2649  023152  000240                        NOP
2650  023154  013737  024556  003426        MOV     PSETXT,TMP1
2651  023162                                DFERR   EM115,ERR20     ; ERROR STATUS WRONG ON READ.
                                                                                TRAP    C$ERDF
 (5)  023162  104455                                                            .WORD   172
 (6)  023164  000254                                                            .WORD   EM115
 (6)  023166  036211                                                            .WORD   ERR20
 (6)  023170  026734
2652  023172  023727  024556  036676  3$:     CMP     PSETXT,#EXPHCRC ; NOW IS THIS THE BAD HEADER SECTOR ??
2653  023200  001062                        BNE     CHKDATA         ; BR IF NOT.
2654
2655  023202  012700  000007        READNH: MOV     #7,R0           ; YES IT IS, SET UP TO READ HEADERS.
2656  023206  112737  000040  036257        MOVB    #40,EM115X      ; EXTEND ERROR TEXT TO "READ NH"
2657  023214  112737  000040  036427        MOVB    #40,EM117X
2658  023222  012777  000210  160074  1$:     MOV     #CRDY!RDHDR,@RLCS
2659  023230  042777  000200  160066        BIC     #CRDY,@RLCS     ; XCT READ HEADER...
2660  023236  105777  160062          2$:   TSTB    @RLCS           ;...AND WAIT FOR DONE.
2661  023242  100375                        BPL     2$
2662  023244  027727  160062  000206        CMP     @RLMP,#<1_7.>!6 ; FOUND BAD SECTOR 1 ??
2663  023252  001406                        BEQ     3$              ; BR IF SO.
2664  023254  077016                        SOB     R0,1$
2665  023256                                DFERR   EM116,ERR21     ; CAN'T FIND CYL 1, SECT 6
```

```
 (5)  023256  104455                                                          TRAP    C$ERDF
 (6)  023260  000255                                                          .WORD   173
 (6)  023262  036305                                                          .WORD   EM116
 (6)  023264  027014                                                          .WORD   ERR21
2666  023266  000460                    BR      READDUN         ; ABORT THE REST
2667  023270  012777  000216  160C26  3$:   MOV     #CRDY!RDNHDR,@RLCS ; OK, SET READ-NO HEADER COMMAND...
2668  023276  013777  003436  160026        MOV     INIMP,@RLMP     ;...INSURE WORD COUNT IS STILL THERE...
2669  023304  004537  010062                JSR     R5,BEFORE
2670  023310  042777  000200  160006        BIC     #CRDY,@RLCS     ;...AND XCT IT.
2671  023316  004537  010704                JSR     R5,WTCRDY
2672  023322  004537  007554                JSR     R5,GETERR       ; SHOULD HAVE NO ERRORS...
2673  023326  000407                        BR      CHKDATA         ;...BR IF SO.
2674  023330  012737  036742  003426        MOV     #EXPNON,TMP1
2675  023336                                DFERR   EM115,ERR20     ; ERROR STATUS INCORRECT AFTER READ NH
 (5)  023336  104455                                                          TRAP    C$ERDF
 (6)  023340  000256                                                          .WORD   174
 (6)  023342  036211                                                          .WORD   EM115
 (6)  023344  026734                                                          .WORD   ERR20
2676
2677  023346  012700  004446        CHKDATA: MOV    #BUF1+48.,R0    ; EXPD DATA FIELD BEGINS AT WORD 24...
2678  023352  012701  005366                 MOV     #BUF2,R1        ;...RECVD DATA AT WORD 0.
2679  023356  005002                         CLR     R2              ;...AND WORD NUMBER.
2680  023360  021011                 1$:     CMP     (R0),(R1)       ; COMPARE EXP'D VS REC'D DATA...
2681  023362  001415                         BEQ     2$              ;...AND BR IF OK.
2682  023364  011037  003432                 MOV     (R0),GDDAT      ; IT'S NOT, SET EXP'D...
2683  023370  011137  003434                 MOV     (R1),BDDAT      ;...RECV'D...
2684  023374  010137  003424                 MOV     R1,TMP0         ;...ADDRESS...
2685  023400  010237  003426                 MOV     R2,TMP1         ;...AND WORD NUMBER.
2686  023404                                 DFERR   EM117,ERR22     ; DATA INCORRECT ON READ OR READ NH.
 (5)  023404  104455                                                          TRAP    C$ERDF
 (6)  023406  000257                                                          .WORD   175
 (6)  023410  036365                                                          .WORD   EM117
 (6)  023412  027024                                                          .WORD   ERR22
2687  023414  000405                         BR      3$
2688  023416  022021                 2$:     CMP     (R0)+,(R1)+     ; BUMP ADDRESSES...
2689  023420  005202                         INC     R2              ;...AND WORD NUMBER.
2690  023422  032702  000177                 BIT     #177,R2
2691  023426  001354                         BNE     1$              ;...AND LOOP 'TIL DONE.
2692  023430                         3$:
2693  023430                         READDUN: ENDSEG
 (3)  023430                                                  10000$:
 (3)  023430  104405                                                  TRAP    C$ESEG
2694  023432  000207                         RTS     PC
2695  023434                                 ENDTST
 (3)  023434                                                  L10061:
 (3)  023434  104401                                                  TRAP    C$ETST
```

```
                        .SBTTL   35 -- WRITE CHECK.

                        STARS
                        ;;*******************************************************************
                        ;* DO A WRITE CHECK USING SECTOR AND CLOCK OPTIONS AS BEFORE.
                        STARS
                        ;;*******************************************************************
                        TLM6:   BEGIN.TEST
                                                                                T35::
                                JSR     PC,TLMPID
                                BVS     8$              ; EXIT IF NOT OK.
                                MOV     #-128.,INIMP    ; INIT WORD COUNT.
                                MOV     SNGLSEC,12$     ; GET SECTOR NUMBER (IF ANY).
                                BIC     #^C7,12$
                                BNE     11$             ; NZ = SINGLE SECTOR MODE.
                        10$:    INC     12$             ; OTHERWISE, USE ALL STARTING WITH 1.
                        11$:    JSR     PC,PSX          ; SET BUFFERS AND DISK ADDRESS...
                        12$:    1                       ;...FOR THIS SECTOR NUMBER.
                                BVC     1$
                                MOVB    TSECX,EM119X    ; SET ASCII SECTOR NUMBER.
                                DFERR   EM119,NOSIG     ; CAN'T FIND SECTOR.
                                                                        TRAP    C$ERDF
                                                                        .WORD   176
                                                                        .WORD   EM119
                                                                        .WORD   NOSIG
                                BR      7$
                        1$:     BIT     #BIT2,MPXCLK    ; NOMINAL CLOCK ENABLED ??
                                BNE     2$              ; BR IF NOT.
                                MOV     #224,(R5)       ; YES, SET NOMINAL CLOCK, NO PEAK SHIFT.
                                MOV     #TCLK0,TMP2
                                BR      4$
                        2$:     BIT     #BIT1,MPXCLK    ; FAST CLOCK ENABLED ??
                                BNE     3$              ; BR IF NOT.
                                MOV     #230,(R5)       ; YES, SET FAST CLOCK, NO PEAK SHIFT.
                                MOV     #TCLK1,TMP2
                                BR      4$
                        3$:     BIT     #BIT0,MPXCLK    ; SLOW CLOCK ENABLED ??
                                BNE     7$              ; BR IF NOT.
                                MOV     #220,(R5)       ; YES, SET SLOW CLOCK, NO PEAK SHIFT.
                                MOV     #TCLK2,TMP2

                        4$:     BIT     #BIT14,MPXCLK   ; MIN PEAK ENABLED ??
                                BNE     5$              ; BR IF NOT.
                                CLRB    TPEAK           ; YES, PEAK SHIFT IS OFF...
                                JSR     PC,WRITCHK      ;...WRITE-CHECK THIS SECTOR.
                        5$:     TST     MPXCLK          ; MAX PEAK SHIFT ENABLED ??
                                BMI     6$              ; BR IF NOT.
                                BIS     #40,(R5)        ; YES, MAX PEAK SHIFT ON...
                                MOVB    #40,TPEAK       ;...EXTEND CLOCK MESSAGE...
                                JSR     PC,WRITCHK      ;...AND DO IT AGAIN.

                        6$:     BIT     #4,(R5)         ; NOMINAL DONE ??
                                BNE     2$              ; LOOP TO "FAST' IF SO.
                                BIT     #10,(R5)        ; FAST DONE ??
                                BNE     3$              ; LOOP TO "SLOW" IF SO...
                                                        ;...OTHERWISE, THIS SECTOR IS DONE.
```

```
2746
2747  023676  032737  000007  003314  7$:     BIT     #7,SNGLSEC        ; SINGLE SECTOR MODE ??
2748  023704  001004                          BNE     8$                ; WE'RE ALL DONE IF SO.
2749  023706  023727  023500  000006          CMP     12$,#6            ; NO, LAST SECTOR DONE ??
2750  023714  103665                          BLO     10$               ; GO "ROUND AGAIN IF NOT...
2751  023716                          8$:     EXIT    TST               ;...OTHERWISE, WE'RE ALL DONE.
 (3)  023716  104432                                                                     TRAP    C$EXIT
 (3)  023720  000112                                                                     .WORD   L10062 .
2752                                  ;
2753                                  ; SUBROUTINE TO WRITE CHECK A SECTOR AGAINST THE DATA IN "BUF1'.
2754                                  ;
2755  023722                          WRITCHK: BGNSEG
 (3)  023722  104404                                                                     TRAP    C$BSEG
2756  023724  012777  000202  157372          MOV     #CRDY!WRCHK,@RLCS ; SET COMMAND TO WRITE-CHECK...
2757  023732  013777  003436  157372          MOV     INIMP,@RLMP       ;...128 WORDS...
2758  023740  013777  003440  157362          MOV     INIDA,@RLDA       ;...FROM CYL X, SECT Y...
2759  023746  012777  004446  157352          MOV     #BUF1+48.,@RLBA   ;...AGAINST BUF1.
2760  023754  004537  010062                  JSR     R5,BEFORE
2761  023760  042777  000200  157336          BIC     #CRDY,@RLCS       ; XCT.
2762  023766  004537  010704                  JSR     R5,WTCRDY         ; WAIT FOR RL DONE.
2763  023772  123737  024560  003365          CMPB    PSERR,E.CS+1      ; FINAL STATUS RIGHT ??
2764  024000  001412                          BEQ     1$                ; BR IF SO.
2765  024002  004537  007554                  JSR     R5,GETERR         ; NO, GET WHATEVER'S THERE.
2766  024006  000240                          NOP
2767  024010  013737  024556  003426          MOV     PSETXT,TMP1
2768  024016                                  DFERR   EM118,ERR20       ; ERROR STATUS WRONG ON WRITE-CHECK
                                                                                         TRAP    C$ERDF
 (5)  024016  104455                                                                     .WORD   177
 (6)  024020  000261                                                                     .WORD   EM118
 (6)  024022  036455                                                                     .WORD   ERR20
 (6)  024024  026734
2769  024026                          1$:     ENDSEG
 (3)  024026                                                                   10000$:
 (3)  024026  104405                                                                     TRAP    C$ESEG
2770  024030  000207                          RTS     PC
2771  024032                                  ENDTST
 (3)  024032                                                                   L10062:
 (3)  024032  104401                                                                     TRAP    C$ETST
```

```
                                        ;
                                        ; SUBROUTINE TO SEE IF TLM IS THERE AND PROPERLY CABLED TO RLV12.
                                        ; ALSO CHECK THAT CORRECT PROM IS INSTALLED.
                                        ; REPORT ERROR AND RETURN WITH "V" SET IF NOT.
                                        ;
024034  005000                  TLMOK:  CLR     R0              ; DISABLE ID CHECK.
024036  000401                          SKP1
024040  005200                  TLMPID: INC     R0              ; ENABLE ID CHECK.
024042  013737  003344  003432          MOV     TCSR,GDDAT      ; GET CSR POINTER.
024050  001453                          BEQ     4$              ; ABORT IF IT'S NOT DEFINED.
024052  005037  010672                  CLR     TRPFLG
024056  005077  157262                  CLR     @TCSR           ; TLM ARE YOU REALLY THERE ??
024062  000240                          240
024064  005737  010672                  TST     TRPFLG
024070  001025                          BNE     1$              ; ERROR IF NOT.
024072  012737  004400  003432          MOV     #4400,GDDAT     ; OTHERWISE, ...
024100  017737  157240  003434          MOV     @TCSR,BDDAT     ;...GET INITIAL STATUS.
024106  001423                          BEQ     2$              ; IF ZERO, CABLE ISN'T CONNECTED.
024110  005700                          TST     R0              ; ID VERIFICATION REQUIRED ??
024112  001413                          BEQ     5$              ; WE'RE DONE IF NOT.
024114  004737  024204                  JSR     PC,CLRTLM       ; YES, RESET, ID => R0.
024120  010037  003434                  MOV     R0,BDDAT
024124  013737  003310  003432          MOV     PROMID,GDDAT    ; GET EXPECTED ID.
024132  023737  003432  003434          CMP     GDDAT,BDDAT
024140  001013                          BNE     3$              ; BR IF ID INCORRECT.
024142  000207                  5$:     RTS     PC              ; RETURN, "V" = 0.

024144                          1$:     DFERR   EM100,ERR1      ; TIME-OUT ON TLM ADDRESS.
                                                                        TRAP    C$ERDF
 (5)    024144  104455                                                  .WORD   178
 (6)    024146  000262                                                  .WORD   EM100
 (6)    024150  034646                                                  .WORD   ERR1
 (6)    024152  026242
                                        BR      4$
2801    024154  000411          2$:     DFERR   EM100A,ERR2     ; CABLE PROBABLY NOT INSTALLED.
2802    024156                                                          TRAP    C$ERDF
 (5)    024156  104455                                                  .WORD   179
 (6)    024160  000263                                                  .WORD   EM100A
 (6)    024162  034702                                                  .WORD   ERR2
 (6)    024164  026272
                                        BR      4$
2803    024166  000404          3$:     DFERR   EM100B,ERR2     ; PROM ID INCORRECT.
2804    024170                                                          TRAP    C$ERDF
 (5)    024170  104455                                                  .WORD   180
 (6)    024172  000264                                                  .WORD   EM100B
 (6)    024174  034765                                                  .WORD   ERR2
 (6)    024176  026272
2805    024200  000262          4$:     SEV                     ; SET "ERROR" FLAG...
2806    024202  000207                  RTS     PC              ;...AND RETURN.
2807                                    ;
2808                                    ; SUBROUTINE TO RESET TEST LOOP MODULE.
2809                                    ; RETURN WITH "DRIVE READY" SET, TLM PROM ID IN R0,
2810                                    ; AND TLM CSR ADDRESS IN R5.
2811                                    ; AS LONG AS WE'RE HERE, CLEAR RLBA, RLMP, AND RLBAE AS WELL.
2812                                    ;
2813    024204  013705  003344  CLRTLM: MOV     TCSR,R5         ; DEDICATE R5 TO THE TLM.
2814    024210  012715  000001          MOV     #1,(R5)         ; RESET...
2815    024214  016500  000006          MOV     6(R5),R0        ;...PROM ID => R0.
2816    024220  005065  000002          CLR     2(R5)           ; CLEAR SKGS...
```

```
2817  024224  005065  000004                  CLR     4(R5)           ;...AND PSUEDO STATUS REGISTERS.
2818  024230  012715  000002                  MOV     #2,(R5)         ; CLEAR FLAGS ??
2819  024234  012715  000200                  MOV     #200,(R5)       ; SET DRIVE READY.
2820  024240  005077  157062                  CLR     @RLBA
2821  024244  005077  157062                  CLR     @RLMP
2822  024250  023727  003402  000003          CMP     RLTYP,#RLV12X
2823  024256  001002                          BNE     1$
2824  024260  005077  157050                  CLR     @RLBAE
2825  024264  000207                  1$:     RTS     PC
2826                                  ;
2827                                  ; SUBROUTINE TO SET UP BUFFERS AND DISK ADDRESSES
2828                                  ; FOR READING EACH OF THE 6 PSUEDO SECTORS.
2829                                  ; USE HEADER TABLE AND SEARCH ROUTINE IN THE DUMP UTILITY.
2830                                  ; IF SUCCESSFUL, CONTENTS OF SELECTED SECTOR (160. WORDS) ARE IN "BUF1 .
2831                                  ; CALL: JSR PC,PSX
2832                                  ;       N                       ; SECTOR NUMBER.
2833                                  ;       BVC     XX              ; ON RETURN, "V" IS SET IN SECTOR NOT FOUND.
2834                                  ;       ERROR
2835                                  ; XX:                           ; CONTINUE.
2836                                  ;
2837  024266  017600  000000          PSX:    MOV     @(SP),R0        ; GET SECTOR NUMBER (1 - 6)...
2838  024272  005300                          DEC     R0              ;...MAKE IT (0   5)...
2839  024274  006300                          ASL     R0              ;...SHIFT UP TO AN INDEX.
2840  024276  062716  000002                  ADD     #2,(SP)         ; ADJUST RETURN PC...
2841  024302  000170  024306                  JMP     @1$(R0)         ;...AND DO ONE OF THE FOLLOWING:
2842  024306  024324                  1$:     PS1
2843  024310  024342                          PS2
2844  024312  024374                          PS3
2845  024314  024426                          PS4
2846  024316  024444                          PS5
2847  024320  024514                          PS6
2848  024322  024462                          PS7             ; SOONER OR LATER SOME TURKEY WILL...
2849                                                          ;...TRY TO ACCESS SECTOR 7.
2850
2851                                          .ENABL  LSB
2852  024324  112737  000061  036604  PS1:    MOVB    #'1,TSECX       ; TLM SECTOR 1...
2853  024332  012737  000205  003440          MOV     #<1_7.>!5,INIDA ;...IS CYL 1 SECT 5...
2854  024340  000473                          BR      1$              ;...AND IS ERROR FREE.
2855
2856  024342  112737  000062  036604  PS2:    MOVB    #'2,TSECX       ; TLM SECTOR 2...
2857  024350  012737  000206  003440          MOV     #<1_7.>!6,INIDA ;...IS CYL 1, SECT 6...
2858  024356  012737  000210  024560          MOV     #↑H<ERR!DCRC>,PSERR
2859  024364  012737  036722  024556          MOV     #EXPDCRC,PSETXT ;...AND HAS A BAD DATA CRC.
2860  024372  000463                          BR      2$
2861
2862  024374  112737  000063  036604  PS3:    MOVB    #'3,TSECX       ; TLM SECTOR 3...
2863  024402  012737  000207  003440          MOV     #<1_7.>!7,INIDA ;...IS CYL 1, SECT 7...
2864  024410  012737  000214  024560          MOV     #↑H<ERR!HCRC!OPI>,PSERR
2865  024416  012737  036676  024556          MOV     #EXPHCRC,PSETXT ;...AND HAS A BAD HEADER CRC.
2866  024424  000446                          BR      2$
2867
2868  024426  112737  000064  036604  PS4:    MOVB    #'4,TSECX       ; TLM SECTOR 4...
2869  024434  012737  125252  003440          MOV     #<525_7.>!52,INIDA ;...IS CYL 525, SECT 52...
2870  024442  000432                          BR      1$              ;...AND IS ERROR FREE.
2871
2872  024444  112737  000065  036604  PS5:    MOVB    #'5,TSECX       ; TLM SECTOR 5...
```

```
 2873  024452  012737  135252  003440          MOV     #<565_7.>!52,INIDA ;...IS CYL 565, SECT 52...
 2874  024460  000423                          BR      1$                 ;...AND IS ERROR FREE.
 2875
 2876  024462                          PS7:    PRINTF  #TURKY             ; THERE ISN'T ANY SECTOR 7...
  (7)  024462  012746  024562                                                          MOV     #TURKY, (SP)
  (6)  024466  012746  000001                                                          MOV     #1, (SP)
  (3)  024472  010600                                                                  MOV     SP,R0
  (4)  024474  104417                                                                  TRAP    C$PNTF
  (4)  024476  062706  000004                                                          ADD     #4,SP
 2877  024502  012737  000006  003314          MOV     #6,SNGLSEC         ;...CHANGE IT TO 6...
 2878  024510  162700  000002                  SUB     #2,R0              ;...ADJUST INDEX AND FALL THRU
 2879
 2880  024514  112737  000066  036604  PS6:    MOVB    #'6,TSECX          ; TLM SECTOR 6...
 2881  024522  012737  155555  003440          MOV     #<666_7.>!155,INIDA ;...IS CYL 666, SECT 55, HEAD 1...
 2882  024530  005037  024560          1$:     CLR     PSERR
 2883  024534  012737  036742  024556          MOV     #EXPNON,PSETXT
 2884  024542  016037  024644  024642  2$:     MOV     DTABL(R0),DHEAD ; SET HCRC TO SEARCH FOR.
 2885  024550  004737  025246                  JSR     PC,FINDSEC         ; GO FIND AND READ IT TO BUF1.
 2886  024554  000207                          RTS     PC                 ; RETURN, "V" = 1 IF SECTOR NOT FOUND.
 2887                                          .DSABL  LSB
 2888
 2889  024556  036742                  PSETXT: EXPNON          ; EXPECTED ERROR STATUS FOR EACH...
 2890  024560  000000                  PSERR:  0               ;...IS RETURNED IN THESE LOCATIONS.
 2891
 2892  024562  047045  040445  042523  TURKY:  .ASCIZ  /%N%ASECTOR 7 DOESN'T EXIST, USING 6 INSTEAD%N/
       024570  052103  051117  033440
       024576  042040  042517  047123
       024604  052047  042440  044530
       024612  052123  020054  051525
       024620  047111  020107  020066
       024626  047111  052123  040505
       024634  022504  000116
 2893                                          .EVEN
```

```
                        .SBTTL          TLM PROM DUMP UTILITY.
                        ;
                        ; ROUTINE TO DUMP TLM ROM CONTENTS.
                        ; CALLED FROM "INIT" SECTION IF PDSW=1.
                        ; GET UNIT NUMBER, SECTOR NUMBER, AND OUTPUT FORMAT FROM OPERATOR.
                        ; <^C> = ABORT AND RESTART DRS.
                        ; LOAD SUBROUTINE USES "BUF2" AS A 256. WORD RING BUFFER FOR SEARCHING.
                        ; IF FOUND, SECTOR CONTENTS (160. WORDS) ARE THEN COPIED TO "BUF1".
                        ; THE LOAD SUBROUTINE IS ALSO USED IN TLM TESTS 5 AND 6
                        ; TO ESTABLISH EXPECTED DATA PATTERNS.
                        ;
                        ; PSUEDO DISK (ROM) SECTOR FORMAT:
                        ;        WORDS                  FUNCTION
                        ;       -------  -              - -- -- -- ----
                        ;         1  -  17       SECTOR PULSE (12), T3(2), HEADER PREAMBLE (3).
                        ;        18  -  20       DISK ADDRESS (1), ZERO (1), HEADER CRC (1).
                        ;        21  -  24       HEADER POSTAMBLE (1), DATA PREAMBLE (3).
                        ;        25     153      DATA (128.), DATA CRC (1).
                        ;       154  - 160       DATA POSTAMBLE (1), AND GAP (6).
                        ;
024640  025376          DMODE:  OCTMOD          ; DUMP MODE (OCTAL OR HEX).
024642  006051          DHEAD:  006051          ; DESIRED HEADER CRC WORD (DEFAULT SECT 1)...
024644  006051          DTABL:  006051  ; 0C29  ;...SELECTED FROM THIS TABLE.
024646  044051                  044051  ; 4829
024650  132051                  132051  ; B429
024652  174001                  174001  ; F801
024654  036400                  036400  ; 3D00
024656  113554                  113554  ; 976C
024660  005037  003306  ROMDUMP: CLR     PDSW            ; CLEAR DUMP REQUEST.
024664  005000                  CLR     R0
024666  077001                  SOB     R0,.            ; DELAY...
024670  104005                  EMT+5                   ;...AND CLEAR KBD.
024672  113702  025753  1$:     MOVB    HUNIT,R2        ; GET DEFAULT UNIT.
024676  004737  025550          JSR     PC,KBDOUT       ; SAY "HELLO".
024702  025633                  Q0
024704  004737  025504          JSR     PC,KBDIN        ; GET A UNIT NUMBER.
024710  113700  004366          MOVB    BUF1,R0
024714  001407                  BEQ     2$              ; IF NONE, USE DEFAULT (LAST).
024716  120027  000060          CMPB    R0,#'0
024722  103763                  BLO     1$              ; BR IF INVALID UNIT.
024724  120027  000067          CMPB    R0,#'7
024730  101360                  BHI     1$              ;       DITTO
024732  110002                  MOVB    R0,R2           ; SAVE NEW UNIT FOR A MOMENT.
024734  110201          2$:     MOVB    R2,R1
024736  013705  003320          MOV     TCS0,R5         ; BASE CSR => R5.
024742  042701  177770          BIC     #^C7,R1         ; STRIP UNIT NUM...
024746  001403                  BEQ     3$              ;...AND BR IF ZERO.
024750  062705  000010  22$:     ADD     #10,R5          ; ELSE, ADJUST UP TO SELECTED UNIT.
024754  077103                  SOB     R1,22$
024756  110237  025753  3$:     MOVB    R2,HUNIT        ; OK, SET UNIT IN TEXT.
024762  012737  025000  000004  MOV     #4$,ERRVEC      ; SET A TRAP CATCHER.
024770  012715  000001          MOV     #1,(R5)         ; RESET TLM...
024774  000240                  240
024776  000410                  BR      5$              ;...AND PROCEED IF IT DIDN T TRAP.
```

```
2951  025000  022626                  4$:     CMP     (SP)+,(SP)+
2952  025002  113737  025753  025610          MOVB    HUNIT,NOANS+6
2953  025010  004737  025550                  JSR     PC,KBDOUT       ; SELECTED UNIT DOESN'T ANSWER
2954  025014  025602                          NOANS
2955  025016  000720                          BR      ROMDUMP
2956
2957  025020  004737  025550          5$:     JSR     PC,KBDOUT       ; GET A SECTOR NUMBER.
2958  025024  025664                          Q1
2959  025026  004737  025504                  JSR     PC,KBDIN
2960  025032  113700  004366                  MOVB    BUF1,R0
2961  025036  001416                          BEQ     6$              ; IF NONE, REDO LAST SECTOR.
2962  025040  120027  000060                  CMPB    R0,#'0
2963  025044  103765                          BLO     5$
2964  025046  120027  000067                  CMPB    R0,#'7
2965  025052  101362                          BHI     5$
2966  025054  110037  025766                  MOVB    R0,HSECT        ; SET IN HEADER STRING.
2967  025060  042700  177770                  BIC     #^C7,R0
2968  025064  006300                          ASL     R0              ; SHIFT UP TO WORD OFFSET...
2969  025066  016037  024642  024642          MOV     DHEAD(R0),DHEAD ;...AND SET HEADER TO SEARCH FOR.
2970
2971  025074  004737  025550          6$:     JSR     PC,KBDOUT       ; GET AN OUTPUT MODE.
2972  025100  025711                          Q2
2973  025102  004737  025504                  JSR     PC,KBDIN
2974  025106  113700  004366                  MOVB    BUF1,R0
2975  025112  001411                          BEQ     7$              ; IF NONE, USE CURRENT FORMAT.
2976  025114  012737  025376  024640          MOV     #OCTMOD,DMODE   ; ASSUME OCTAL...
2977  025122  120027  000131                  CMPB    R0,#'Y
2978  025126  001003                          BNE     7$
2979  025130  012737  025422  024640          MOV     #HEXMOD,DMODE   ;...CHANGE TO HEX IF REQUIRED.
2980  025136                          7$:
2981  025136  016537  000006  003424  DOIT:   MOV     6(R5),TMP0      ; GET PROM ID.
2982  025144  004737  025550                  JSR     PC,KBDOUT       ; SHOW UNIT AND SECTOR...
2983  025150  025742                          HEADR
2984  025152  012701  003424                  MOV     #TMP0,R1        ;...AND PROM ID...
2985  025156  004777  177456                  JSR     PC,@DMODE       ;...IN THE CURRENT CONTEXT.
2986  025162  104007                          EMT+7                   ; <CRLF>
2987  025164  004737  025246                  JSR     PC,FINDSEC      ; SEARCH FOR AND READ SECTOR.
2988  025170  102004                          BVC     1$              ; BR IF SECTOR FOUND.
2989  025172  004737  025550                  JSR     PC,KBDOUT
2990  025176  026003                          CANTFIND
2991  025200  000627                          BR      ROMDUMP
2992
2993  025202  012701  004366          1$:     MOV     #BUF1,R1        ; NOW FOUND SECTOR IS IN BUF1.
2994  025206  012702  000240                  MOV     #160.,R2        ; DUMP 160. WORDS AT 8 PER LINE.
2995  025212  104007                          EMT+7                   ; <CRLF>
2996  025214  004737  025550          2$:     JSR     PC,KBDOUT
2997  025220  026030                          TAB
2998  025222  004777  177412                  JSR     PC,@DMODE       ; PRINT FROM (R1) IN OCTAL OR HEX.
2999  025226  005302                          DEC     R2
3000  025230  032702  000007                  BIT     #7,R2
3001  025234  001367                          BNE     2$              ; LOOP 'TIL LINE DONE...
3002  025236  104007                          EMT+7                   ; <CRLF>
3003  025240  005702                          TST     R2
3004  025242  001364                          BNE     2$              ;...AND LOOP 'TIL ALL DONE.
3005  025244  000605                          BR      ROMDUMP
3006                                  ;
```

```
3007                                    ; SEARCH FOR SELECTED SECTOR AND LOAD 160. WORD BLOCK TO BUF1.
3008                                    ; IF UNSUCCESSFUL, RETURN TO CALLER WITH "V" BIT SET.
3009                                    ;
3010  025246  012715  000001           FINDSEC: MOV     #1,(R5)          ; RESET TLM...
3011  025252  012715  000034                    MOV     #34,(R5)         ;...AND SET PROM READ MODE.
3012  025256  005046                            CLR      (SP)            ; CLEAR "FOUND" FLAG.
3013  025260  005000                            CLR     R0               ; SET LOOP CONTROL...
3014  025262  012701  006366                    MOV     #BUFEND,R1       ; NOW, FILL BUF2 FROM TOP DOWN.
3015  025266  020127  005366           1$:      CMP     R1,#BUF2         ; IN LOOP    RESET RING POINTER ..
3016  025272  001002                            BNE     2$               ;...WHEN IT REACHES THE BOTTOM.
3017  025274  012701  006366                    MOV     #BUFEND,R1
3018  025300  005265  000006           2$:      INC     6(R5)            ; INCR ROM ADDRESS...
3019  025304  016541  000006                    MOV     6(R5),-(R1)      ;...AND GET A WORD.
3020  025310  021137  024642                    CMP     (R1),DHEAD       ; IS THIS THE DESIRED HCRC WORD ??
3021  025314  001003                            BNE     3$               ; BR IF NOT.
3022  025316  005216                            INC     (SP)             ; YES, SET "FOUND" FLAG...
3023  025320  012700  000024                    MOV     #20.,R0          ;...AND SET TO READ 19 MORE.
3024  025324  077020                    3$:      SOB     R0,1$            ; LOOP 'TIL DONE...
3025  025326  012715  000001                    MOV     #1,(R5)          ;...THEN, RESET TLM...
3026  025332  012715  000200                    MOV     #200,(R5)        ;...AND RESTORE DRIVE READY.
3027  025336  005726                            TST     (SP)+            ; SECTOR FOUND ??
3028  025340  001002                            BNE     4$               ; BR IF SO.
3029  025342  000262                            SEV                      ; NO, SET "V" BIT...
3030  025344  000207                            RTS     PC               ;...AND RETURN.
3031
3032  025346  012702  004366           4$:      MOV     #BUF1,R2         ; NOW COPY FOUND SECTOR TO BUF1.
3033  025352  012703  000240                    MOV     #160.,R3
3034  025356  020127  006366           5$:      CMP     R1,#BUFEND       ; IN LOOP -- RESET RING POINTER...
3035  025362  001002                            BNE     6$               ;...WHEN IT REACHES THE TOP.
3036  025364  012701  005366                    MOV     #BUF2,R1
3037  025370  012122                    6$:      MOV     (R1)+,(R2)+      ; BUF2 => BUF1.
3038  025372  077307                            SOB     R3,5$
3039  025374  000207                            RTS     PC               ; RETURN, "V" IS CLEAR.
3040                                    ;
3041                                    ; SUBROUTINES TO DUMP DATA IN OCTAL OR HEX.
3042                                    ;
3043  025376                            OCTMOD: PRINTF  #OCTTXT,(R1)+
 (8)  025376  012146                                                              MOV     (R1)+, (SP)
 (7)  025400  012746  026042                                                      MOV     #OCTTXT,-(SP)
 (6)  025404  012746  000002                                                      MOV     #2,-(SP)
 (3)  025410  010600                                                              MOV     SP,R0
 (4)  025412  104417                                                              TRAP    C$PNTF
 (4)  025414  062706  000006                                                      ADD     #6,SP
3044  025420  000207                            RTS     PC
3045
3046  025422  010546                    HEXMOD: MOV     R5,-(SP)         ; SAVE TLM POINTER.
3047  025424  012700  026035           1$:      MOV     #HEXTXT,R0       ; SET HEX TEXT POINTER.
3048  025430  012104                            MOV     (R1)+,R4         ; NEXT WORD => R4.
3049  025432  005005                    2$:      CLR     R5               ;...AND PARSE EACH NIBBLE IN R5.
3050  025434  012703  000004                    MOV     #4,R3
3051  025440  006304                    3$:       ASL    R4
3052  025442  006105                              ROL    R5               ; NIBBLE => R5<3:0>
3053  025444  077303                               SOB   R3,3$
3054  025446  062705  000060                    ADD     #'0,R5           ; CONVERT TO ASCII 0 TO 9...
3055  025452  120527  000071                    CMPB    R5,#'9
3056  025456  003402                            BLE     4$
```

```
                                        ADD     #7,R5           ;...AND A(10) TO F(15)...
                                4$:     MOVB    R5,(R0)+        ;...AND STUFF IT.
                                        TSTB    (R0)
                                        BNE     2$              ; LOOP 'TIL 4 CHARS ASSEMBLED...
                                        JSR     PC,KBDOUT       ;...THEN DUMP IT.
                                        HEXTXT
                                        MOV     (SP)+,R5        ; RESTORE R5.
                                        RTS     PC

                                KBDIN:  MOV     #BUF1,R1        ; TEMP ASCII BUFFER.
                                1$:     EMT+5                   ; CHAR -> R0.
                                        MOVB    R0,(R1)
                                        BEQ     1$
                                        CMPB    R0,#3
                                        BEQ     3$              ; EXIT ON <^C>.
                                        CMPB    R0,#15
                                        BEQ     2$              ; BR ON TERMINATOR.
                                        EMT+4                   ; OTHERWISE, ECHO...
                                        INC     R1              ;...BUMP POINTER...
                                        BR      1$              ;...AND LOOP.
                                2$:     CLRB    (R1)            ; TERMINATE INPUT STRING...
                                        EMT+7                   ;...ECHO CRLF...
                                        RTS     PC              ;...AND RETURN TO CALLER.
                                3$:     DOCLN                   ; EXIT ON <^C>.
                                                                        TRAP    C$DCLN

                                KBDOUT: PRINTF  #PURE,@(SP)
                                                                        MOV     @(SP), (SP)
                                                                        MOV     #PURE, (SP)
                                                                        MOV     #2, (SP)
                                                                        MOV     SP,R0
                                                                        TRAP    C$PNTF
                                                                        ADD     #6,SP
                                        ADD     #2,(SP)
                                        RTS     PC

                        NOANS:  .ASCIZ  /  TLM:0 DOESN'T ANSWER/<15><12>
                        QO:     .ASCII  <15><12>
                                .ASCIZ  /  TLM UNIT (0 TO 7)    ? /
                        Q1:     .ASCIZ  /  SECTOR (1 TO 6)      ? /
                        Q2:     .ASCIZ  /  HEX OUTPUT (Y OR N)  ? /
                        HEADR:  .ASCII  <15><12><11>/UNIT: /
```

```
                025750  035124     040
3092            025753     060  020040  042523  HUNIT:  .ASCII  /0  SECTOR: /
                025760  052103  051117  020072
3093            025766  020061  050040  047522  HSECT:  .ASCIZ  /1  PROM ID: /
                025774  020115  042111  020072
                026002     000
3094            026003     011  040503  023516  CANTFIND: .ASCIZ <11>/CAN'T FIND HEADEP/<15><12>
                026010  020124  044506  042116
                026016  044040  040505  042504
                026024  006522  000012
3095            026030  000011                  TAB:    .ASCIZ  <11>
3096            026032  005015     000          CRLF:   .ASCIZ  <15><12>
3097            026035     101  041502  000104  HEXTXT: .ASCIZ  /ABCD/
3098            026042  047445  000066          OCTTXT: .ASCIZ  /%06/
3099            026046  052045     000          PURE:   .ASCIZ  /%T/
3100                    026052                          .EVEN
```

```
3102                                            .SBTTL
3103                                            .SBTTL  SUPERVISOR DISPATCH TABLE.
3104                                            ;
3105                                            ; SUBROUTINE TO ADJUST THE NUMBER OF TESTS TO RUN IAW CONTROLLER TYPE.
3106                                            ;
3107  026052  013700  003402           ADJTN:  MOV     RLTYP,R0        ; GET RL TYPE.
3108  026056  001414                           BEQ     2$              ; BR IF RL11.
3109  026060  020027  000002                   CMP     R0,#RLV12
3110  026064  103406                           BLO     1$              ; BR IF RLV11.
3111  026066  005737  003344                   TST     TCSR
3112  026072  001403                           BEQ     1$              ; BR IF TLM BYPASSED.
3113  026074  012700  000043                   MOV     #35.,R0         ; RLV12 WITH TLM RUNS ALL.
3114  026100  000402                           SKP2
3115  026102  012700  000035           1$:     MOV     #29.,R0         ; RLV12 OR RLV11 RUN THRU 29.
3116  026106  000402                           SKP2
3117  026110  012700  000026           2$:     MOV     #22.,R0         ; RL11 RUN THRU 22.
3118  026114  010037  026122                   MOV     R0,L$DISPATCH-2 ;...AND SET LAST TEST NUMBER.
3119  026120  000207                           RTS     PC
3120
3121  026122                                    DISPATCH T$TESTNUM
 (4)  026122  000043                                                    .WORD   35
 (3)  026124                                                    L$DISPATCH::
 (6)  026124  012172                                                    .WORD   T1
 (6)  026126  012256                                                    .WORD   T2
 (6)  026130  012342                                                    .WORD   T3
 (6)  026132  012426                                                    .WORD   T4
 (6)  026134  012512                                                    .WORD   T5
 (6)  026136  012634                                                    .WORD   T6
 (6)  026140  013076                                                    .WORD   T7
 (6)  026142  013216                                                    .WORD   T8
 (6)  026144  013322                                                    .WORD   T9
 (6)  026146  013410                                                    .WORD   T10
 (6)  026150  013514                                                    .WORD   T11
 (6)  026152  013742                                                    .WORD   T12
 (6)  026154  014126                                                    .WORD   T13
 (6)  026156  014274                                                    .WORD   T14
 (6)  026160  014466                                                    .WORD   T15
 (6)  026162  014670                                                    .WORD   T16
 (6)  026164  015114                                                    .WORD   T17
 (6)  026166  015340                                                    .WORD   T18
 (6)  026170  015630                                                    .WORD   T19
 (6)  026172  016024                                                    .WORD   T20
 (6)  026174  016232                                                    .WORD   T21
 (6)  026176  016320                                                    .WORD   T22
 (6)  026200  016466                                                    .WORD   T23
 (6)  026202  016622                                                    .WORD   T24
 (6)  026204  016706                                                    .WORD   T25
 (6)  026206  017034                                                    .WORD   T26
 (6)  026210  017734                                                    .WORD   T27
 (6)  026212  020360                                                    .WORD   T28
 (6)  026214  020554                                                    .WORD   T29
 (6)  026216  021350                                                    .WORD   T30
 (6)  026220  021722                                                    .WORD   T31
 (6)  026222  022126                                                    .WORD   T32
 (6)  026224  022274                                                    .WORD   T33
 (6)  026226  022554                                                    .WORD   T34
```

```
   (6)  026230  023436                                          .WORD   T35
```

```
                        .SBTTL  GLOBAL ERROR HANDLERS AND ASCII TEXT
                        ;
                        ; THESE ARE THE HANDLERS FOR THE VARIOUS ERROR SIGNATURES.
                        ;
                                BGNMSG  ERRSIG
                                                                        ERRSIG::
3128  026232  000137  027360   NOSIG:  JMP     CKERLT          ; SOMF HAVE NO SIGNATURE.
3130  026236  000137  027152   ERR0:   JMP     ALLREGS         ; ALL REGISTERS.
3132  026242                   ERR1:   PRINTB  #FRMT2,GDDAT    ; BUS-TIMEOUT REG ADDR.
 (8)  026242  013746  003432                                            MOV     GDDAT,-(SP)
 (7)  026246  012746  027553                                            MOV     #FRMT2,-(SP)
 (6)  026252  012746  000002                                            MOV     #2,-(SP)
 (3)  026256  010600                                                    MOV     SP,R0
 (4)  026260  104414                                                    TRAP    C$PNTB
 (4)  026262  062706  000006                                            ADD     #6,SP
3133  026266  000137  027360           JMP     CKERLT
3135  026272                   ERR2:   PRINTB  #FRMT4,GDDAT,BDDAT      ; EXP'D VS REC'D.
 (9)  026272  013746  003434                                            MOV     BDDAT,(SP)
 (8)  026276  013746  003432                                            MOV     GDDAT,-(SP)
 (7)  026302  012746  027654                                            MOV     #FRMT4,-(SP)
 (6)  026306  012746  000003                                            MOV     #3,(SP)
 (3)  026312  010600                                                    MOV     SP,R0
 (4)  026314  104414                                                    TRAP    C$PNTB
 (4)  026316  062706  000010                                            ADD     #10,SP
3136  026322  000137  027360           JMP     CKERLT
3138  026326                   ERR3:   PRINTB  #FRMT5,BDDAT    ; MAINT SEQ FAILED STATE.
 (8)  026326  013746  003434                                            MOV     BDDAT,(SP)
 (7)  026332  012746  027710                                            MOV     #FRMT5,(SP)
 (6)  026336  012746  000002                                            MOV     #2,(SP)
 (3)  026342  010600                                                    MOV     SP,R0
 (4)  026344  104414                                                    TRAP    C$PNTB
 (4)  026346  062706  000006                                            ADD     #6,SP
3139  026352  000137  027152           JMP     ALLREGS
3141  026356                   ERR4:   PRINTB  #FRMT4,GDDAT,BDDAT      ; EXP'D VS REC'D...
 (9)  026356  013746  003434                                            MOV     BDDAT,(SP)
 (8)  026362  013746  003432                                            MOV     GDDAT,(SP)
 (7)  026366  012746  027654                                            MOV     #FRMT4,(SP)
 (6)  026372  012746  000003                                            MOV     #3,-(SP)
 (3)  026376  010600                                                    MOV     SP,R0
 (4)  026400  104414                                                    TRAP    C$PNTB
 (4)  026402  062706  000010                                            ADD     #10,SP
3142  026406  000137  027152           JMP     ALLREGS                 ;...AND REGISTERS.
3144  026412                   ERR6:   PRINTB  #FRMT3,#EM99    ; CS ERRORS.
 (8)  026412  012746  034456                                            MOV     #EM99,-(SP)
 (7)  026416  012746  027571                                            MOV     #FRMT3,(SP)
 (6)  026422  012746  000002                                            MOV     #2,(SP)
 (3)  026426  010600                                                    MOV     SP,R0
 (4)  026430  104414                                                    TRAP    C$PNTB
 (4)  026432  062706  000006                                            ADD     #6,SP
3145  026436  000137  027152           JMP     ALLREGS
```

```
3146
3147  026442
 (8)  026442  013746  003424          ERR7:   PRINTB  #FRMT6,TMP0      ; CPU PRIORITY
 (7)  026446  012746  027742                  MOV     TMP0,-(SP)
 (6)  026452  012746  000002                  MOV     #FRMT6,-(SP)
 (3)  026456  010600                          MOV     #2,-(SP)
 (4)  026460  104414                          MOV     SP,R0
 (4)  026462  062706  000006                  TRAP    C$PNTB
                                              ADD     #6,SP
3148  026466  000137  027360                  JMP     CKERLT
3149
3150  026472                          ERR10:  PRINTB  #FRMT3A,#EM99   ; EXPECTED OPI ERRORS.
 (8)  026472  012746  034456                  MOV     #EM99,(SP)
 (7)  026476  012746  027613                  MOV     #FRMT3A,(SP)
 (6)  026502  012746  000002                  MOV     #2,-(SP)
 (3)  026506  010600                          MOV     SP,R0
 (4)  026510  104414                          TRAP    C$PNTB
 (4)  026512  062706  000006                  ADD     #6,SP
3151  026516  000137  027152                  JMP     ALLREGS
3152
3153  026522                          ERR11:  PRINTB  #FRMT10,BDDAT   ; OPI TIMING ERROR.
 (8)  026522  013746  003434                  MOV     BDDAT,(SP)
 (7)  026526  012746  027775                  MOV     #FRMT10,-(SP)
 (6)  026532  012746  000002                  MOV     #2,-(SP)
 (3)  026536  010600                          MOV     SP,R0
 (4)  026540  104414                          TRAP    C$PNTB
 (4)  026542  062706  000006                  ADD     #6,SP
3154  026546  000137  027360                  JMP     CKERLT
3155
3156  026552  004737  026662          ERR12:  JSR     PC,PRTPA       ; STAT WRONG ON NXM (ABOVE 32K)...
3157  026556                                  PRINTB  #FRMT21,#EM99  ;...OR BBS7/NXM FAILURE.
 (8)  026556  012746  034456                  MOV     #EM99,(SP)
 (7)  026562  012746  030313                  MOV     #FRMT21,(SP)
 (6)  026566  012746  000002                  MOV     #2,(SP)
 (3)  026572  010600                          MOV     SP,R0
 (4)  026574  104414                          TRAP    C$PNTB
 (4)  026576  062706  000006                  ADD     #6,SP
3158  026602  000137  027152                  JMP     ALLREGS
3159
3160  026606  004737  026662          ERR13:  JSR     PC,PRTPA       ; UNEX STAT ERRORS (ABOVE 32K).
3161  026612  000137  026412                  JMP     ERR6
3162
3163  026616  004737  026662          ERR14:  JSR     PC,PRTPA       ; DATA WRONG (ABOVE 32K).
3164  026622                                  PRINTB  #FRMT22,TMP0,GDDAT,BDDAT ; EXPD VS RECD.
 (10) 026622  013746  003434                  MOV     BDDAT,-(SP)
 (9)  026626  013746  003432                  MOV     GDDAT,(SP)
 (8)  026632  013746  003424                  MOV     TMP0,(SP)
 (7)  026636  012746  030350                  MOV     #FRMT22,(SP)
 (6)  026642  012746  000004                  MOV     #4,-(SP)
 (3)  026646  010600                          MOV     SP,R0
 (4)  026650  104414                          TRAP    C$PNTB
 (4)  026652  062706  000012                  ADD     #12,SP
3165  026656  000137  027152                  JMP     ALLREGS
3166                                    ;
3167                                    ; PACK AND PRINT 22 BIT PHYSICAL ADDRESS FROM TMP1,,TMP2.
3168                                    ;
3169  026662  005737  003430          PRTPA:  TST     TMP2           ; BIT 15 ON ??
```

```
3170  026666  100003                    BPL     1$                  ; NO, "C" = 0.
3171  026670  062737  100000  003430    ADD     #BIT15,TMP2         ; YES, "C" = 1.
3172  026676  006137  003426    1$:     ROL     TMP1                ; TMP1 = ADDR<21:15>...
3173  026702                            PRINTB  #FRMT20,TMP1,TMP2 ; TMP2 = ADDR<14:00>.
 (9)  026702  013746  003430                                                MOV     TMP2,-(SP)
 (8)  026706  013746  003426                                                MOV     TMP1,(SP)
 (7)  026712  012746  030253                                                MOV     #FRMT20,(SP)
 (6)  026716  012746  000003                                                MOV     #3,-(SP)
 (3)  026722  010600                                                        MOV     SP,R0
 (4)  026724  104414                                                        TRAP    C$PNTB
 (4)  026726  062706  000010                                                ADD     #10,SP
3174  026732  000207                    RTS     PC
3175                                  ;
3176                                  ; TLM UNIQUE ERROR SIGNATURES.
3177                                  ;
3178  026734  004737  027114    ERR20:  JSR     PC,E2022            ; BAD STATUS AFTER READ,READNH,WRTCHK...
3179  026740                    ERR20A:                             ;...OR AFTER SEEK,GET STATUS,WRITE.
3180  026740                            PRINTX  #FRMT26,TMP1,#EM99
 (9)  026740  012746  034456                                                MOV     #EM99,(SP)
 (8)  026744  013746  003426                                                MOV     TMP1,-(SP)
 (7)  026750  012746  030462                                                MOV     #FRMT26,-(SP)
 (6)  026754  012746  000003                                                MOV     #3,(SP)
 (3)  026760  010600                                                        MOV     SP,R0
 (4)  026762  104415                                                        TRAP    C$PNTX
 (4)  026764  062706  000010                                                ADD     #10,SP
3181  026770                            PRINTX  #FRMT27             ; CRLF.
 (7)  026770  012746  030503                                                MOV     #FRMT27,-(SP)
 (6)  026774  012746  000001                                                MOV     #1,-(SP)
 (3)  027000  010600                                                        MOV     SP,R0
 (4)  027002  104415                                                        TRAP    C$PNTX
 (4)  027004  062706  000004                                                ADD     #4,SP
3182  027010  000137  027152                    JMP     ALLREGS
3183
3184  027014  004737  027114    ERR21:  JSR     PC,E2022            ; READ HEADER FAILS.
3185  027020  000137  027360            JMP     CKERLT
3186
3187  027024  004737  027114    ERR22:  JSR     PC,E2022            ; DATA FROM TLM WRONG.
3188  027030                            PRINTX  #FRMT14,TMP1,TMP0,GDDAT,BDDAT
 (11) 027030  013746  003434                                                MOV     BDDAT,(SP)
 (10) 027034  013746  003432                                                MOV     GDDAT,(SP)
 (9)  027040  013746  003424                                                MOV     TMP0,(SP)
 (8)  027044  013746  003426                                                MOV     TMP1,(SP)
 (7)  027050  012746  030103                                                MOV     #FRMT14,(SP)
 (6)  027054  012746  000005                                                MOV     #5,(SP)
 (3)  027060  010600                                                        MOV     SP,R0
 (4)  027062  104415                                                        TRAP    C$PNTX
 (4)  027064  062706  000014                                                ADD     #14,SP
3189  027070                            PRINTX  #FRMT27             ; CRLF
 (7)  027070  012746  030503                                                MOV     #FRMT27,(SP)
 (6)  027074  012746  000001                                                MOV     #1,(SP)
 (3)  027100  010600                                                        MOV     SP,R0
 (4)  027102  104415                                                        TRAP    C$PNTX
 (4)  027104  062706  000004                                                ADD     #4,SP
3190  027110  000137  027152                    JMP     ALLREGS
3191
3192  027114                    E2022:  PRINTX  #FRMT25,#TSEC,TMP2,#TPEAK
```

```
   (10) 027114  012746  036654                                                  MOV     @TPEAK,(SP)
   (9)  027120  013746  003430                                                  MOV     TMP2,(SP)
   (8)  027124  012746  036575                                                  MOV     @TSEC,(SP)
   (7)  027130  012746  030453                                                  MOV     @FRMT25,-(SP)
   (6)  027134  012746  000004                                                  MOV     #4,-(SP)
   (3)  027140  010600                                                          MOV     SP,R0
   (4)  027142  104415                                                          TRAP    C$PNTX
   (4)  027144  062706  000012                                                  ADD     #12,SP
 3193   027150  000207                  RTS     PC
 3194                                   ;
 3195                                   ; DISPLAY ALL REGISTERS BEFORE AND AFTER ERROR (IF REQ'D),
 3196                                   ; CHECK IF ERROR LIMIT EXCEEDED AND EXIT ACCORDINGLY.
 3197                                   ;
 3198   027152  005000          ALLREGS: CLR    R0                      ; DISABLE...
 3199   027154  023727  003402  000003          CMP     RLTYP,#RLV12X
 3200   027162  001002                  BNE     1$
 3201   027164  012700  000045          MOV     #'%,R0                  ;...OR ENABLE THE EXTRA REGISTER.
 3202   027170  110037  027477          1$:     MOVB    R0,FRMT1A               ; ENABLE/DISABLE BAE TEXT.
 3203   027174  110037  027541          MOVB    R0,FRMT1C
 3204   027200                          PRINTB  #FRMT1                  ; HEADER.
   (7)  027200  012746  027440                                                  MOV     @FRMT1,(SP)
   (6)  027204  012746  000001                                                  MOV     #1,-(SP)
   (3)  027210  010600                                                          MOV     SP,R0
   (4)  027212  104414                                                          TRAP    C$PNTB
   (4)  027214  062706  000004                                                  ADD     #4,SP
 3205   027220                          PRINTB  #FRMT1B,#BEREG,B.CS,B.BA,B.DA,B.MP,B.BAE
   (13) 027220  013746  003360                                                  MOV     B.BAE,(SP)
   (12) 027224  013746  003356                                                  MOV     B.MP,(SP)
   (11) 027230  013746  003354                                                  MOV     B.DA,(SP)
   (10) 027234  013746  003352                                                  MOV     B.BA,-(SP)
   (9)  027240  013746  003350                                                  MOV     B.CS,-(SP)
   (8)  027244  012746  030506                                                  MOV     #BEREG,(SP)
   (7)  027250  012746  027510                                                  MOV     @FRMT1B,(SP)
   (6)  027254  012746  000007                                                  MOV     #7,(SP)
   (3)  027260  010600                                                          MOV     SP,R0
   (4)  027262  104414                                                          TRAP    C$PNTB
   (4)  027264  062706  000020                                                  ADD     #20,SP
 3206   027270                  PRINTB  #FRMT1B,#AFREG,E.CS,E.BA,E.DA,E.MP,E.BAE
   (13) 027270  013746  003376                                                  MOV     E.BAE,(SP)
   (12) 027274  013746  003372                                                  MOV     E.MP,(SP)
   (11) 027300  013746  003370                                                  MOV     E.DA,-(SP)
   (10) 027304  013746  003366                                                  MOV     E.BA,-(SP)
   (9)  027310  013746  003364                                                  MOV     E.CS,(SP)
   (8)  027314  012746  030527                                                  MOV     #AFREG,(SP)
   (7)  027320  012746  027510                                                  MOV     @FRMT1B,(SP)
   (6)  027324  012746  000007                                                  MOV     #7,(SP)
   (3)  027330  010600                                                          MOV     SP,R0
   (4)  027332  104414                                                          TRAP    C$PNTB
   (4)  027334  062706  000020                                                  ADD     #20,SP
 3207   027340                  PRINTB  #FRMT1D
   (7)  027340  012746  027550                                                  MOV     @FRMT1D,(SP)
   (6)  027344  012746  000001                                                  MOV     #1,-(SP)
   (3)  027350  010600                                                          MOV     SP,R0
   (4)  027352  104414                                                          TRAP    C$PNTB
   (4)  027354  062706  000004                                                  ADD     #4,SP
 3208                                   ; FALL THRU...
```

```
                                        ;
                                        ;...AND CHECK ERROR LIMIT (IF ANY).
                                        ;
3212  027360                          CKERLT: INLOOP                                          TRAP    C$INLP
 (3)  027360  104420
                                                BCOMPLETE 3$            ; RETURN IF LOOPING...
3213  027362                                                                                  BCS     3$
 (2)  027362  103425
3214  027364  005737  003304                   TST     ERRLMT
3215  027370  001422                           BEQ     3$              ;...OR NO ERROR LIMIT SET
3216  027372  005277  154070                   INC     @ERPOINT        ;COUNT THE UNIT ERROR DETECTED
3217  027376  027737  154064  003304           CMP     @ERPOINT,ERRLMT ;REACHED THE ERROR LIMIT?
3218  027404  002414                           BLT     3$              ;NO, RETURN
3219  027406                                   PRINTF  #FRMT23         ; "ERROR LIMIT EXCEEDED"
 (7)  027406  012746  030422                                                               MOV     #FRMT23,-(SP)
 (6)  027412  012746  000001                                                               MOV     #1,-(SP)
 (3)  027416  010600                                                                       MOV     SP,R0
 (4)  027420  104417                                                                       TRAP    C$PNTF
 (4)  027422  062706  000004                                                               ADD     #4,SP
3220  027426                          2$:     DODU    UNITST          ;DROP THE UNIT...
 (3)  027426  013700  003322                                                               MOV     UNITST,R0
 (3)  027432  104451                                                                       TRAP    C$DODU
                                                DOCLN                   ;...AND ABORT.
3221  027434                                                                              TRAP    C$DCLN
 (3)  027434  104444
                                        3$:     ENDMSG                  ; OR RETURN TO CALLER.
3222  027436                                                                    L10063:
 (3)  027436                                                                               TRAP    C$MSG
 (3)  027436  104423
```

```
                                        ;
                                        ; FORMATTED ASCII TEXT.
                                        ;
3227  027440  040445  042522  044507  FRMT1:  .ASCII  /%AREGISTERS      CS      BA      DA      MP/
      027446  052123  051105  004523
      027454  020040  051503  020011
      027462  041040  004501  020040
      027470  040504  020011  046440
      027476     120
3228  027477     045  004501  020040  FRMT1A: .ASCIZ  /%A       BAE/
      027504  040502  000105
3229  027510  047045  052045  047445  FRMT1B: .ASCII  /%N%T%06%S2%06%S2%06%S2%06/
      027516  022466  031123  047445
      027524  022466  031123  047445
      027532  022466  031123  047445
      027540     066
3230  027541     045  031123  047445  FRMT1C: .ASCIZ  /%S2%06/
      027546  000066
3231  027550  047045     000          FRMT1D: .ASCIZ  /%N/
3232  027553     045  040501  042104  FRMT2:  .ASCIZ  /%AADDR: %06%N/
      027560  035122  022440  033117
      027566  047045     000
3233  027571     045  042501  051122  FRMT3:  .ASCIZ  /%AERRORS SET:%T%N/
      027576  051117  020123  042523
      027604  035124  052045  047045
      027612     000
3234  027613     045  042501  050130  FRMT3A: .ASCIZ  /%AEXP'D: ERR HNF OPI  REC'D:%T%N/
      027620  042047  020072  051105
      027626  020122  047110  020106
      027634  050117  020111  051040
      027642  041505  042047  022472
      027650  022524  000116
3235  027654  040445  054105  023520  FRMT4:  .ASCIZ  /%AEXP'D: %06%A REC'D: %06%N/
      027662  035104  022440  033117
      027670  040445  051040  041505
      027676  042047  020072  047445
      027704  022466  000116
3236  027710  040445  052101  044440  FRMT5:  .ASCIZ  /%AAT INTERNAL STATE %D2%N/
      027716  052116  051105  040516
      027724  020114  052123  052101
      027732  020105  042045  022462
      027740  000116
3237  027742  040445  052101  050040  FRMT6:  .ASCIZ  /%AAT PROCESSOR LEVEL %01%N/
      027750  047522  042503  051523
      027756  051117  046040  053105
      027764  046105  022440  030517
      027772  047045     000
3238  027775     045  047501  044520  FRMT10: .ASCII  /%AOPI FLAG RECEIVED AT%D4%A MSEC.%N/
      030002  043040  040514  020107
      030010  042522  042503  053111
      030016  042105  040440  022524
      030024  032104  040445  046440
      030032  042523  027103  047045
3239  030040  040445  054105  042520          .ASCIZ  /%AEXPECTED FROM 155 TO 650 MSEC.%N/
      030046  052103  042105  043040
      030054  047522  020115  032461
```

```
        030062  020065  047524  033040
        030070  030065  046440  042523
        030076  027103  047045     000
 3240   030103     045  022516  053501  FRMT14: .ASCIZ  /%N%AWORD: %03%A  ADDR: %06%A  EXP'D: %06%A  REC'D: %06/
        030110  051117  035104  022440
        030116  031517  040445  020040
        030124  042101  051104  020072
        030132  047445  022466  020101
        030140  042440  050130  042047
        030146  020072  047445  022466
        030154  020101  051040  041505
        030162  042047  020072  047445
        030170  000066
 3241   030172  047045  042045  022463  FRMT15: .ASCIZ  /%N%D3%A WORDS BAD OUT OF 255 WORDS TRANSFERRED%N/
        030200  020101  047527  042122
        030206  020123  040502  020104
        030214  052517  020124  043117
        030222  031040  032465  053440
        030230  051117  051504  052040
        030236  040522  051516  042506
        030244  051122  042105  047045
        030252     000
 3242   030253     045  040501  020124  FRMT20: .ASCIZ  /%AAT PHYSICAL ADDRESS: %03%05%N/
        030260  044120  051531  041511
        030266  046101  040440  042104
        030274  042522  051523  020072
        030302  047445  022463  032517
        030310  047045     000
 3243   030313     045  042501  050130  FRMT21: .ASCIZ  /%AEXP'D: ERR NXM  REC'D:%T%N/
        030320  042047  020072  051105
        030326  020122  054116  020115
        030334  051040  041505  042047
        030342  022472  022524  000116
 3244   030350  040445  047527  042122  FRMT22: .ASCIZ  /%AWORD: %03%A  EXP'D: %06%A  REC'D: %06%N/
        030356  020072  047445  022463
        030364  020101  042440  050130
        030372  042047  020072  047445
        030400  022466  020101  051040
        030406  041505  042047  020072
        030414  047445  022466  000116
 3245   030422  040445  051105  047522  FRMT23: .ASCIZ  /%AERROR LIMIT EXCEEDED%N/
        030430  020122  044514  044515
        030436  020124  054105  042503
        030444  042105  042105  047045
        030452     000
 3246
 3247   030453     045  022524  022524  FRMT25: .ASCIZ  /%T%T%T/
        030460  000124
 3248   030462  047045  052045  040445  FRMT26: .ASCIZ  /%N%T%A  REC'D:%T/
        030470  020040  042522  023503
        030476  035104  052045     000
 3249   030503     045  000116          FRMT27: .ASCIZ  /%N/
 3250                                             .EVEN
 3251                                    ;
 3252                                    ; PURE (UNFORMATTED) ASCII TEXT.
 3253                                    ;
```

```
3254  030506 042502 047506 042522  BEREG:  .ASCIZ  /BEFORE COMMAND: /
      030514 041440 046517 040515
      030522 042116 020072    000
3255  030527    101 052106 051105  AFREG:  .ASCIZ  /AFTER COMMAND:  /
      030534 041440 046517 040515
      030542 042116 020072 000040
3256  030550 047503 052116 047522  CRTIM:  .ASCIZ  /CONTROLLER TIMED OUT/
      030556 046114 051105 052040
      030564 046511 042105 047440
      030572 052125    000
3257  030575    104 044522 042526  DRTIM:  .ASCIZ  /DRIVE READY TIMED OUT/
      030602 051040 040505 054504
      030610 052040 046511 042105
      030616 047440 052125    000
3258  030623    040 051105 000122  CERR:   .ASCIZ  / ERR/
3259  030630 042040 053122    000  DEMES:  .ASCIZ  / DRV/
3260  030635    040 054116 000115  NXMMES: .ASCIZ  / NXM/
3261  030642 050040 051101    000  PARMES: .ASCIZ  / PAR/
3262  030647    040 046104 000124  DLTMES: .ASCIZ  / DLT/
3263  030654 044040 043116    000  HNFMES: .ASCIZ  / HNF/
3264  030661    040 041504 041522  DCRCMES: .ASCIZ / DCRC/
      030666    000
3265  030667    040 041510 041522  HCRCMES:.ASCIZ  / HCRC/
      030674    000
3266  030675    040 050117 000111  OPIMES: .ASCIZ  / OPI/
3267  030702 047040 047117 000105  NON:    .ASCIZ  / NONE/
3268
3269  030710 047503 052116 047522  EMO:    .ASCIZ  /CONTROLLER DOESN'T ANSWER    CAN'T TEST/
      030716 046114 051105 042040
      030724 042517 047123 052047
      030732 040440 051516 042527
      030740 020122 026455 041440
      030746 047101 052047 052040
      030754 051505 000124
3270  030760 040503 020116 047516  EM1:    .ASCIZ  /CAN NOT ADDRESS RLCS/
      030766 020124 042101 051104
      030774 051505 020123 046122
      031002 051503    000
3271  031005    103 047101 047040  EM2:    .ASCIZ  /CAN NOT ADDRESS RLBA/
      031012 052117 040440 042104
      031020 042522 051523 051040
      031026 041114 000101
3272  031032 040503 020116 047516  EM3:    .ASCIZ  /CAN NOT ADDRESS RLDA/
      031040 020124 042101 051104
      031046 051505 020123 046122
      031054 040504    000
3273  031057    103 047101 047040  EM4:    .ASCIZ  /CAN NOT ADDRESS RLMP/
      031064 052117 040440 042104
      031072 042522 051523 051040
      031100 046514 000120
3274  031104 040503 020116 047516  EM4A:   .ASCIZ  /CAN NOT ADDRESS RLBAE/
      031112 020124 042101 051104
      031120 051505 020123 046122
      031126 040502 000105
3275  031132 040502 020105 044123  EM4B:   .ASCIZ  /BAE SHOULD BE DISABLED -  IT'S NOT !!!/
      031140 052517 042114 041040
```

```
                031146  020105  044504  040523
                031154  046102  042105  026440
                031162  020055  052111  051447
                031170  047040  052117  020440
                031176  020441     000
 3276           031201     122  041514  020123  EM5:    .ASCIZ  \RLCS READ/WRITE ERROR (BIT 0 DON'T CARE)\
                031206  042522  042101  053457
                031214  044522  042524  042440
                031222  051122  051117  024040
                031230  044502  020124  020060
                031236  047504  023516  020124
                031244  040503  042522  000051
 3277           031252  046122  040502  051040  EM6:    .ASCIZ  \RLBA READ/WRITE ERROR\
                031260  040505  027504  051127
                031266  052111  020105  051105
                031274  047522  000122
 3278           031300  046122  040504  051040  EM7:    .ASCIZ  \RLDA READ/WRITE ERROR\
                031306  040505  027504  051127
                031314  052111  020105  051105
                031322  047522  000122
 3279           031326  046122  040502  020105  EM8:    .ASCIZ  \RLBAE READ/WRITE ERROR\
                031334  042522  042101  053457
                031342  044522  042524  042440
                031350  051122  051117     000
 3280           031355     122  041114  020101  EM10:   .ASCIZ  /RLBA ERROR AFTER MAINT. FUNCTION/
                031362  051105  047522  020122
                031370  043101  042524  020122
                031376  040515  047111  027124
                031404  043040  047125  052103
                031412  047511  000116
 3281           031416  046122  040504  042440  EM12:   .ASCIZ  /RLDA ERROR AFTER MAINT. FUNCTION/
                031424  051122  051117  040440
                031432  052106  051105  046440
                031440  044501  052116  020056
                031446  052506  041516  044524
                031454  047117     000
 3282           031457     122  041514  020123  EM14:   .ASCIZ  /RLCS INCORRECT AFTER NO OP/
                031464  047111  047503  051122
                031472  041505  020124  043101
                031500  042524  020122  047516
                031506  047455  000120
 3283           031512  047516  047455  020120  EM14A:  .ASCIZ  /NO-OP ALTERED RLBA, RLDA, OR RLMP/
                031520  046101  042524  042522
                031526  020104  046122  040502
                031534  020054  046122  040504
                031542  020054  051117  051040
                031550  046514  000120
 3284           031554  040515  047111  042524  EM14B:  .ASCIZ  /MAINTENANCE MODE SEQUENCER FAILED/
                031562  040516  041516  020105
                031570  047515  042504  051440
                031576  050505  042525  041516
                031604  051105  043040  044501
                031612  042514  000104
 3285           031616  047516  044440  052116  EM15.   .ASCIZ  /NO INTERRUPT ON FUNCTION COMPLETE/
                031624  051105  052522  052120
                031632  047440  020116  052506
```

```
                031640  041516  044524  047117
                031646  041440  046517  046120
                031654  052105  000105
3286            031660  047111  042524  051122  EM16:   .ASCIZ  /INTERRUPT PRIORITY FAILURE/
                031666  050125  020124  051120
                031674  047511  044522  054524
                031702  043040  044501  052514
                031710  042522     000
3287            031713     106  051117  042503  EM17:   .ASCIZ  /FORCED OPI -  INTERRUPT NOT RECEIVED/
                031720  020104  050117  020111
                031726  026455  044440  052116
                031734  051105  052522  052120
                031742  047040  052117  051040
                031750  041505  044505  042526
                031756  000104
3288            031760  051103  020103  043117  EM20:   .ASCIZ  /CRC OF DA+3 INCORRECT (SERIAL DATA PATH)/
                031766  042040  025501  020063
                031774  047111  047503  051122
                032002  041505  020124  051450
                032010  051105  040511  020114
                032016  040504  040524  050040
                032024  052101  024510     000
3289            032031     103  041522  047440  EM21:   .ASCIZ  /CRC OF CRC OF DA+4 INCORRECT (SERIAL DATA PATH)/
                032036  020106  051103  020103
                032044  043117  042040  025501
                032052  020064  047111  047503
                032060  051122  041505  020124
                032066  051450  051105  040511
                032074  020114  040504  040524
                032102  050040  052101  024510
                032110     000
3290            032111     106  046111  027514  EM22:   .ASCIZ  \FILL/EMPTY FIFO DATA TRANSFER ERROR\
                032116  046505  052120  020131
                032124  044506  047506  042040
                032132  052101  020101  051124
                032140  047101  043123  051105
                032146  042440  051122  051117
                032154     000
3291            032155     106  046111  027514  EM23:   .ASCIZ  \FILL/EMPTY FIFO LAST WORD+1 INCORRECT\
                032162  046505  052120  020131
                032170  044506  047506  046040
                032176  051501  020124  047527
                032204  042122  030453  044440
                032212  041516  051117  042522
                032220  052103     000
3292            032223     105  051122  051117  EM27:   .ASCII  /ERROR STATUS INCORRECT AFTER FORCED OPI/<15><12>
                032230  051440  040524  052524
                032236  020123  047111  047503
                032244  051122  041505  020124
                032252  043101  042524  020122
                032260  047506  041522  042105
                032266  047440  044520  005015
3293            032274  047111  052111  040511          .ASCII  /INITIAL WORD COUNT WAS /
                032302  020114  047527  042122
                032310  041440  052517  052116
                032316  053440  051501     040
```

```
3294  032323  000074  032440  030461  EM27X:  .ASCIZ  /< 511./
      032330  000056
3295  032332  050117  020111  046106  EM31:   .ASCIZ  /OPI FLAG NOT RECEIVED/
      032340  043501  047040  052117
      032346  051040  041505  044505
      032354  042526  000104
3296  032360  050117  020111  044524  EM32:   .ASCIZ  /OPI TIMING INCORRECT/
      032366  044515  043516  044440
      032374  041516  051117  042522
      032402  052103  000000
3297  032405  000127  044522  044524  EM44:   .ASCIZ  /WRITING RLMP MODIFIED RLCS/
      032412  043516  051040  046514
      032420  020120  047515  044504
      032426  044506  042105  051040
      032434  041514  000123
3298  032440  051127  052111  047111  EM45:   .ASCIZ  /WRITING RLMP MODIFIED RLBA/
      032446  020107  046122  050115
      032454  046440  042117  043111
      032462  042511  020104  046122
      032470  040502  000000
3299  032473  000127  044522  044524  EM46:   .ASCIZ  /WRITING RLMP MODIFIED RLDA/
      032500  043516  051040  046514
      032506  020120  047515  044504
      032514  044506  042105  051040
      032522  042114  000101
3300  032526  051127  052111  047111  EM47:   .ASCIZ  /WRITING RLMP MODIFIED RLBAE/
      032534  020107  046122  050115
      032542  046440  042117  043111
      032550  042511  020104  046122
      032556  040502  000105
3301  032562  046122  051503  053440  EM50:   .ASCIZ  /RLCS WRONG AFTER WRITING RLBAE/
      032570  047522  043516  040440
      032576  052106  051105  053440
      032604  044522  044524  043516
      032612  051040  041114  042501
      032620  000000
3302  032621  000122  041114  042501  EM51:   .ASCIZ  /RLBAE MODIFIED RLBA/
      032626  046440  042117  043111
      032634  042511  020104  046122
      032642  040502  000000
3303  032645  000122  041114  042501  EM52:   .ASCIZ  /RLBAE MODIFIED RLDA/
      032652  046440  042117  043111
      032660  042511  020104  046122
      032666  040504  000000
3304  032671  000042  044502  020124  EM61:   .ASCIZ  /"BIT SET" ON RLCS YIELDS WRONG RESULT/
      032676  042523  021124  047440
      032704  020116  046122  051503
      032712  054440  042511  042114
      032720  020123  051127  047117
      032726  020107  042522  052523
      032734  052114  000000
3305  032737  000042  044502  020124  EM62:   .ASCIZ  /"BIT CLEAR" ON RLCS YIELDS WRONG RESULT/
      032744  046103  040505  021122
      032752  047440  020116  046122
      032760  051503  054440  042511
      032766  042114  020123  051127
```

```
                032774  047117  020107  042522
                033002  052523  052114     000
3306            033007     042  044502  020124  EM63.   .ASCIZ  /"BIT SET" ON RLBA YIELDS WRONG RESULT/
                033014  042523  021124  047440
                033022  020116  046122  040502
                033030  054440  042511  042114
                033036  020123  051127  047117
                033044  020107  042522  052523
                033052  052114     000
3307            033055     042  044502  020124  EM64:   .ASCIZ  /"BIT CLEAR" ON RLBA YIELDS WRONG RESULT/
                033062  046103  040505  021122
                033070  047440  020116  046122
                033076  040502  054440  042511
                033104  042114  020123  051127
                033112  047117  020107  042522
                033120  052523  052114     000
3308            033125     042  044502  020124  EM65:   .ASCIZ  /"BIT SET" ON RLDA YIELDS WRONG RESULT/
                033132  042523  021124  047440
                033140  020116  046122  040504
                033146  054440  042511  042114
                033154  020123  051127  047117
                033162  020107  042522  052523
                033170  052114     000
3309            033173     042  044502  020124  EM66:   .ASCIZ  /"BIT CLEAR" ON RLDA YIELDS WRONG RESULT/
                033200  046103  040505  021122
                033206  047440  020116  046122
                033214  040504  054440  042511
                033222  042114  020123  051127
                033230  047117  020107  042522
                033236  052523  052114     000
3310            033243     042  044502  020124  EM67:   .ASCIZ  /"BIT SET" ON RLBAE YIELDS WRONG RESULT/
                033250  042523  021124  047440
                033256  020116  046122  040502
                033264  020105  044531  046105
                033272  051504  053440  047522
                033300  043516  051040  051505
                033306  046125  000124
3311            033312  041042  052111  041440  EM68:   .ASCIZ  /"BIT CLEAR" ON RLBAE YIELDS WRONG RESULT/
                033320  042514  051101  020042
                033326  047117  051040  041114
                033334  042501  054440  042511
                033342  042114  020123  051127
                033350  047117  020107  042522
                033356  052523  052114     000
3312            033363     102  051525  051055  EM69:   .ASCIZ  /BUS-RESET DIDN'T CLEAR RLCS/
                033370  051505  052105  042040
                033376  042111  023516  020124
                033404  046103  040505  020122
                033412  046122  051503     000
3313            033417     102  051525  051055  EM70:   .ASCIZ  /BUS-RESET DIDN'T CLEAR RLBA/
                033424  051505  052105  042040
                033432  042111  023516  020124
                033440  046103  040505  020122
                033446  046122  040502     000
3314            033453     102  051525  051055  EM71:   .ASCIZ  /BUS-RESET DIDN'T CLEAR RLDA/
                033460  051505  052105  042040
```

```
                033466  042111  023516  020124
                033474  046103  040505  020122
                033502  046122  040504     000
 3315           033507     102  051525  051055  EM71A:  .ASCIZ  /BUS-RESET DIDN'T CLEAR RLBAE/
                033514  051505  052105  042040
                033522  042111  023516  020124
                033530  046103  040505  020122
                033536  046122  040502  000105
 3316           033544  051127  052111  047111  EM72:   .ASCIZ  /WRITING RLCS MODIFIED RLBA/
                033552  020107  046122  051503
                033560  046440  042117  043111
                033566  042511  020104  046122
                033574  040502     000
 3317           033577     127  044522  044524  EM73:   .ASCIZ  /WRITING RLCS MODIFIED RLDA/
                033604  043516  051040  041514
                033612  020123  047515  044504
                033620  044506  042105  051040
                033626  042114  000101
 3318           033632  046122  040502  020105  EM73A:  .ASCIZ  /RLBAE WRONG AFTER WRITING RLCS/
                033640  051127  047117  020107
                033646  043101  042524  020122
                033654  051127  052111  047111
                033662  020107  046122  051503
                033670     000
 3319           033671     127  044522  044524  EM74:   .ASCIZ  /WRITING RLBA MODIFED RLCS/
                033676  043516  051040  041114
                033704  020101  047515  044504
                033712  042506  020104  046122
                033720  051503     000
 3320           033723     127  044522  044524  EM75:   .ASCIZ  /WRITING RLBA MODIFED RLDA/
                033730  043516  051040  041114
                033736  020101  047515  044504
                033744  042506  020104  046122
                033752  040504     000
 3321           033755     127  044522  044524  EM75A:  .ASCIZ  /WRITING RLBA MODIFIED RLBAE/
                033762  043516  051040  041114
                033770  020101  047515  044504
                033776  044506  042105  051040
                034004  041114  042501     000
 3322           034011     127  044522  044524  EM76:   .ASCIZ  /WRITING RLDA MODIFIED RLCS/
                034016  043516  051040  042114
                034024  020101  047515  044504
                034032  044506  042105  051040
                034040  041514  000123
 3323           034044  051127  052111  047111  EM77:   .ASCIZ  /WRITING RLDA MODIFIED RLBA/
                034052  020107  046122  040504
                034060  046440  042117  043111
                034066  042511  020104  046122
                034074  040502     000
 3324           034077     127  044522  044524  EM77A:  .ASCIZ  /WRITING RLDA MODIFIED RLBAE/
                034104  043516  051040  042114
                034112  020101  047515  044504
                034120  044506  042105  051040
                034126  041114  042501     000
 3325           034133     116  046530  042440  EM80:   .ASCII  /NXM ERROR FLAG DIDN'T SET/
                034140  051122  051117  043040
```

```
                034146  040514  020107  044504
                034154  047104  052047  051440
                034162  052105
3326            034164  020054  040502  045516  EM80X:  .ASCIZ  /, BANK SELECT 7 (BBS7) FAILS/
                034172  051440  046105  041505
                034200  020124  020067  041050
                034206  051502  024467  043040
                034214  044501  051514     000
3327            034221     123  040524  052524  EM90:   .ASCIZ  /STATUS INCORRECT AFTER NON-EX MEMORY ACCESS/
                034226  020123  047111  047503
                034234  051122  041505  020124
                034242  043101  042524  020122
                034250  047516  026516  054105
                034256  046440  046505  051117
                034264  020131  041501  042503
                034272  051523     000
3328            034275     125  042516  050130  EM91:   .ASCIZ  /UNEXPECTED STATUS ERROR ON EXT MEMORY ACCESS/
                034302  041505  042524  020104
                034310  052123  052101  051525
                034316  042440  051122  051117
                034324  047440  020116  054105
                034332  020124  042515  047515
                034340  054522  040440  041503
                034346  051505  000123
3329            034352  040504  040524  044440  EM92:   .ASCIZ  \DATA INCORRECT TO/FROM EXTENDED MEMORY\
                034360  041516  051117  042522
                034366  052103  052040  027517
                034374  051106  046517  042440
                034402  052130  047105  042504
                034410  020104  042515  047515
                034416  054522     000
3330            034421     125  042516  050130  EM98:   .ASCIZ  /UNEXPECTED CONTROLLER ERRORS/
                034426  041505  042524  020104
                034434  047503  052116  047522
                034442  046114  051105  042440
                034450  051122  051117  000123
3331            034456  000170                  EM99:   .BLKB   120.
3332                                            ;
3333                                            ; TLM UNIQUE ERROR TEXT.
3334                                            ;
3335            034646  052502  020123  044524  EM100:  .ASCIZ  /BUS TIME-OUT ON TLM ADDRESS/
                034654  042515  047455  052125
                034662  047440  020116  046124
                034670  020115  042101  051104
                034676  051505  000123
3336            034702  046124  020115  052123  EM100A: .ASCII  /TLM STATUS WRONG/<15><12>
                034710  052101  051525  053440
                034716  047522  043516  005015
3337            034724  044103  041505  020113          .ASCIZ  /CHECK THAT CABLE IS IN PLACE !!!/
                034732  044124  052101  041440
                034740  041101  042514  044440
                034746  020123  047111  050040
                034754  040514  042503  020440
                034762  020441     000
3338            034765     120  047522  020115  EM100B: .ASCII  /PROM ID WRONG/<15><12>
                034772  042111  053440  047522
```

```
                035000  043516  005015
3339            035004  044103  041505  020113          .ASCIZ  /CHECK THAT CORRECT PROM SET IS INSTALLED !!!/
                035012  044124  052101  041440
                035020  051117  042522  052103
                035026  050040  047522  020115
                035034  042523  020124  051511
                035042  044440  051516  040524
                035050  046114  042105  020440
                035056  020441     000
3340            035061     123  051531   46103  EM101:   .ASCIZ  \SYSCLK<11> AND/OR PWROK<8> NOT SET IN TLM STATUS\
                035066  036113  030461  020076
                035074  047101  027504  051117
                035102  050040  051127  045517
                035110  034074  020076  047516
                035116  020124  042523  020124
                035124  047111  052040  046514
                035132  051440  040524  052524
                035140  000123
3341            035142  051104  053111  020105  EM102:   .ASCIZ  /DRIVE READY STATUS BIT<0> INCORRECT IN RLCSR/
                035150  042522  042101  020131
                035156  052123  052101  051525
                035164  041040  052111  030074
                035172  020076  047111  047503
                035200  051122  041505  020124
                035206  047111  051040  041514
                035214  051123     000
3342            035217     104  044522  042526  EM103:   .ASCIZ  /DRIVE ERROR STATUS BITS<15:14> INCORRECT IN RLCSR/
                035224  042440  051122  051117
                035232  051440  040524  052524
                035240  020123  044502  051524
                035246  030474  035065  032061
                035254  020076  047111  047503
                035262  051122  041505  020124
                035270  047111  051040  041514
                035276  051123     000
3343            035301     104  044522  042526  EM104:   .ASCII  /DRIVE /
                035306     040
3344            035307     060  051440  046105  EM104X:  .ASCIZ  /0 SELECT BITS<10:9> INCORRECT IN TLM STATUS/
                035314  041505  020124  044502
                035322  051524  030474  035060
                035330  037071  044440  041516
                035336  051117  042522  052103
                035344  044440  020116  046124
                035352  020115  052123  052101
                035360  051525     000
3345            035363     104  044522  042526  EM105:   .ASCIZ  /DRIVE COMMAND (GET STATUS) INCORRECT IN TLM CSR+2/
                035370  041440  046517  040515
                035376  042116  024040  042507
                035404  020124  052123  052101
                035412  051525  020051  047111
                035420  047503  051122  041505
                035426  020124  047111  052040
                035434  046514  041440  051123
                035442  031053     000
3346            035445     122  052105  051125  EM106:   .ASCIZ  /RETURNED DRIVE STATUS INCORRECT IN RLMP/
                035452  042516  020104  051104
```

```
        035460  053111  020105  052123
        035466  052101  051525  044440
        035474  041516  051117  042522
        035502  052103  044440  020116
        035510  046122  050115     000
3347    035515     105  051122  051117  EM107:  .ASCIZ  /ERRORS IN RLCSR AFTER "GET STATUS" COMMAND/
        035522  020123  047111  051040
        035530  041514  051123  040440
        035536  052106  051105  021040
        035544  042507  020124  052123
        035552  052101  051525  020042
        035560  047503  046515  047101
        035566  000104
3348    035570  051104  053111  020105  EM110:  .ASCIZ  /DRIVE COMMAND (SEEK DIFF) INCORRECT IN TLM CSR+2/
        035576  047503  046515  047101
        035604  020104  051450  042505
        035612  020113  044504  043106
        035620  020051  047111  047503
        035626  051122  041505  020124
        035634  047111  052040  046514
        035642  041440  051123  031053
        035650     000
3349    035651     105  051122  051117  EM111:  .ASCIZ  /ERRORS IN RLCSR AFTER "SEEK" COMMAND/
        035656  020123  047111  051040
        035664  041514  051123  040440
        035672  052106  051105  021040
        035700  042523  045505  020042
        035706  047503  046515  047101
        035714  000104
3350    035716  051127  052111  020105  EM112:  .ASCIZ  /WRITE GATE<13> OR DATA ACTIVE<12> DIDN'T SET DURING WRITE/
        035724  040507  042524  030474
        035732  037063  047440  020122
        035740  040504  040524  040440
        035746  052103  053111  036105
        035754  031061  020076  044504
        035762  047104  052047  051440
        035770  052105  042040  051125
        035776  047111  020107  051127
        036004  052111  000105
3351    036010  051127  052111  020105  EM113:  .ASCIZ  /WRITE GATE ERROR BIT<14> SET DURING WRITE/
        036016  040507  042524  042440
        036024  051122  051117  041040
        036032  052111  030474  037064
        036040  051440  052105  042040
        036046  051125  047111  020107
        036054  051127  052111  000105
3352    036062  051127  052111  020105  EM113A: .ASCIZ  /WRITE GATE BIT<13> STILL SET AFTER WRITE DONE/
        036070  040507  042524  041040
        036076  052111  030474  037063
        036104  051440  044524  046114
        036112  051440  052105  040440
        036120  052106  051105  053440
        036126  044522  042524  042040
        036134  047117  000105
3353    036140  051105  047522  051522  EM114:  .ASCIZ  /ERRORS IN RLCSR AFTER WRITE DATA COMMAND/
        036146  044440  020116  046122
```

```
        036154  051503  020122  043101
        036162  042524  020122  051127
        036170  052111  020105  040504
        036176  040524  041440  046517
        036204  040515  042116     000
3354    036211     105  051122  051117  EM115:  .ASCII  /ERROR STATUS INCORRECT AFTER READ DATA/
        036216  051440  040524  052524
        036224  020123  047111  047503
        036232  051122  041505  020124
        036240  043101  042524  020122
        036246  042522  042101  042040
        036254  052101     101
3355    036257     000  044527  044124  EM115X: .ASCIZ  <0>/WITHOUT HEADER CHECK/
        036264  052517  020124  042510
        036272  042101  051105  041440
        036300  042510  045503     000
3356    036305     122  040505  020104  EM116:  .ASCIZ  /READ HEADER CAN'T FIND TLM SECTOR 2 (CYL1,SEC6)/
        036312  042510  042101  051105
        036320  041440  047101  052047
        036326  043040  047111  020104
        036334  046124  020115  042523
        036342  052103  051117  031040
        036350  024040  054503  030514
        036356  051454  041505  024466
        036364     000
3357    036365     122  041505  044505  EM117:  .ASCII  /RECEIVED DATA INCORRECT AFTER READ/
        036372  042526  020104  040504
        036400  040524  044440  041516
        036406  051117  042522  052103
        036414  040440  052106  051105
        036422  051040  040505     104
3358    036427     000  044527  044124  EM117X: .ASCIZ  <0>/WITHOUT HEADER CHECK/
        036434  052517  020124  042510
        036442  042101  051105  041440
        036450  042510  045503     000
3359    036455     105  051122  051117  EM118:  .ASCIZ  /ERROR STATUS INCORRECT AFTER WRITE-CHECK/
        036462  051440  040524  052524
        036470  020123  047111  047503
        036476  051122  041505  020124
        036504  043101  042524  020122
        036512  051127  052111  026505
        036520  044103  041505  000113
3360    036526  051120  046517  051040  EM119:  .ASCII  /PROM READ FAILURE/<15><12>
        036534  040505  020104  040506
        036542  046111  051125  006505
        036550     012
3361    036551     103  047101  052047          .ASCII  /CAN'T FIND SECTOR /
        036556  043040  047111  020104
        036564  042523  052103  051117
        036572     040
3362    036573     061     000          EM119X: .ASCIZ  /1/
3363    036575     123  041505  047524  TSEC:   .ASCII  /SECTOR /
        036602  020122
3364    036604  026061  000040          TSECX:  .ASCIZ  /1, /
3365    036610  047516  044515  040516  TCLKO:  .ASCIZ  /NOMINAL CLOCK/
        036616  020114  046103  041517
```

```
                036624  000113
 3366           036626  040506  052123  041440  TCLK1:  .ASCIZ  /FAST CLOCK/
                036634  047514  045503     000
 3367           036641     123  047514  020127  TCLK2:  .ASCIZ  /SLOW CLOCK/
                036646  046103  041517  000113
 3368           036654  026440  046440  054101  TPEAK:  .ASCIZ  / - MAX PEAK SHIFT/
                036662  050040  040505  020113
                036670  044123  043111  000124
 3369           036676  054105  023520  035104  EXPHCRC: .ASCIZ /EXP'D: ERR HCRC OPI/
                036704  042440  051122  044040
                036712  051103  020103  050117
                036720  000111
 3370           036722  054105  023520  035104  EXPDCRC: .ASCIZ /EXP'D: ERR DCRC/
                036730  042440  051122  042040
                036736  051103  000103
 3371           036742  054105  023520  035104  EXPNON: .ASCIZ  /EXP'D: NONE/
                036750  047040  047117  000105
 3372                                            .EVEN
```

```
                                        .SBTTL  DEVELOPMENT/DEBUG AIDS
                                        .SBTTL
                                        .SBTTL          RLV12 EMULATOR
                                        ;
                                        ; FOR DEBUGGING (UNDER MIMIC) WE'LL EMULATE THE ACTION
                                        ; THAT WOULD OCCUR ON A MAINT/NOP FUNCTION.
                                        ;
                                        ;LWL01 .IIF P2, .PRINT .                ; FOR DEBUG, MIMIC FLAG IS HERE...
036756  000000                          MI""C:  0                       ;...SET NZ TO ENABLE EMULATOR.
                                        ;
036760  023727  003402  000000  EMURLV: CMP     RLTYP,#RL11
036766  001004                          BNE     1$                      ; BR IF RLV
036770  042777  036000  144326          BIC     #36000,@RLCS            ; RL11 -- NOP    CLEAR ERROR BITS.
036776  000517                          BR      7$                      ; AND THAT'S ALL.

037000  027727  144326  177001  1$:     CMP     @RLMP,#-511.            ; WORD COUNT RIGHT ??
037006  001404                          BEQ     2$                      ; YES.
037010  052777  112000  144306          BIS     #ERR!HNF!OPI,@RLCS ; NO SET TH E ERROR BITS...
037016  000507                          BR      7$                      ;...AND RETURN.

037020  020527  020470          2$:     CMP     R5,#BB7                 ; CALLED FROM BBS7 TEST ??
037024  001004                          BNE     3$                      ; SKIP IF NOT.
037026  052777  120000  144270          BIS     #ERR!NXM,@RLCS          ; YES, SET ERROR BITS...
037034  000500                          BR      7$                      ;...AND RETURN.

037036  012701  004366          3$:     MOV     #BUF1,R1                ; STANDARD SRC...
037042  012702  005366                  MOV     #BUF2,R2                ;...AND DST...
037046  012703  037310                  MOV     #DFIFO,R3               ;...AND DUMMY FIFO POINTERS.
037052  023701  010416                  CMP     BA16,R1                 ; IS BA STANDARD (INTERNAL) ??
037056  001411                          BEQ     4$                      ; BR IF SO.
037060  012701  100000                  MOV     #100000,R1              ; POINT TO BUF1 IF EXT MEMORY.
037064  012702  101000                  MOV     #101000,R2              ; DITTO BUF2 (RECEIVER).
037070  012737  037160  000004          MOV     #5$,ERRVEC              ; SET TRAP CATCHER.
037076  005237  177572                  INC     MMR0                    ;********** KT ON **************
037102  062777  000002  144216  4$:     ADD     #2,@RLBA                ; SIMULATE INC BA...                *
037110  005577  144220                  ADC     @RLBAE                  ;...OVERFLOWING INTO BAE.           *
037114  012123                          MOV     (R1)+,(R3)+             ; MEM => FIFO (256 WORDS).          *
037116  000240                          240
037120  020327  040310                  CMP     R3,#DFIFO+1000          ;                                   *
037124  103766                          BLO     4$                      ;                                   *
037126  012703  037310                  MOV     #DFIFO,R3               ; RESET FIFO POINTER.               *
037132  062777  000002  144166  14$:    ADD     #2,@RLBA                ;                                   *
037140  005577  144170                  ADC     @RLBAE                  ; INC BA.                           *
037144  012322                          MOV     (R3)+,(R2)+             ; FIFO => MEM (255 WORDS).          *
037146  000240                          240
037150  020327  040306                  CMP     R3,#DFIFO+776           ;                                   *
037154  103766                          BLO     14$                     ; LOOP...                           *
037156  000406                          BR      6$                      ;...UNTIL DONE.                     *
037160  052777  120000  144136  5$:     BIS     #ERR!NXM,@RLCS          ; ON NXM TRAP, SET ERROR BITS...*
037166  012716  037174                  MOV     #6$,(SP)                ;...AND CONTINUE.                   *
037172  000002                          RTI                             ;                                   *
037174  005037  177572          6$:     CLR     MMR0                    ;********** KT OFF **************
037200  012737  010670  000004          MOV     #TRAP4,ERRVEC           ; RESET TRAP CATCHER.
037206  017700  144116                  MOV     @RLDA,R0
037212  062700  000006                  ADD     #6,R0                   ; ADJUST FINAL DA...
037216  110077  144106                  MOVB    R0,@RLDA                ;...LO BYTE ONLY.
```

```
 3430  037222  013777  003442  144102          MOV     GDCRC3,@RLMP    ; FAKE THE 1ST...
 3431  037230  013737  003444  003374          MOV     GDCRC4,E.MP1    ;...AND 2ND CRC WORDS.
 3432  037236  052777  000200  144060  7$:     BIS     #CRDY,@RLCS     ; SET DONE BIT...
 3433  037244  032777  000100  144052          BIT     #INTEN,@RLCS    ; INTERRUPT EXPECTED ??
 3434  037252  001410                          BEQ     8$              ; NO.
 3435  037254                                  GETPRI  R0
                                                                                 TRAP    C$GPRI
  (3)  037254  104440
 3436  037256  042700  177437                  BIC     #^CPRI07,R0     ; MASK PRIORITY BITS.
 3437  037262  020037  003340                  CMP     R0,BPRIOR
 3438  037266  002002                          BGE     8$              ; BR IF CPU >= RL BR LEVEL
 3439  037270  005237  010700                  INC     INTFLG          ; OTHERWISE, SET INT RECEIVED FLAG.
 3440  037274  000207                  8$:     RTS     PC              ;...AND RETURN.
 3441
 3442  037276  000005                  DUMMY:  .BLKW   5               ; THESE ARE THE DUMMY REGISTERS.
 3443  037310  000400                  DFIFO:  .BLKW   256.            ; AND A DUMMY FIFO.
```

```
                                ;
                                ; FINALLY, A SMALL PATCH BLOCK...
                                ;
040310  040310                  PATCH:  .
        040412                          .= .+100
                                ;
                                ;...AND THAT'S ALL THERE IS TO IT !!!
                                ;
040412                                  LASTAD          ; LAST USED ADDRESS.
 (2)                                                                            .EVEN
 (2)    040412  040434                                                          .WORD T$FREE
 (2)    040414  000007                                                          .WORD T$SIZE
 (3)    040416                  L$LAST::
                                ;*******************************************************************************
                                ;
                                ; NOW CAN A SINGLE UNIT P TABLE, SO WE CAN RUN UNDER
                                ; DEFAULT CONDITIONS, AND CALL THE BINARY A .BIC FILE.
                                ;
040416                                  BGNSETUP 1              ; 1 UNIT ONLY...
040416                                  BGNPTAB                 ;...USING THE FOLLOWING DEFAULTS.
 (4)    040416  000000                                                          .WORD   0
 (3)    040420  000005                                                          .WORD   L10066 ./2-1
 (3)    040422                                                          L10064:
040422  174400                          .WORD   174400          ; (0) CSR ADDRESS.
040424  000160                          .WORD   160             ; (2) VECTOR.
040426  000200                          .WORD   PRI04           ; (4) PRIORITY.
040430  000000                          .WORD   0               ; (6) DRIVE (BITS 8,9,10).
040432  000003                          .WORD   3               ; (10) CONTROLLER TYPE (RLV12 W/BAE).
040434                                  ENDPTAB
 (3)    040434                                                          L10066:
040434                                  ENDSETUP
                                ;
                                ;*******************************************************************************
        000001                          .END
```

```
ADJTN   026052          578  3107#
ADLIM   002542 )        106   124#
ADR   = 000020 G        155#
AFREG   030527         3206  3255#
AFTER   010140          751#   928   931
ALLREG  027152         3130  3139  3142  3145  3151  3158  3165  3182  3190  3198#
ASSEMB= 000010           17
BA16    010416          582*   800   821#  2238*  2254  2257*  2293*  2373*  2382*  3402
BA22    010420          583*   803   811   822#  2243*  2253  2258*  2292*  2374*  2383*
BB7     020470         2246#  3394
BCCFBK  003406          257#   987*   993*   996*   999  1003
BCSR    003336          237#   533*   536*   584
BDDAT   003434          268#  1296*  1297*  1298  1302*  1305*  1310*  1332*  1333*  1334  1360*  1361  1383*
                       1384  1409*  1411  1439*  1440*  1441  1452*  1453*  1454  1481*  1482  1490*  1491
                       1514*  1515  1523*  1524  1551*  1552  1561*  1562  1591*  1592  1597*  1598  1605*
                       1606  1631*  1632*  1633  1638*  1639  1646*  1647  1672*  1673*  1674  1679*  1680
                       1687*  1688  1714*  1715*  1716  1721*  1722  1727*  1728  1735*  1736  1761*  1762*
                       1763  1768*  1772*  1805*  1806  1822*  1823  1867*  1871  1878  1887*  1976*  1977*
                       1982  1984  2062*  2063  2068*  2073  2078*  2079  2084*  2085  2094*  2095  2103
                       2114*  2115  2190*  2191  2199  2350*  2351  2403*  2405  2409*  2412  2417*  2420
                       2425*  2428  2438*  2444  2473*  2476  2479*  2481  2509*  2512  2542*  2545  2552*
                       2553  2555  2557  2683*  2789*  2794*  2796  3135  3138  3141  3153  3164  3188
BEFORE  010062          737#   814  2467  2503  2538  2643  2669  2760
BEGPAT  003672          287#  1353  1379  1405  1473  1509  1545
BEREG   030506         3205  3254#
BITO  = 000001 G         66    68   108   111   118   155#   189   193  1358  2601  2726
BIT00 = 000001 G        155#
BIT01 = 000002 G        155#
BIT02 = 000004 G        155#
BIT03 = 000010 G        155#
BIT04 = 000020 G        155#
BIT05 = 000040 G        155#
BIT06 = 000100 G        155#
BIT07 = 000200 G        155#
BIT08 = 000400 G        155#
BIT09 = 001000 G        155#
BIT1  = 000002 G         64   117   155#   182   184   186   188   192   359  2596  2721
BIT10 = 002000 G        155#   173  2439
BIT11 = 004000 G        155#   171   172
BIT12 = 010000 G        155#   169   170  2543
BIT13 = 020000 G        155#   167   168  2543  2554  2557
BIT14 = 040000 G        115    155#   166  2554  2606  2731
BIT15 = 100000 G        114    155#   165  3171
BIT2  = 000004 G        116    155#   183   184   187   188   194   360  2591  2716
BIT3  = 000010 G        155#   185   186   187   188   191   361
BIT4  = 000020 G        155#   197   362
BIT5  = 000040 G        155#   363
BIT6  = 000100 G        155#   179   195   196   364
BIT7  = 000200 G        155#   178
BIT8  = 000400 G        155#   175   177   365
BIT9  = 001000 G        155#   176   177   366  2439
BOE   = 000400 G        155#
BPRIOR  003340          238#   538*   596  1869  3437
BRL     002351           71    83#
BUFEND  006366          459#  2061  3014  3017  3034
BUF1    004366          457#   582   821   837   861  2090  2140  2153  2186  2257  2297  2382  2536
```

```
                    2677    2759    2932    2960    2974    2993    3032    3066    3399
BUF2    005366      458#    2091    2166    2187    2633    2642    2678    3015    3036    3400
BVEC    003342      239#     537*    594
B.BA    003352      243#     739*   1810    3205
B.BAE   003360      246#     745*   3205
B.CS    003350      242#     737*    738*   1803    3205
B.DA    003354      244#     740*   1812    2067    2070    3205
B.MP    003356      245#     742*   1814    3205
CACREG  003670      283#     571*
CALBCC  003410      258#     955     963     968    1009*
CALCRC  010760      945#    1792    1844    1873    1907    1940    1970    2015    2030    2042    2236    2312
CANTFI  026003     2990    3094#
CERR    030623      681    3258#
CHKDAT  023346     2653    2673    2677#
CKERLT  027360     3128    3133    3136    3148    3154    3185    3212#
CLKRTI  010702      599     914#
CLRTLM  024204     2462    2498    2529    2793    2813#
CONT    007114      485     580#
CPUTYP  003400      254#    513*    563     566    1968
CRCEND  004272      421#
CRDY  = 000200      178#    622     627     798     815     922    1282    1432    1434    1589    1621    1662    1703
                   1752    2435    2450    2465    2468    2501    2504    2533    2539    2639    2644    2658    2659
                   2667    2670    2756    2761    3432
CRLF    026032     3096#
CRTIM   030550      929    3256#
CSEND   004200      389#    1339    1459
CSPAT   004102      358#    1324    1430
CSRA    002323       69      81#
C$AU  = 000052       17#     656
C$AUTO= 000061       17#     616
C$BRK = 000022       17#
C$BSEG= 000004       17#    1325    1354    1380    1406    1431    1474    1510    1546    1870    2050    2164    2296
                   2632    2755
C$BSUB= 000002       17#    2009    2024    2039    2137    2150
C$CEFG= 000045       17#
C$CLCK= 000062       17#
C$CLEA= 000012       17#     632
C$CLOS= 000035       17#
C$CLP1= 000006       17#    1595    1601    1636    1642    1677    1683    1719    1725    1731    1766    1771    1809
                   1817    1828    1886    1922    1950    2057    2066    2076    2082    2088    2104    2178    2184
                   2200    2371
C$CVEC= 000036       17#
C$DCLN= 000044       17#     522    1168    1190    1212    1234    1259    3080    3221
C$DODU= 000051       17#     615    1167    1189    1211    1233    1258    3220
C$DRPT= 000024       17#     518
C$DU  = 000053       17#     644
C$EDIT= 000003       17#      50
C$ERDF= 000055       17#     929    1263    1300    1304    1307    1312    1336    1363    1386    1413    1443    1456
                   1484    1493    1517    1526    1554    1564    1594    1600    1608    1635    1641    1649    1676
                   1682    1690    1718    1724    1730    1738    1765    1770    1774    1808    1816    1827    1852
                   1885    1921    1949    1980    1987    2056    2065    2075    2081    2087    2101    2117    2177
                   2183    2197    2255    2336    2341    2369    2407    2414    2422    2430    2446    2478    2483
                   2487    2514    2518    2549    2559    2561    2565    2589    2651    2665    2675    2686    2714
                   2768    2800    2802    2804
C$ERHR= 000056       17#
C$ERRO= 000060       17#
```

```
C$ERSF= 000054   17#   614   1166   1188   1210   1232   1257
C$ERSO= 000057   17#
C$ESCA= 000010   17#  1337   1364   1387   1414   1444   1457   1485   1494   1518   1527   1555   1565
C$ESEG= 000005   17#  1341   1368   1391   1418   1461   1498   1531   1569   1890   2118   2209   2372
                2693  2769
C$ESUB= 000003   17#  2020   2035   2045   2146   2159
C$ETST= 000001   17#  1169   1191   1213   1235   1264   1313   1342   1369   1392   1419   1462   1499
                1532  1570   1609   1650   1691   1739   1775   1829   1854   1892   1929   1952   1988
                2121  2213   2259   2384   2451   2488   2519   2566   2695   2771
C$EXIT= 000032   17#  1818   2046   2060   2160   2232   2284   2626   2751
C$GETB= 000026   17#
C$GETW= 000027   17#
C$GMAN= 000043   17#
C$GPHR= 000042   17#   531
C$GPLO= 000030   17#
C$GPRI= 000040   17#  3435
C$INIT= 000011   17#   601
C$INLP= 000020   17#  3212
C$MANI= 000050   17#
C$MEM = 000031   17#
C$MSG = 000023   17#  3222
C$OPEN= 000034   17#
C$PNTB= 000014   17#  2112   2208   3132   3135   3138   3141   3144   3147   3150   3153   3157   3164
                3173  3204   3205   3206   3207
C$PNTF= 000017   17#   640    652   1135   1136   1137   2876   3043   3082   3219
C$PNTS= 000016   17#
C$PNTX= 000015   17#  2103   2199   3180   3181   3188   3189   3192
C$QIO = 000377   17#
C$RDBU= 000007   17#
C$REFG= 000047   17#   474    476    478    480    482
C$RESE= 000033   17#
C$REVI= 000003   17#    50
C$RFLA= 000021   17#
C$RPT = 000025   17#  1144
C$SEFG= 000046   17#
C$SPRI= 000041   17#   631   1280   1843   1853   1871   1891   1942   1951   2171   2210
C$SVEC= 000037   17#
C$TPRI= 000013   17#
DAHS  = 000020  197#
DCRC  = 004000  171#   706   2858
DCRCME  030661   708    713   3264#
DEMES   030630   686   3259#
DERFLG  003362   247#   670*   684*
DERR  = 040000   166#   682   1283   1285   1329   1331   1436   1438   1449   1451   1622   1624   1663
                1665  1704   1706   1753   1755   2426
DFIFO   037310  3401  3412   3414   3419   3443#
DFN   = 000264   205#   929#  1263#  1300#  1304#  1307#  1312#  1336#  1363#  1386#  1413#  1443#  1456#
                1484#  1493#  1517#  1526#  1554#  1564#  1594#  1600#  1608#  1635#  1641#  1649#  1676#
                1682#  1690#  1718#  1724#  1730#  1738#  1765#  1770#  1774#  1808#  1816#  1827#  1852#
                1885#  1921#  1949#  1980#  1987#  2056#  2065#  2075#  2081#  2087#  2101#  2117#  2177#
                2183#  2197#  2255#  2336#  2341#  2369#  2407#  2414#  2422#  2430#  2446#  2478#  2483#
                2487#  2514#  2518#  2549#  2559#  2561#  2565#  2589#  2651#  2665#  2675#  2686#  2714#
                2768#  2800#  2802#  2804#
DHEAD   024642  2884*  2916#  2969*  3020
DIAGMC= 000000    17
DLT   = 010000   169#   698
```

```
DLTMES  030647            700    705   3262#
DLYCNT  003462            279#   577*   775
DMA1    017034           2009#
DMA2    017102           2024#
DMA3    017150           2039#
DMODE   024640           2915#  2976*  2979*  2985   2998
DOIT    025136           2981#
DRDY  = 000001            189#  1297   1333   1440   1453   1632   1673   1715   1762   2410   2418
DRIVE   003346            241#   539*   797
DRN     002363             73     84#
DROPPE  003464            280#   494*   520    637    639*   649    651*
DRST  = 000010            191#  2466   2475
DRTIM   030575           3257#
DS0   = 000000            174#
DS1   = 000400            175#  2447
DS2   = 001000            176#
DS3   = 001400            177#
DTABL   024644           2884   2917#
DUMMY   037276            536   3442#
EF.CON= 000036 G          155#   482
EF.NEW= 000035 G          155#   480
EF.PWR= 000034 G          155#   474
EF.RES= 000037 G          155#   478
EF.STA= 000040 G          155#   476
EMURLV  036760            818   3384#
EM0     030710            614   3269#
EM1     030760           1166   3270#
EM10    031355           2065   3280#
EM100   034646           2800   3335#
EM100A  034702           2802   3336#
EM100B  034765           2804   3338#
EM101   035061           2407   3340#
EM102   035142           2414   2422   3341#
EM103   035217           2430   3342#
EM104   035301           2446   3343#
EM104X  035307           2433*  2448*  3344#
EM105   035363           2478   3345#
EM106   035445           2483   3346#
EM107   035515           2487   3347#
EM110   035570           2514   3348#
EM111   035651           2518   3349#
EM112   035716           2549   3350#
EM113   036010           2561   3351#
EM113A  036062           2559   3352#
EM114   036140           2565   3353#
EM115   036211           2651   2675   3354#
EM115X  036257           2637*  2656*  3355#
EM116   036305           2665   3356#
EM117   036365           2686   3357#
EM1 7X  036427           2638*  2657*  3358#
EM118   036455           2768   3359#
EM119   036526           2589   2714   3360#
EM119X  036573           2588*  2713*  3362#
EM12    031416           2075   3281#
EM14    031457           1808   3282#
EM14A   031512           1816   3283#
```

```
EM14B   031554          1827    3284#
EM15    031616          1852    2183    3285#
EM16    031660          1885    3286#
EM17    031713          1949    3287#
EM2     031005          1188    3271#
EM20    031760          2081    3288#
EM21    032031          2087    3289#
EM22    032111          2101    2197    3290#
EM23    032155          2117    3291#
EM27    032223          1921    3292#
EM27X   032323          1910*   1911*   1926*   1927*   3294#
EM3     031032          1210    3272#
EM31    032332          1980    3295#
EM32    032360          1987    3296#
EM4     031057          1232    3273#
EM4A    031104          1257    3274#
EM4B    031132          1263    3275#
EM44    032405          1718    3297#
EM45    032440          1724    3298#
EM46    032473          1730    3299#
EM47    032526          1738    3300#
EM5     031201          1336    3276#
EM50    032562          1765    3301#
EM51    032621          1770    3302#
EM52    032645          1774    3303#
EM6     031252          1363    3277#
EM61    032671          1443    3304#
EM62    032737          1456    3305#
EM63    033007          1484    3306#
EM64    033055          1493    3307#
EM65    033125          1517    3308#
EM66    033173          1526    3309#
EM67    033243          1554    3310#
EM68    033312          1564    3311#
EM69    033363          1300    3312#
EM7     031300          1386    3278#
EM70    033417          1304    3313#
EM71    033453          1307    3314#
EM71A   033507          1312    3315#
EM72    033544          1594    3316#
EM73    033577          1600    3317#
EM73A   033632          1608    3318#
EM74    033671          1635    3319#
EM75    033723          1641    3320#
EM75A   033755          1649    3321#
EM76    034011          1676    3322#
EM77    034044          1682    3323#
EM77A   034077          1690    3324#
EM8     031326          1413    3279#
EM80    034133          2255    3325#
EM80X   034164          2233*   2235*   3326#
EM90    034221          2336    3327#
EM91    034275          2341    3328#
EM92    034352          2369    3329#
EM98    034421          2056    2177    3330#
EM99    034456           671    3144    3150    3157    3180    3331#
```

```
ENDDAT  004364          453#
ENDPAT  004100          354#  1366  1389  1416  1496  1529  1567
ENVIRN  006526          500#
ERCOUN  003470          282#   495   523
ERPCIN  003466          281#   523*  528*  3216*  3217
ERR   = 100000          165#  1285  1331  1438  1451  1624  1665  1706  1755  1916  2247  2331  2426
                       2858  2864  3391  3396  3422
ERRLMT  003304          144#  3214  3217
ERRSIG  026232 G        3127#
ERRVEC= 000004          159#   597*  598*  2300*  2311*  2947*  3406*  3426*
ERR0    026236          929  1816  1949  1980  2101  2183  2197  3130#
ERR1    026242          614  1166  1188  1210  1232  1257  1263  2800  3132#
ERR10   026472         1921  3150#
ERR11   026522         1987  3153#
ERR12   026552         2255  2336  3156#
ERR13   026606         2341  3160#
ERR14   026616         2369  3163#
ERR2    026272         1300  1304  1307  1312  1336  1363  1386  1413  1443  1456  1484  1493  1517
                       1526  1554  1564  1594  1600  1608  1635  1641  1649  1676  1682  1690  1718
                       1724  1730  1738  1765  1770  1774  1808  2407  2414  2422  2430  2446  2802
                       2804  3135#
ERR20   026734         2651  2675  2768  3178#
ERR20A  026740         2487  2518  2565  3179#
ERR21   027014         2665  3184#
ERR22   027024         2686  3187#
ERR3    026326         1827  3138#
ERR4    026356         2065  2075  2081  2087  2117  2478  2483  2514  2549  2559  2561  3141#
ERR6    026412         2056  2177  3144#  3161
ERR7    026442         1852  1885  3147#
EVL   = 000004 G        155#
EXECUT  017204         2017  2032  2044  2050#
EXMDUN  021334         2379  2382#
EXMLUP  020662         2295#  2380
EXMTST  020600         2283  2285#
EXPUCR  036722         2859  3370#
EXPHCR  036676         2652  2865  3369#
EXPNON  036742         2486  2517  2564  2674  2883  2889  3371#
E$END = 002100           17#
E$LOAD= 000035           17#    50
E.BA    003366          249#   752*  1810  2062  2328  3206
E.BAE   003376          253#   760*  2326  3206
E.CS    003364          248#   672   678   682   687   690   693   698   701   706   709   714   751*
                       1805  1825  1917  2058  2179  2248  2319  2332  2646  2763  3206
E.DA    003370          250#   753*  1812  1822  2068  3206
E.MP    003372          251#   754*  1814  2078  2479  3206
E.MP1   003374          252#   757*  2084  3431*
E2022   027114         3178  3184  3187  3192#
FIFO1   017734         2137#
FIFO2   017766         2150#
FINDSE  025246         2885  2987  3010#
FIX     010050          674   680   685   696   704   712   716   728#
FRMT1   027440         3204  3227#
FRMT1A  027477         3202*  3228#
FRMT1B  027510         3205  3206  3229#
FRMT1C  027541         3203*  3230#
FRMT1D  027550         3207  3231#
```

```
FRMT10  027775          3153    3238#
FRMT14  030103          2103    2199    3188    3240#
FRMT15  030172          2112    2206    3241#
FRMT2   027553          3132    3232#
FRMT20  030253          3173    3242#
FRMT21  030313          3157    3243#
FRMT22  030350          3164    3244#
FRMT23  030422          3219    3245#
FRMT25  030453          3192    3247#
FRMT26  030462          3180    3248#
FRMT27  030503          3181    3189    3249#
FRMT3   027571          3144    3233#
FRMT3A  027613          3150    3234#
FRMT4   027654          3135    3141    3235#
FRMT5   027710          3138    3236#
FRMT6   027742          3147    3237#
F$AU  = 000015            17#     648     656
F$AUTO= 000020            17#     605     616
F$BGN = 000040            17#      63     105     107     465     473     605     620     636     648    1130    1138    1157
                         1169    1179    1191    1201    1213    1223    1235    1243    1264    1279    1313    1323    1325
                         1337    1342    1352    1354    1364    1369    1378    1380    1387    1392    1402    1406    1414
                         1419    1429    1431    1444    1457    1462    1472    1474    1485    1494    1499    1508    1510
                         1518    1527    1532    1542    1546    1555    1565    1570    1583    1609    1620    1650    1661
                         1691    1702    1739    1749    1775    1786    1818    1829    1841    1854    1866    1870    1892
                         1902    1929    1939    1952    1967    1988    2005    2009    2020    2024    2035    2039    2045
                         2046    2050    2060    2121    2133    2137    2146    2150    2159    2160    2164    2213    2227
                         2232    2259    2278    2284    2296    2384    2398    2451    2459    2488    2495    2519    2526
                         2566    2577    2626    2632    2695    2702    2751    2755    2771    3127    3460    3461    3467
                         3468
F$CLEA= 000007            17#     620     632
F$DU  = 000016            17#     636     644
F$END = 000041            17#      74     120     601     616     632     644     656    1138    1144    1157    1169    1179
                         1191    1201    1213    1223    1235    1243    1264    1279    1313    1323    1337    1341    1342
                          352    1364    1368    1369    1378    1387    1391    1392    1402    1414    1418    1419    1429
                         1444    1457    1461    1462    1472    1485    1494    1498    1499    1508    1518    1527    1531
                         1532    1542    1555    1565    1569    1570    1583    1609    1620    1650    1661    1691    1702
                         1739    1749    1775    1786    1818    1829    1841    1854    1866    1890    1892    1902    1929
                         1939    1952    1967    1988    2005    2009    2020    2024    2035    2039    2045    2046    2060
                         2118    2121    2133    2137    2146    2150    2159    2160    2209    2213    2227    2232    2259
                         2278    2284    2372    2384    2398    2451    2459    2488    2495    2519    2526    2566    2577
                         2626    2693    2695    2702    2751    2769    2771    3222    3460    3461    3467    3468
F$HARD= 000004            17#      63      65      67      72      74     109     112
F$HW  = 000013            17#      89      99
F$INIT= 000006            17#     473     601
F$JMP = 000050            17#    1138    1818    2046    2060    2160    2232    2284    2626    2751
F$MOD = 000000            17#
F$MSG = 000011            17#    3127    3222
F$PROT= 000021            17#     465     469
F$PWR = 000017            17#
F$RPT = 000012            17#    1130    1144
F$SEG = 000003            17#    1325    1341    1354    1368    1380    1391    1406    1418    1431    1461    1474    1498
                         1510    1531    1546    1569    1870    1890    2050    2118    2164    2209    2296    2372    2632
                         2693    2755    2769
F$SOFT= 000005            17#     105     109     112     120
F$SRV = 000010            17#
F$SUB = 000002            17#    2009    2020    2024    2035    2039    2045    2137    2146    2150    2159
```

```
F$SW   = 000014          17#   143   151
F$TEST = 000001          17#  1157  1169  1179  1191  1201  1213  1223  1235  1243  1264  1279  1313
                       1323  1342  1352  1369  1378  1392  1402  1419  1429  1462  1472  1499  1508
                       1532  1542  1570  1583  1609  1620  1650  1661  1691  1702  1739  1749  1775
                       1786  1829  1841  1854  1866  1892  1902  1929  1939  1952  1967  1988  2005
                       2121  2133  2213  2227  2259  2278  2384  2398  2451  2459  2488  2495  2519
                       2526  2566  2577  2695  2702  2771
GDCRC3   003442         271#   955*  2077  3430
GDCRC4   003444         272#   968*  2083  3431
GDDAT    003432         267#   613*  1165* 1187* 1209* 1231* 1247* 1282* 1285* 1298  1301* 1326* 1327*
                       1328  1331* 1334  1355* 1358* 1359  1361  1381* 1382  1384  1407* 1408  1410*
                       1411  1433* 1434* 1438* 1441  1446* 1447* 1451* 1454  1476* 1479* 1482  1487*
                       1488* 1491  1512* 1515  1520* 1521* 1524  1548* 1549* 1552  1557* 1558* 1559*
                       1562  1590* 1592  1596* 1598  1604* 1606  1621* 1624* 1625  1633  1637* 1639
                       1645* 1647  1662* 1665* 1666  1674  1678* 1680  1686* 1688  1703* 1706* 1707
                       1716  1720* 1722  1726* 1728  1734* 1736  1752* 1755* 1756  1760* 1763  1767*
                       1803* 1804* 1806  1869* 1878  2061* 2063  2067* 2072* 2073  2077* 2079  2083*
                       2085  2093* 2095  2103  2113* 2115  2189* 2191  2199  2349* 2351  2404* 2405
                       2411* 2412  2419* 2420  2427* 2428  2443* 2444  2475* 2476  2480* 2481  2511*
                       2512  2544* 2545  2553* 2554* 2555  2682* 2781* 2788* 2795* 2796  3132  3135
                       3141  3164  3188
GETERR   007554         669#  1919  2054  2175  2251  2334  2339  2484  2515  2562  2648  2672  2765
GSBIT  = 000002         192#  2466  2475
GSTAT  = 000004         183#  2465
G$CNTO = 000200          17#
G$DELM = 000372          17#
G$DISP = 000003          17#   107
G$EXCP = 000400          17#
G$HILI = 000002          17#
G$LOLI = 000001          17#
G$NO   = 000000          17#
G$OFFS = 000400          17#    64    66    68    69    70    71    73   106   108   110   111   113
                       114   115   116   117   118   119
G$OFST = 000376          17#    64    66    68    69    70    71    73   106   108   110   111   113
                       114   115   116   117   118   119
G$PRMA = 000001          17#    69    70   110
G$PRMD = 000002          17#    71    73   106   113   119
G$PRML = 000000          17#    64    66    68   108   111   114   115   116   117   118
G$RADA = 000140          17#
G$RADB = 000000          17#
G$RADD = 000040          17#   106
G$RADL = 000120          17#    64    66    68   108   111   114   115   116   117   118
G$RADO = 000020          17#    69    70    71    73   110   113   119
G$XFER = 000004          17#    65    67    72   109   112
G$YES  = 000010          17#    64    66    68    69    70    71    73   106   108   110   111   113
                       114   115   116   117   118   119
HCRC   = 004000          172#   706  2864
HCRCME   030667          711   3265#
HEADR    025742         2983   3091#
HEXMOD   025422         2979   3046#
HEXTXT   026035         3047   3062  3097#
HINUM    003452          275#   492*  525   581*  864   887   895   900*
HNF    = 010000          170#   698  1916  3391
HNFMES   030654          703   3263#
HOE    = 100000 G        155#
HSECT    025766         2966*  3093#
```

```
HUNIT   025753          2928    2946*   2952    3092#
IBE   = 010000 G         155#
IDU   = 000040 G         155#
IER   = 020000 G         155#
INHFC   003177           117     136#
INHMNP  003120           115     134#
INHMXP  003070           114     133#
INHNC   003150           116     135#
INHSC   003223           118     137#
INIDA   003440           270#    812     945*    946     2641    2758    2853*   2857*   2863*   2869*   2873*   2881*
INIMP   003436           269#    795*    813     2463*   2499*   2534*   2535    2580*   2640    2668    2705*   2757
INTEN = 000100           179#    1847    1876    1945    2173    3433
INTFLG  010700           913#    1842*   1849    1872*   1880    1883    1943*   1947    2170*   2181    3439*
IOPAG   021324          2285*   2291*   2377#
ISR   = 000100 G         155#
IXE   = 004000 G         155#
I$AU  = 000041            17#    648#    656#
I$AUTO= 000041            17#    605#    616#
I$CLN = 000041            17#    620#    632#
I$DU  = 000041            17#    636#    644#
I$HRD = 000041            63#     74#    107
I$INIT= 000041            17#    473#    601#
I$MOD = 000041            17#
I$MSG = 000041            17#    3127#   3222#
I$PROT= 000040            17#    465#
I$PTAB= 000041            17#    3461#   3467#
I$PWR = 000041            17#
I$RPT = 000041            17#    1130#   1144#
I$SEG = 000041            17#    1157    1179    1201    1223    1243    1279    1323    1325#   1337    1341#   1352    1354#
                         1364    1368#   1378    1380#   1387    1391#   1402    1406#   1414    1418#   1429    1431#   1444
                         1457    1461#   1472    1474#   1485    1494    1498#   1508    1510#   1518    1527    1531#   1542
                         1546#   1555    1565    1569#   1583    1620    1661    1702    1749    1786    1841    1866    1870#
                         1890#   1902    1939    1967    2005    2009    2024    2039    2050#   2060    2118#   2133    2137
                         2150    2164#   2209#   2227    2278    2296#   2372#   2398    2459    2495    2526    2577    2632#
                         2693#   2702    2755#   2769#
I$SETU= 000041            17#    3460#   3461    3468#
I$SFT = 000041           105#     107     120#
I$SRV = 000041            17#
I$SUB = 000041            17#    1157    1179    1201    1223    1243    1279    1323    1352    1378    1402    1429    1472
                         1508    1542    1583    1620    1661    1702    1749    1786    1841    1866    1902    1939    1967
                         2005    2009#   2020#   2024#   2035#   2039#   2045#   2133    2137#   2146#   2150#   2159#   2227
                         2278    2398    2459    2495    2526    2577    2702
I$TST = 000041            17#    1157#   1169#   1179#   1191#   1201#   1213#   1223#   1235#   1243#   1264#   1279#   1313#
                         1323#   1342#   1352#   1369#   1378#   1392#   1402#   1419#   1429#   1462#   1472#   1499#   1508#
                         1532#   1542#   1570#   1583#   1609#   1620#   1650#   1661#   1691#   1702#   1739#   1749#   1775#
                         1786#   1818    1829#   1841#   1854#   1866#   1892#   1902#   1929#   1939#   1952#   1967#   1988#
                         2005#   2009    2024    2039    2046    2121#   2133#   2137    2150    2160    2213#   2227#   2232
                         2259#   2278#   2284    2384#   2398#   2451#   2459#   2488#   2495#   2519#   2526#   2566#   2577#
                         2626    2695#   2702#   2751    2771#
J$JMP = 000167            17#    1138
KBDIN   025504          2931    2959    2973    3066#
KBDOUT  025550          2929    2953    2957    2971    2982    2989    2996    3061    3082#
KIPARO= 172340          1039#   1040    1071    2277
KIPDRO= 172300          1040#   1072
LDFUN   010254           794#   1794    1846    1875    1912    1944    1973    2051    2172    2244    2314
LOE   = 040000 G         155#
```

LONUM	003454		276#	493*	524	580*	886	893	899*
LOT	= 000010	G	155#						
LSI	006576		503	513#					
L$ACP	002110	G	50#						
L$APT	002036	G	50#						
L$AU	007476	G	50	648#					
L$AUT	002070	G	50#						
L$AUTO	007260	G	50	605#					
L$CCP	002106	G	50#						
L$CLEA	007336	G	50	620#					
L$CO	002032	G	50#						
L$DEPO	002011	G	50#						
L$DESC	002122	G	50	52#					
L$DESP	002076	G	50#						
L$DEVP	002060	G	50#						
L$DISP	026124	G	50	3118*	3121#				
L$DLY	002116	G	50#						
L$DTP	002040	G	50#						
L$DTYP	002034	G	50#						
L$DU	007414	G	50	636#					
L$DUT	002072	G	50#						
L$DVTY	002142	G	50	54#					
L$EF	002052	G	50#						
L$ENVI	002044	G	50#						
L$ETP	002102	G	50#						
L$EXP1	002046	G	50#						
L$EXP4	002064	G	50#						
L$EXP5	002066	G	50#						
L$HARD	002172	G	50	63#					
L$HIME	002120	G	50#						
L$HPCP	002016	G	50#						
L$HPTP	002022	G	50#						
L$HW	002376	G	50	89#					
L$ICP	002104	G	50#						
L$INIT	006376	G	50	473#					
L$LADP	002026	G	50#						
L$LAST	040416	G	45	50	3453#	3468			
L$LOAD	002100	G	50#						
L$LUN	002074	G	50#						
L$MREV	002050	G	50#						
L$NAME	002000	G	50#						
L$PRIO	002042	G	50#						
L$PROT	006370	G	50	465#					
L$PRT	002112	G	50#						
L$REPP	002062	G	50#						
L$REV	002010	G	50#						
L$RPT	011722	G	50	1130#					
L$SOFT	002412	G	50	105#					
L$SPC	002056	G	50#						
L$SPCP	002020	G	50#						
L$SPTP	002024	G	50#						
L$STA	002030	G	50#						
L$SW	003304	G	50	143#					
L$TEST	002114	G	50#						
L$TIML	002014	G	50#						
L$UNIT	002012	G	50#	520	529	606	637		

L10000 002266 63 74#
L10001 002410 89 99#
L10002 002542 105 120#
L10003 003322 143 151#
L10005 007256 601#
L10006 007334 616#
L10007 007412 632#
L10010 007474 644#
L10011 007552 656#
L10012 012170 1138 1144#
L10013 012254 1169#
L10014 012340 1191#
L10015 012424 1213#
L10016 012510 1235#
L10017 012632 1264#
L10020 013074 1313#
L10021 013214 1342#
L10022 013320 1369#
L10023 013406 1392#
L10024 013512 1419#
L10025 013740 1462#
L10026 014124 1499#
L10027 014272 1532#
L10030 014464 1570#
L10031 014666 1609#
L10032 015112 1650#
L10033 015336 1691#
L10034 015626 1739#
L10035 016022 1775#
L10036 016230 1818 1829#
L10037 016316 1854#
L10040 016464 1892#
L10041 016620 1929#
L10042 016704 1952#
L10043 017032 1988#
L10044 017732 2046 2121#
L10045 017100 2020#
L10046 017146 2035#
L10047 017176 2045#
L10050 020356 2160 2213#
L10051 017764 2146#
L10052 020020 2159#
L10053 020552 2232 2259#
L10054 021346 2284 2384#
L10055 021720 2451#
L10056 022124 2488#
L10057 022272 2519#
L10060 022552 2566#
L10061 023434 2626 2695#
L10062 024032 2751 2771#
L10063 027436 3222#
L10064 040422 3461#
L10066 040434 3461 3467#
MAINT = 000000 181# 1913 1945 1974 2052 2177 2245 2315
MFPT = 000007 508# 509
MIMIC 036756 534 755 816 3382#

```
MK     = 000001          193#  2466  2475  2502  2511
MMR0   = 177572         1035#  1055  1087* 1108* 2280  2302* 2310* 2348* 2355* 3407* 3425*
MMR1   = 177574         1036#
MMR2   = 177576         1037#
MMR3   = 172516         1038#  1084  1085* 1092* 1110* 2290*
MPXCLK  003312           147#  2591  2596  2601  2606  2610  2716  2721  2726  2731  2735
MSGNOT  012162          1131*  1134* 1135  1142#
MSG2    012042          1135   1139#
MSG3    012072          1136   1140#
MSG4    012125          1137   1141#
NEWPAS  006622           481    520#  530
NLSI    006572           507    512#
NOANS   025602          2952*  2954  3086#
NON     030702           675   3267#
NOOP   = 000000           180#
NOSIG   026232          2589   2714  3128#
NXM    = 020000           167#   690  2058  2179  2247  2331  3396  3422
NXMMES  030635           692    697  3260#
NXTU    006664           484    527#  532
OCTMOD  025376          2915   2976  3043#
OCTTXT  026042          3043   3098#
OPI    = 002000           173#   693   701   709   714  1825  1916  1978  2058  2179  2864  3391
OPIMES  030675           717   3266#
OPIMN   003446           273#  1984
OPIMX   003450           274#  1982
O$APTS= 000000            17#    50
O$AU   = 000001            17#   49#    50
O$BGNR= 000001            17#   49#    50
O$BGNS= 000001            17#   49#    50
O$DU   = 000001            17#   49#    50
O$ERRT= 000000            17#    50
O$GNSW= 000001            17#   49#    50
O$POIN= 000001            17#   49#    50
O$SETU= 000001            17#   49#    50  3453
PAR    = 020000           168#   690
PARMES  030642           695   3261#
PAR4   = 172350          2277#  2294* 2360  2375* 2376
PATCH   040310          3448#
PATCRC  004202           393#  2010  2025
PATDAT  004274           425#
PDSW    003306           145#   489  2924*
PNT    = 001000 G        155#
PRGSIZ= 000101            45#
PRI    = 002000 G        155#
PRI00  = 000000 G        155#  1843  1942  2171
PRI01  = 000040 G        155#
PRI02  = 000100 G        155#
PRI03  = 000140 G        155#
PRI04  = 000200 G         92   155#  3464
PRI05  = 000240 G        155#
PRI06  = 000300 G        155#
PRI07  = 000340 G        155#   598   600   631  1280  1853  1867  1891  1951  2210  3436
PRM     003047           113   132#
PRMDMP  003024           111   131#
PROMID  003310           146#  2095
PRTPA   026662          3156  3160  3163  3169#
```

```
PSERR   024560   2646  2763  2858* 2864* 2882* 2890#
PSETXT  024556   2650  2652  2767  2859* 2865* 2883* 2889#
PSX     024266   2585  2710  2837#
PS1     024324   2842  2852#
PS2     024342   2843  2856#
PS3     024374   2844  2862#
PS4     024426   2845  2868#
PS5     024444   2846  2872#
PS6     024514   2847  2880#
PS7     024462   2848  2876#
PURE    026046   3082  3099#
Q0      025633   2930  3087#
Q1      025664   2958  3089#
Q2      025711   2972  3090#
RAND    010572    863   883#
RDHDR = 000010    185#  2658
RDNHDR= 000016    188#  2667
READ  = 000014    187#  2639
READDU  023430   2666  2693#
READNH  023202   2655#
READSE  023040   2609  2614  2632#
RESTAR  006454    475   479   487#
RHHS  = 000100    195#
RLBA    003326    233#  587*  739   752   800*  1181* 1183  1187  1286* 1302  1359* 1360  1475*
                  1480* 1481  1486* 1489* 1490  1584* 1591  1630* 1667* 1679  1708* 1721  1757*
                  1768  2536* 2642* 2759* 2820* 3408* 3415*
RLBAE   003334    236#  593*  630*  745   760   811*  1247  1248* 1250  1290* 1310  1408* 1409
                  1547* 1550* 1551  1556* 1560* 1561  1588* 1605  1629* 1646  1670* 1687  1712*
                  1735  1759* 2824* 3409* 3416*
RLCS    003324    232#  585*  609   613   622   627*  737   751   799*  809*  815*  922   1159*
                  1161  1165  1281* 1283  1296  1328* 1329  1332  1432* 1435* 1436  1439  1445*
                  1448* 1449  1452  1589* 1622  1625* 1631  1663  1666* 1672  1704  1707* 1714
                  1753  1756* 1761  1978  2408  2416  2424  2435* 2436* 2450* 2465* 2468* 2501*
                  2504* 2533* 2539* 2639* 2644* 2658* 2659* 2660  2667* 2670* 2756* 2761* 3386*
                  3391* 3396* 3422* 3432* 3433
RLDA    003330    234#  589*  740   753   812*  1203* 1205  1209  1287* 1305  1382* 1383  1511*
                  1513* 1514  1519* 1522* 1523  1585* 1597  1626* 1638  1671* 1709* 1727  1758*
                  1772  2466* 2502* 2537* 2641* 2758* 3427  3429*
RLINT   010676    595   912#
RLMP    003332    235#  591*  742   754   757   813*  1225* 1227  1231  1713* 2535* 2640* 2662
                  2668* 2757* 2821* 3389  3430*
RLTYP   003402    255#  540*  628   743   758   801   1244  1252  1288  1308  1356  1403  1477
                  1543  1586  1602  1627  1643  1668  1684  1710  1732  1750  1797  2228  2288
                  2317  2822  3107  3199  3384
RLV11 = 000001    161#  2228
RLV12 = 000002    162#  1244  3109
RLV12X= 000003    163#  628   743   758   801   1252  1288  1308  1403  1543  1586  1602  1627
                  1643  1668  1684  1710  1732  1750  2288  2317  2822  3199
RL1     002266     64    78#
RL1A    002276     66    79#
RL11  = 000000    160#  1356  1477  1797  3384
RL2     002313     68    80#
ROMDUM  024660    491   2924#  2955  2991  3005
SEC1    003247    119   138#
SEEK  = 000006    184#  2501
SETCMP  010426    833#  2027
```

```
SETPAT  010422          831#  2012
SETRAN  010516          859#  2040  2295
SFN     = 000006        204#   614#  1166#  1188#  1210#  1232#  1257#
SIGN    = 000004        194#
SIMBCC  011124          951    959   964    981#
SKP1    = 000401        225#  2779
SKP2    = 000402        226#   511   930    2234   2325   2550   3114   3116
SKP3    = 000403        227#
SNGLSE  003314          148#  2581  2622   2706   2747   2877*
START   006454          477    487#
STHS    = 000100        196#
SVCGBL= 000000           17#    19#   46#    50     52     54     56#    63     89     105    143    465    473
                        605    620   636    648    1130   3121   3127   3453#
SVCINS= 000001           17#    23#   47#    50     52     54     57#    63     64     65     66     67     68
                         69     70    71     72     73     74     89     105    106    107    108    109    110
                        111    112   113    114    115    116    117    118    119    120    143    474    475
                        476    477   478    479    480    481    482    483    518    522    531    532    601
                        614    615   616    631    632    640    644    652    656    929    1135   1136   1137
                       1138   1144  1166   1167   1168   1169   1188   1189   1190   1191   1210   1211   1212
                       1213   1232  1233   1234   1235   1257   1258   1259   1263   1264   1280   1300   1304
                       1307   1312  1313   1325   1336   1337   1341   1342   1354   1363   1364   1368   1369
                       1380   1386  1387   1391   1392   1406   1413   1414   1418   1419   1431   1443   1444
                       1456   1457  1461   1462   1474   1484   1485   1493   1494   1498   1499   1510   1517
                       1518   1526  1527   1531   1532   1546   1554   1555   1564   1565   1569   1570   1594
                       1595   1600  1601   1608   1609   1635   1636   1641   1642   1649   1650   1676   1677
                       1682   1683  1690   1691   1718   1719   1724   1725   1730   1731   1738   1739   1765
                       1766   1770  1771   1774   1775   1808   1809   1816   1817   1818   1827   1828   1829
                       1843   1852  1853   1854   1870   1871   1885   1886   1890   1891   1892   1921   1922
                       1929   1942  1949   1950   1951   1952   1980   1987   1988   2009   2020   2024   2035
                       2039   2045  2046   2050   2056   2057   2060   2065   2066   2075   2076   2081   2082
                       2087   2088  2101   2103   2104   2112   2117   2118   2121   2137   2146   2150   2159
                       2160   2164  2171   2177   2178   2183   2184   2197   2199   2200   2208   2209   2210
                       2213   2232  2255   2259   2284   2296   2336   2341   2369   2371   2372   2384   2407
                       2414   2422  2430   2446   2451   2478   2483   2487   2488   2514   2518   2519   2549
                       2559   2561  2565   2566   2589   2626   2632   2651   2665   2675   2686   2693   2695
                       2714   2751  2755   2768   2769   2771   2800   2802   2804   2876   3043   3080   3082
                       3121   3132  3135   3138   3141   3144   3147   3150   3153   3157   3164   3173   3180
                       3181   3188  3189   3192   3204   3205   3206   3207   3212   3213   3219   3220   3221
                       3222   3435  3453   3461
SVCSUB= 000001           17#    21#   2009   2024   2039   2137   2150
SVCTAG= 000001           17#    22#   74     99     120    151    601    616    632    644    656    1144   1151
                       1156   1169  1173   1178   1191   1195   1200   1213   1217   1222   1235   1239   1242
                       1264   1268  1278   1313   1317   1322   1341   1342   1346   1351   1368   1369   1373
                       1377   1391  1392   1396   1401   1418   1419   1423   1428   1461   1462   1466   1471
                       1498   1499  1503   1507   1531   1532   1536   1541   1569   1570   1574   1582   1609
                       1613   1619  1650   1654   1660   1691   1695   1701   1739   1743   1748   1775   1779
                       1785   1829  1833   1840   1854   1858   1865   1890   1892   1896   1901   1929   1934
                       1938   1952  1956   1966   1988   1992   2004   2020   2035   2045   2118   2121   2125
                       2132   2146  2159   2209   2213   2217   2226   2259   2263   2276   2372   2384   2389
                       2397   2451  2455   2458   2488   2492   2494   2519   2523   2525   2566   2570   2576
                       2693   2695  2699   2701   2769   2771   3222   3461   3467
SVCTST= 000001           17#    20#   1157   1179   1201   1223   1243   1279   1323   1352   1378   1402   1429
                       1472   1508  1542   1583   1620   1661   1702   1749   1786   1841   1866   1902   1939
                       1967   2005  2133   2227   2278   2398   2459   2495   2526   2577   2702
S$LSYM= 010000           17#    74#   99#    120#   151#   601#   616#   632#   644#   656#   1144#  1169#  1191#
                       1213#  1235#  1264#  1313#  1325#  1342#  1354#  1369#  1380#  1392#  1406#  1419#  1431#
```

```
                    1462#  1474#  1499#  1510#  1532#  1546#  1570#  1609#  1650#  1691#  1739#  1775#  1829#
                    1854#  1870#  1892#  1929#  1952#  1988#  2020#  2035#  2045#  2050#  2121#  2146#  2159#
                    2164#  2213#  2259#  2296#  2384#  2451#  2488#  2519#  2566#  2632#  2695#  2755#  2771#
                    3222#
TAB       026030    2997   3095#
TCLKO     036610    2594   2719   3365#
TCLK1     036626    2599   2724   3366#
TCLK2     036641    2604   2729   3367#
TCSR      003344     240#   542*   544*   547*  2401*  2402*  2403   2415*  2423*  2431*  2437   2781   2784*
                    2789   2813   3111
TCSUO     002776     110    130#
TCSO      003320     150#   544   2940
TEMHI     003460     278#   525*   581
TEMLO     003456     277#   524*   580   2041
TEMP1     003422     263#   946*   947    949*   950    957*   958
TEMP2     003412     259#   984*  1007*
TEMP3     003414     260#   985*   989*
TEMP4     003416     261#   986*   988    998*  1000   1005*  1006*  1009
TEMP5     003420     262#   947*   948*   949   956*   957
TLM8P     002575     107    126#
TLMF      003316     149#   542
TLMIN     002751     108    129#
TLMOK     024034    2399   2460   2496   2527  2778#
TLMPID    024040    2578   2703   2780#
TLM1      021350    2398#
TLM2      021722    2459#
TLM3      022126    2495#
TLM4      022274    2526#
TLM5      022554    2577#
TLM6      023436    2702#
TMPO      003424     264#   836*   839    842*  1851*  1868*  1888*  2069*  2070*  2071*  2072   2097*  2103
                    2193*  2199   2358*  2684*  2981*  2984   3147   3164   3188
TMP1      003426     265#  2098*  2103   2194*  2199   2253*  2327*  2361*  2363*  2368*  2486*  2517*  2564*
                    2650*  2674*  2685*  2767*  3172*  3173   3180   3188
TMP2      003430     266#  2089*  2099   2102*  2110   2112   2185*  2195   2198*  2206   2208   2254*  2328*
                    2360*  2362*  2367*  2594*  2599*  2604*  2719*  2724*  2729*  3169   3171*  3173   3192
TPEAK     036654    2608*  2613*  2733*  2738*  3192   3368#
TRAP4     010670     597    908#  2311   3426
TRPFLG    010672     608*   611    909#  1158*  1163   1180*  1185   1202*  1207   1224*  1229   1246*  1255
                    1261   2279*  2282   2301*  2307*  2329   2783*  2786
TSEC      036575    3192   3363#
TSECX     036604    2588   2713   2852*  2856*  2862*  2868*  2872*  2880*  3364#
TURKY     024562    2876   2892#
T$ARGC=   000001     50#   640#   652#  1135#  1136#  1137#  2103#  2112#  2199#  2208#  2876#  3043#  3082#
                    3132#  3135#  3138#  3141#  3144#  3147#  3150#  3153#  3157#  3164#  3173#  3180#  3181#
                    3188#  3189#  3192#  3204#  3205#  3206#  3207#  3219#
T$CODE=   004032     64#   65#    66#   67#   68#   69#    70#    71#    72#    73#   106#   107#   108#
                    109#   110#   111#  112#  113#  114#   115#   116#   117#   118#   119#
T$ERRN=   000264     17#   614#   929#  1166#  1188#  1210#  1232#  1257#  1263#  1300#  1304#  1307#  1312#
                    1336#  1363#  1386#  1413#  1443#  1456#  1484#  1493#  1517#  1526#  1554#  1564#  1594#
                    1600#  1608#  1635#  1641#  1649#  1676#  1682#  1690#  1718#  1724#  1730#  1738#  1765#
                    1770#  1774#  1808#  1816#  1827#  1852#  1885#  1921#  1949#  1980#  1987#  2056#  2065#
                    2075#  2081#  2087#  2101#  2117#  2177#  2183#  2197#  2255#  2336#  2341#  2369#  2407#
                    2414#  2422#  2430#  2446#  2478#  2483#  2487#  2514#  2518#  2549#  2559#  2561#  2565#
                    2589#  2651#  2665#  2675#  2686#  2714#  2768#  2800#  2802#  2804#
T$EXCP=   000000     69#   70#    71#   73#   106#   110#   113#   119#
```

```
T$FLAG= 000040   1138#  1337#  1364#  1387#  1414#  1444#  1457#  1485#  1494#  1518#  1527#  1555#  1565#
                 1818#  2046#  2060#  2160#  2232#  2284#  2626#  2751#
T$FREE= 040434   3453    3468#
T$GMAN= 000000     17#
T$HILI= 000006     69#    70#    71#    73#   106#   110#   113#   119#
T$LAST= 000001     17#  3453#  3460
T$LOLI= 000000     69#    70#    71#    73#   106#   110#   113#   119#
T$LSYM= 010000     17#    74     99    120    151    601    616    632    644    656   1144   1169   1191
                 1213   1235   1264   1313   1342   1369   1392   1419   1462   1499   1532   1570   1609
                 1650   1691   1739   1775   1829   1854   1892   1929   1952   1988   2020   2035   2045
                 2121   2146   2159   2213   2259   2384   2451   2488   2519   2566   2695   2771   3222
T$LTNO= 000043   3453#
T$NEST= 177777     17#    63#    65     67     72     74#    89#    99#   105#   109    112    120#   143#
                  151#   465#   469#   473#   601#   605#   616#   620#   632#   636#   644#   648#   656#
                 1130#  1144#  1157#  1169#  1179#  1191#  1201#  1213#  1223#  1235#  1243#  1264#  1279#
                 1313#  1323#  1325#  1341#  1342#  1352#  1354#  1368#  1369#  1378#  1380#  1391#  1392#
                 1402#  1406#  1418#  1419#  1429#  1431#  1461#  1462#  1472#  1474#  1498#  1499#  1508#
                 1510#  1531#  1532#  1542#  1546#  1569#  1570#  1583#  1609#  1620#  1650#  1661#  1691#
                 1702#  1739#  1749#  1775#  1786#  1829#  1841#  1854#  1866#  1870#  1890#  1892#  1902#
                 1929#  1939#  1952#  1967#  1988#  2005#  2009#  2020#  2024#  2035#  2039#  2045#  2050#
                 2118#  2121#  2133#  2137#  2146#  2150#  2159#  2164#  2209#  2213#  2227#  2259#  2278#
                 2296#  2372#  2384#  2398#  2451#  2459#  2488#  2495#  2519#  2526#  2566#  2577#  2632#
                 2693#  2695#  2702#  2755#  2769#  2771#  3127#  3222#
T$NSO = 000011     63#    65     67     72     74     89#    99   105#   109    112    120    143#   151
                  465#   469    473#   601    605#   616    620#   632    636#   644    648#   656    1130#
                 1144   1157#  1169   1179#  1191   1201#  1213   1223#  1235   1243#  1264   1279#  1313
                 1323#  1342   1352#  1369   1378#  1392   1402#  1419   1429#  1462   1472#  1499   1508#
                 1532   1542#  1570   1583#  1609   1620#  1650   1661#  1691   1702#  1739   1749#  1775
                 1786#  1829   1841#  1854   1866#  1892   1902#  1929   1939#  1952   1967#  1988   2005#
                 2121   2133#  2213   2227#  2259   2278#  2384   2398#  2451   2459#  2488   2495#  2519
                 2526#  2566   2577#  2695   2702#  2771   3127#  3222
T$NS1 = 000003   1325#  1341   1354#  1368   1380#  1391   1406#  1418   1431#  1461   1474#  1498   1510#
                 1531   1546#  1569   1870#  1890   2009#  2020   2024#  2035   2039#  2045   2050#  2118
                 2137#  2146   2150#  2159   2164#  2209   2296#  2372   2632#  2693   2755#  2769
T$PCNT= 000000   3460#  3461#
T$PTAB= 010065   3461#
T$PTHV= 000001     50   3468#
T$PTNU= 000001     17#  3461#  3468
T$SAVL= 177777     17#
T$SEGL= 177777     17#  1325#  1337   1341#  1354#  1364   1368#  1380#  1387   1391#  1406#  1414   1418#
                 1431#  1444   1457   1461#  1474#  1485   1494   1498#  1510#  1518   1527   1531#  1546#
                 1555   1565   1569#  1870#  1890#  2050#  2060   2118#  2164#  2209#  2296#  2372#  2632#
                 2693#  2755#  2769#
T$SEKO= 010000   1325#  1337   1341   1354#  1364   1368   1380#  1387   1391   1406#  1414   1418   1431#
                 1444   1457   1461   1474#  1485   1494   1498   1510#  1518   1527   1531   1546#  1555
                 1565   1569   1870#  1890   2050#  2060   2118   2164#  2209   2296#  2372   2632#  2693
                 2755#  2769
T$SIZE= 000007   3453   3468#
T$SUBN= 000000     17#  1157#  1179#  1201#  1223#  1243#  1279#  1323#  1352#  1378#  1402#  1429#  1472#
                 1508#  1542#  1583#  1620#  1661#  1702#  1749#  1786#  1841#  1866#  1902#  1939#  1967#
                 2005#  2009#  2024#  2039#  2133#  2137#  2150#  2227#  2278#  2398#  2459#  2495#  2526#
                 2577#  2702#
T$TAGL= 177777     17#
T$TAGN= 010067     17#    63#    89#   105#   143#   465#   473#   605#   620#   636#   648#  1130#  1157#
                 1179#  1201#  1223#  1243#  1279#  1323#  1352#  1378#  1402#  1429#  1472#  1508#  1542#
                 1583#  1620#  1661#  1702#  1749#  1786#  1841#  1866#  1902#  1939#  1967#  2005#  2009#
```

```
                    2024#  2039#  2133#  2137#  2150#  2227#  2278#  2398#  2459#  2495#  2526#  2577#  2702#
                    3127#  3460#  3461#
T$TEMP= 000011        64#    66#    68#    69#    70#    71#    73#    74#    99#   106#   108#   110#   111#
                     113#   114#   115#   116#   117#   118#   119#   120#   151#   469#   601#   616#   632#
                     644#   656#  1138#  1144#  1151#  1156#  1169#  1173#  1178#  1191#  1195#  1200#  1213#
                    1217#  1222#  1235#  1239#  1242#  1264#  1268#  1278#  1313#  1317#  1322#  1337#  1341#
                    1342#  1346#  1351#  1364#  1368#  1369#  1373#  1377#  1387#  1391#  1392#  1396#  1401#
                    1414#  1418#  1419#  1423#  1428#  1444#  1457#  1461#  1462#  1466#  1471#  1485#  1494#
                    1498#  1499#  1503#  1507#  1518#  1527#  1531#  1532#  1536#  1541#  1555#  1565#  1569#
                    1570#  1574#  1582#  1609#  1613#  1619#  1650#  1654#  1660#  1691#  1695#  1701#  1739#
                    1743#  1748#  1775#  1779#  1785#  1818#  1829#  1833#  1840#  1854#  1858#  1865#  1890#
                    1892#  1896#  1901#  1929#  1934#  1938#  1952#  1956#  1966#  1988#  1992#  2004#  2020#
                    2035#  2045#  2046#  2060#  2118#  2121#  2125#  2132#  2146#  2159#  2160#  2209#  2213#
                    2217#  2226#  2232#  2259#  2263#  2276#  2284#  2372#  2384#  2389#  2397#  2451#  2455#
                    2458#  2488#  2492#  2494#  2519#  2523#  2525#  2566#  2570#  2576#  2626#  2693#  2695#
                    2699#  2701#  2751#  2769#  2771#  3121#  3222#
T$TEST= 000043        17#  1157#  1179#  1201#  1223#  1243#  1279#  1323#  1352#  1378#  1402#  1429#  1472#
                    1508#  1542#  1583#  1620#  1661#  1702#  1749#  1786#  1841#  1866#  1902#  1939#  1967#
                    2005#  2009   2024   2039   2133#  2137   2150   2227#  2278#  2398#  2459#  2495#  2526#
                    2577#  2702#  3121   3453
T$TSTM= 177777        17#   474    476    478    480    482    518    522    531    601    614    615    616
                     631    632    640    644    652    656    929   1135   1136   1137   1144   1166   1167
                    1168   1169   1188   1189   1190   1191   1210   1211   1212   1213   1232   1233   1234
                    1235   1257   1258   1259   1263   1264   1280   1300   1304   1307   1312   1313   1325
                    1336   1337   1341   1342   1354   1363   1364   1368   1369   1380   1386   1387   1391
                    1392   1406   1413   1414   1418   1419   1431   1443   1444   1456   1457   1461   1462
                    1474   1484   1485   1493   1494   1498   1499   1510   1517   1518   1526   1527   1531
                    1532   1546   1554   1555   1564   1565   1569   1570   1594   1595   1600   1601   1608
                    1609   1635   1636   1641   1642   1649   1650   1676   1677   1682   1683   1690   1691
                    1718   1719   1724   1725   1730   1731   1738   1739   1765   1766   1770   1771   1774
                    1775   1808   1809   1816   1817   1818   1827   1828   1829   1843   1852   1853   1854
                    1870   1871   1885   1886   1890   1891   1892   1921   1922   1929   1942   1949   1950
                    1951   1952   1980   1987   1988   2009   2020   2024   2035   2039   2045   2046   2050
                    2056   2057   2060   2065   2066   2075   2076   2081   2082   2087   2088   2101   2103
                    2104   2112   2117   2118   2121   2137   2146   2150   2159   2160   2164   2171   2177
                    2178   2183   2184   2197   2199   2200   2208   2209   2210   2213   2232   2255   2259
                    2284   2296   2336   2341   2369   2371   2372   2384   2407   2414   2422   2430   2446
                    2451   2478   2483   2487   2488   2514   2518   2519   2549   2559   2561   2565   2566
                    2589   2626   2632   2651   2665   2675   2686   2693   2695   2714   2751   2755   2768
                    2769   2771   2800   2802   2804   2876   3043   3080   3082   3132   3135   3138   3141
                    3144   3147   3150   3153   3157   3164   3173   3180   3181   3188   3189   3192   3204
                    3205   3206   3207   3212   3219   3220   3221   3222   3435
T$TSTS= 000001        17#  1157#  1179#  1201#  1223#  1243#  1279#  1323#  1352#  1378#  1402#  1429#  1472#
                    1508#  1542#  1583#  1620#  1661#  1702#  1749#  1786#  1841#  1866#  1902#  1939#  1967#
                    2005#  2133#  2227#  2278#  2398#  2459#  2495#  2526#  2577#  2702#
T$$AU = 010011       648#   656
T$$AU1= 010006       605#   616
T$$CLE= 010007       620#   632
T$$DAT= 010066      3461#  3467
T$$DU = 010010       636#   644
T$$HAR= 010000        63#    74
T$$HW = 010001        89#    99
T$$INI= 010005       473#   601
T$$MSG= 010063      3127#  3222
T$$PC = 000001      3460#  3468
T$$PRO= 010004       465#
```

```
T$$PTA= 010065          3460# 3461#
T$$RPT= 010012          1130# 1138  1144
T$$SEG= 010000          1325# 1337  1341# 1354# 1364  1368# 1380# 1387  1391# 1406# 1414  1418# 1431#
                        1444  1457  1461# 1474# 1485  1494  1498# 1510# 1518  1527  1531# 1546# 1555
                        1565  1569# 1870# 1890# 2050# 2060  2118# 2164# 2209# 2296# 2372# 2632# 2693#
                        2755# 2769#
T$$SOF= 010002           105#  120
T$$SUB= 010052          2009# 2020  2024# 2035  2039# 2045  2137# 2146  2150# 2159
T$$SW = 010003           143#  151
T$$TES= 010062          1157# 1169  1179# 1191  1201# 1213  1223# 1235  1243# 1264  1279# 1313  1323#
                        1342  1352# 1369  1378# 1392  1402# 1419  1429# 1462  1472# 1499  1508# 1532
                        1542# 1570  1583# 1609  1620# 1650  1661# 1691  1702# 1739  1749# 1775  1786#
                        1818  1829  1841# 1854  1866# 1892  1902# 1929  1939# 1952  1967# 1988  2005#
                        2046  2121  2133# 2160  2213  2227# 2232  2259  2278# 2284  2384  2398# 2451
                        2459# 2488  2495# 2519  2526# 2566  2577# 2626  2695  2702# 2751  2771
T1      012172 G        1157# 3121
T10     013410 G        1402# 3121
T11     013514 G        1429# 3121
T12     013742 G        1472# 3121
T13     014126 G        1508# 3121
T14     014274 G        1542# 3121
T15     014466 G        1583# 3121
T16     014670 G        1620# 3121
T17     015114 G        1661# 3121
T18     015340 G        1702# 3121
T19     015630 G        1749# 3121
T2      012256 G        1179# 3121
T20     016024 G        1786# 3121
T21     016232 G        1841# 3121
T22     016320 G        1866# 3121
T23     016466 G        1902# 3121
T24     016622 G        1939# 3121
T25     016706 G        1967# 3121
T26     017034 G        2005# 3121
T26.1   017034          2009#
T26.2   017102          2024#
T26.3   017150          2039#
T27     017734 G        2133# 3121
T27.1   017734          2137#
T27.2   017766          2150#
T28     020360 G        2227# 3121
T29     020554 G        2278# 3121
T3      012342 G        1201# 3121
T30     021350 G        2398# 3121
T31     021722 G        2459# 3121
T32     022126 G        2495# 3121
T33     022274 G        2526# 3121
T34     022554 G        2577# 3121
T35     023436 G        2702# 3121
T4      012426 G        1223# 3121
T5      012512 G        1243# 3121
T6      012634 G        1279# 3121
T7      013076 G        1323# 3121
T8      013216 G        1352# 3121
T9      013322 G        1378# 3121
UAM   = 000200 G         155#
```

```
UNITST  003322          231# 526* 527* 529  531  545  606  615  1167 1189 1211 1233 1258
                        3220
VECA    002340           70  82#
WDELAY  010224          624  772# 924  1291 1294 2531
WRCHK = 000002          182# 2756
WRITCH  023722         2734  2739 2755#
WRITE = 000012          186# 2533
WTCRDY  010704          921# 1796 1848 1877 1915 1946 1975 2053 2174 2246 2316 2474 2510
                       2548  2551 2645 2671 2762
XFIFO   020026         2145  2158 2164#
XPOLY   003404          256# 994  1005
X$ALWA= 000000           17# 67   72
X$FALS= 000040           17# 65   109
X$OFFS= 000400           17# 65   67   72   109  112
X$TRUE= 000020           17# 112
.     = 040434           43# 52#  65   67   72   85#  109  112  139# 282# 457# 458# 643#
                        655# 694  702  710  832  1138 1143# 1337 1364 1387 1414 1444 1457
                       1485  1494 1518 1527 1555 1565 1818 2046 2060 2160 2232 2284 2626
                       2751  2926 3100# 3331# 3442# 3443# 3448 3449# 3461 3468
.ABUSW  011304         1030# 1044* 1093* 1096* 1137 2240 2286
.LSTAD  011302         1028# 1116*
.LSTPG  011300         1026# 1115* 1132
.MSIZE  011276         1025# 1117* 1136 2230
.SIZE   011306          517  1044#
.SIZKT  011434         1057  1071#
.SIZME  011576         1099#
.SIZXI  011662         1069  1115#
```

```
BCOMPL   475    477   479   481   483  3213
BEGIN.   219#  1157  1179  1201  1223  1243  1279  1323  1352  1378  1402  1429  1472  1508  1542
        1583  1620  1661  1702  1749  1786  1841  1866  1902  1939  1967  2005  2133  2227  2278
        2398  2459  2495  2526  2577  2702
BGNAU    648
BGNAUT   605
BGNCLN   620
BGNDU    636
BGNHRD    63
BGNHW     89
BGNINI   473
BGNMSG  3127
BGNPRO   465
BGNPTA  3461
BGNRPT  1130
BGNSEG  1325  1354  1380  1406  1431  1474  1510  1546  1870  2050  2164  2296  2632  2755
BGNSET  3460
BGNSFT   105
BGNSUB  2009  2024  2039  2137  2150
BGNSW    143
BGNTST  1157  1179  1201  1223  1243  1279  1323  1352  1378  1402  1429  1472  1508  1542  1583
        1620  1661  1702  1749  1786  1841  1866  1902  1939  1967  2005  2133  2227  2278  2398
        2459  2495  2526  2577  2702
BNCOMP   532
CKLOOP  1595  1601  1636  1642  1677  1683  1719  1725  1731  1766  1771  1809  1817  1828  1836
        1922  1950  2057  2066  2076  2082  2088  2104  2178  2184  2200  2371
DESCRI    52
DEVTYP    54
DFERR    212#  929  1263  1300  1304  1307  1312  1336  1363  1386  1413  1443  1456  1484  1493
        1517  1526  1554  1564  1594  1600  1608  1635  1641  1649  1676  1682  1690  1718  1724
        1730  1738  1765  1770  1774  1808  1816  1827  1852  1885  1921  1949  1980  1987  2056
        2065  2075  2081  2087  2101  2117  2177  2183  2197  2255  2336  2341  2369  2407  2414
        2422  2430  2446  2478  2483  2487  2514  2518  2549  2559  2561  2565  2589  2651  2665
        2675  2686  2714  2768  2800  2802  2804
DISPAT  3121
DISPLA   107
DOCLN    522  1168  1190  1212  1234  1259  3080  3221
DODU     615  1167  1189  1211  1233  1258  3220
DORPT    518
ENDAU    656
ENDAUT   616
ENDCLN   632
ENDDU    644
ENDHRD    74
ENDHW     99
ENDINI   601
ENDMSG  3222
ENDPRO   469
ENDPTA  3467
ENDRPT  1144
ENDSEG  1341  1368  1391  1418  1461  1498  1531  1569  1890  2118  2209  2372  2693  2769
ENDSET  3468
ENDSFT   120
ENDSUB  2020  2035  2045  2146  2159
ENDSW    151
ENDTST  1169  1191  1213  1235  1264  1313  1342  1369  1392  1419  1462  1499  1532  1570  1609
```

```
            1650    1691    1739    1775    1829    1854    1892    1929    1952    1988    2121    2213    2259    2384    2451
            2488    2519    2566    2695    2771
EQUALS       155
ERRDF        929    1263    1300    1304    1307    1312    1336    1363    1386    1413    1443    1456    1484    1493    1517
            1526    1554    1564    1594    1600    1608    1635    1641    1649    1676    1682    1690    1718    1724    1730
            1738    1765    1770    1774    1808    1816    1827    1852    1885    1921    1949    1980    1987    2056    2065
            2075    2081    2087    2101    2117    2177    2183    2197    2255    2336    2341    2369    2407    2414    2422
            2430    2446    2478    2483    2487    2514    2518    2549    2559    2561    2565    2589    2651    2665    2675
            2686    2714    2768    2800    2802    2804
ERRSF        614    1166    1188    1210    1232    1257
ESCAPE      1337    1364    1387    1414    1444    1457    1485    1494    1518    1527    1555    1565
EXIT        1138    1818    2046    2060    2160    2232    2284    2626    2751
GETPRI      3435
GPHARD       531
GPRMA         69      70     110
GPRMD         71      73     106     113     119
GPRML         64      66      68     108     111     114     115     116     117     118
HEADER        50
INLOOP      3212
LASTAD      3453
M$BYTE       50#
M$CHEC     1138#   1818#   2046#   2060#   2160#   2232#   2284#   2626#   2751#
M$CNTO       64#     66#     68#     69#     70#     71#     73#    106#    108#    110#    111#    113#    114#    115#    116#
            117#    118#    119#
M$COUN       640#    652#   1135#   1136#   1137#   2103#   2112#   2199#   2208#   2876#   3043#   3082#   3132#   3135#   3138#
            3141#   3144#   3147#   3150#   3153#   3157#   3164#   3173#   3180#   3181#   3188#   3189#   3192#   3204#   3205#
            3206#   3207#   3219#
M$DATA       50#     52#     54#
M$DECR       74#     99#    120#    151#    469#    601#    616#    632#    644#    656#   1144#   1169#   1191#   1213#   1235#
            1264#   1313#   1341#   1342#   1368#   1369#   1391#   1392#   1418#   1419#   1461#   1462#   1498#   1499#   1531#
            1532#   1569#   1570#   1609#   1650#   1691#   1739#   1775#   1829#   1854#   1890#   1892#   1929#   1952#   1988#
            2020#   2035#   2045#   2118#   2121#   2146#   2159#   2209#   2213#   2259#   2372#   2384#   2451#   2488#   2519#
            2566#   2693#   2695#   2769#   2771#   3222#   3461#
M$DEFA       64#     66#     68#     69#     70#     71#     73#    106#    108#    110#    111#    113#    114#    115#    116#
            117#    118#    119#
M$ENDE       74#     99#    120#    151#    601#    616#    632#    644#    656#   1144#   1169#   1191#   1213#   1235#   1264#
           1313#   1341#   1342#   1368#   1369#   1391#   1392#   1418#   1419#   1461#   1462#   1498#   1499#   1531#   1532#
           1569#   1570#   1609#   1650#   1691#   1739#   1775#   1829#   1854#   1890#   1892#   1929#   1952#   1988#   2020#
           2035#   2045#   2118#   2121#   2146#   2159#   2209#   2213#   2259#   2372#   2384#   2451#   2488#   2519#   2566#
           2693#   2695#   2769#   2771#   3222#
M$ERRI       614#    929#   1166#   1188#   1210#   1232#   1257#   1263#   1300#   1304#   1307#   1312#   1336#   1363#   1386#
           1413#   1443#   1456#   1484#   1493#   1517#   1526#   1554#   1564#   1594#   1600#   1608#   1635#   1641#   1649#
           1676#   1682#   1690#   1718#   1724#   1730#   1738#   1765#   1770#   1774#   1808#   1816#   1827#   1852#   1885#
           1921#   1949#   1980#   1987#   2056#   2065#   2075#   2081#   2087#   2101#   2117#   2177#   2183#   2197#   2255#
           2336#   2341#   2369#   2407#   2414#   2422#   2430#   2446#   2478#   2483#   2487#   2514#   2518#   2549#   2559#
           2561#   2565#   2589#   2651#   2665#   2675#   2686#   2714#   2768#   2800#   2802#   2804#
M$ESCA      1337#   1364#   1387#   1414#   1444#   1457#   1485#   1494#   1518#   1527#   1555#   1565#
M$ESCS      1337#   1364#   1387#   1414#   1444#   1457#   1485#   1494#   1518#   1527#   1555#   1565#
M$EXCP       69#     70#     71#     73#    106#    110#    113#    119#
M$EXIT      1138#   1818#   2046#   2060#   2160#   2232#   2284#   2626#   2751#
M$EXSE      1138#   1818#   2046#   2060#   2160#   2232#   2284#   2626#   2751#
M$EXTJ      1138#   1818#   2046#   2060#   2160#   2232#   2284#   2626#   2751#
M$GEN        50#     52#     54#     63#     74#     89#     99#    105#    120#    143#    151#    465#    473#    601#    605#
            616#    620#    632#    636#    644#    648#    656#   1130#   1144#   1157#   1169#   1179#   1191#   1201#   1213#
           1223#   1235#   1243#   1264#   1279#   1313#   1323#   1341#   1342#   1352#   1368#   1369#   1378#   1391#   1392#
           1402#   1418#   1419#   1429#   1461#   1462#   1472#   1498#   1499#   1508#   1531#   1532#   1542#   1569#   1570#
```

```
                1583#  1609#  1620#  1650#  1661#  1691#  1702#  1739#  1749#  1775#  1786#  1829#  1841#  1854#  1866#
                1890#  1892#  1902#  1929#  1939#  1952#  1967#  1988#  2005#  2009#  2020#  2024#  2035#  2039#  2045#
                2118#  2121#  2133#  2137#  2146#  2150#  2159#  2209#  2213#  2227#  2259#  2278#  2372#  2384#  2398#
                2451#  2459#  2488#  2495#  2519#  2526#  2566#  2577#  2693#  2695#  2702#  2769#  2771#  3121#  3127#
                3222#  3453#  3461#  3467#
M$GETS            65#    67#    72#    74#    99#   109#   112#   120#   151#   469#   601#   616#   632#   644#   656#
                1144#  1169#  1191#  1213#  1235#  1264#  1313#  1337#  1341#  1342#  1364#  1368#  1369#  1387#  1391#
                1392#  1414#  1418#  1419#  1444#  1457#  1461#  1462#  1485#  1494#  1498#  1499#  1518#  1527#  1531#
                1532#  1555#  1565#  1569#  1570#  1609#  1650#  1691#  1739#  1775#  1829#  1854#  1890#  1892#  1929#
                1952#  1988#  2020#  2035#  2045#  2060#  2118#  2121#  2146#  2159#  2209#  2213#  2259#  2372#  2384#
                2451#  2488#  2519#  2566#  2693#  2695#  2769#  2771#  3222#
M$GETT            65#    67#    72#   109#   112#  1138#  1337#  1364#  1387#  1414#  1444#  1457#  1485#  1494#  1518#
                1527#  1555#  1565#  1818#  2046#  2060#  2160#  2232#  2284#  2626#  2751#
M$GNGB            50#    52#    54#    63#    89#   105#   143#   465#   473#   605#   620#   636#   648#  1130#  3121#
                3127#  3453#
M$GNIN            50#    52#    54#    63#    64#    65#    66#    67#    68#    69#    70#    71#    72#    73#    74#
                 89#   105#   106#   107#   108#   109#   110#   111#   112#   113#   114#   115#   116#   117#   118#
                1191#  1201#  1431#  4741#  4751#  4761#  4771#  4781#  4791#  4801#  4811#  4821#  4831#  5181#  5221#
                5311#  5321#  6011#  6141#  6151#  6161#  6311#  6321#  6401#  6441#  6521#  6561#  9291#  1135#  1136#
                1137#  1138#  1144#  1166#  1167#  1168#  1169#  1188#  1189#  1190#  1191#  1210#  1211#  1212#  1213#
                1232#  1233#  1234#  1235#  1257#  1258#  1259#  1263#  1264#  1280#  1300#  1304#  1307#  1312#  1313#
                1325#  1336#  1337#  1341#  1342#  1354#  1363#  1364#  1368#  1369#  1380#  1386#  1387#  1391#  1392#
                1406#  1413#  1414#  1418#  1419#  1431#  1443#  1444#  1456#  1457#  1461#  1462#  1474#  1484#  1485#
                1493#  1494#  1498#  1499#  1510#  1517#  1518#  1526#  1527#  1531#  1532#  1546#  1554#  1555#  1564#
                1565#  1569#  1570#  1594#  1595#  1600#  1601#  1608#  1609#  1635#  1636#  1641#  1642#  1649#  1650#
                1676#  1677#  1682#  1683#  1690#  1691#  1718#  1719#  1724#  1725#  1730#  1731#  1738#  1739#  1765#
                1766#  1770#  1771#  1774#  1775#  1808#  1809#  1816#  1817#  1818#  1827#  1828#  1829#  1843#  1852#
                1853#  1854#  1870#  1871#  1885#  1886#  1890#  1891#  1892#  1921#  1922#  1929#  1942#  1949#  1950#
                1951#  1952#  1980#  1987#  1988#  2009#  2020#  2024#  2035#  2039#  2045#  2046#  2050#  2056#  2057#
                2060#  2065#  2066#  2075#  2076#  2081#  2082#  2087#  2088#  2101#  2103#  2104#  2112#  2117#  2118#
                2121#  2137#  2146#  2150#  2159#  2160#  2164#  2171#  2177#  2178#  2183#  2184#  2197#  2199#  2200#
                2208#  2209#  2210#  2213#  2232#  2255#  2259#  2284#  2296#  2336#  2341#  2369#  2371#  2372#  2384#
                2407#  2414#  2422#  2430#  2446#  2451#  2478#  2483#  2487#  2488#  2514#  2518#  2519#  2549#  2559#
                2561#  2565#  2566#  2589#  2626#  2632#  2651#  2665#  2675#  2686#  2693#  2695#  2714#  2751#  2755#
                2768#  2769#  2771#  2800#  2802#  2804#  2876#  3043#  3080#  3082#  3121#  3132#  3135#  3138#  3141#
                3144#  3147#  3150#  3153#  3157#  3164#  3173#  3180#  3181#  3188#  3189#  3192#  3204#  3205#  3206#
                3207#  3212#  3213#  3219#  3220#  3221#  3222#  3435#  3453#  3461#
M$GNLS          1341#  1368#  1391#  1418#  1461#  1498#  1531#  1569#  1890#  2118#  2209#  2372#  2693#  2769#
M$GNSU          2009#  2024#  2039#  2137#  2150#
M$GNTA            74#    99#   120#   151#   601#   616#   632#   644#   656#  1144#  1169#  1191#  1213#  1235#  1264#
                1313#  1342#  1369#  1392#  1419#  1462#  1499#  1532#  1570#  1609#  1650#  1691#  1739#  1775#  1829#
                1854#  1892#  1929#  1952#  1988#  2020#  2035#  2045#  2121#  2146#  2159#  2213#  2259#  2384#  2451#
                2488#  2519#  2566#  2695#  2771#  3222#  3461#  3467#
M$GNTE          1157#  1179#  1201#  1223#  1243#  1279#  1323#  1352#  1378#  1402#  1429#  1472#  1508#  1542#  1583#
                1620#  1661#  1702#  1749#  1786#  1841#  1866#  1902#  1939#  1967#  2005#  2133#  2227#  2278#  2398#
                2459#  2495#  2526#  2577#  2702#
M$HAPT            50#
M$HNAP            50#
M$INCR            63#    89#   105#   143#   465#   473#   474#   476#   478#   480#   482#   518#   522#   531#   601#
                 605#   614#   615#   616#   620#   631#   632#   636#   640#   644#   648#   652#   656#   929#  1130#
                1135#  1136#  1137#  1144#  1157#  1166#  1167#  1168#  1169#  1179#  1188#  1189#  1190#  1191#  1201#
                1210#  1211#  1212#  1213#  1223#  1232#  1233#  1234#  1235#  1243#  1257#  1258#  1259#  1263#  1264#
                1279#  1280#  1300#  1304#  1307#  1312#  1313#  1323#  1325#  1336#  1337#  1341#  1342#  1352#  1354#
                1363#  1364#  1368#  1369#  1378#  1380#  1386#  1387#  1391#  1392#  1402#  1406#  1413#  1414#  1418#
                1419#  1429#  1431#  1443#  1444#  1456#  1457#  1461#  1462#  1472#  1474#  1484#  1485#  1493#  1494#
                1498#  1499#  1508#  1510#  1517#  1518#  1526#  1527#  1531#  1532#  1542#  1546#  1554#  1555#  1564#
```

```
                1565#  1569#  1570#  1583#  1594#  1595#  1600#  1601#  1608#  1609#  1620#  1635#  1636#  1641#  1642#
                1649#  1650#  1661#  1676#  1677#  1682#  1683#  1690#  1691#  1702#  1718#  1719#  1724#  1725#  1730#
                1731#  1738#  1739#  1749#  1765#  1766#  1770#  1771#  1774#  1775#  1786#  1808#  1809#  1816#  1817#
                1818#  1827#  1828#  1829#  1841#  1843#  1852#  1853#  1854#  1866#  1870#  1871#  1885#  1886#  1890#
                1891#  1892#  1902#  1921#  1922#  1929#  1939#  1942#  1949#  1950#  1951#  1952#  1967#  1980#  1987#
                1988#  2005#  2009#  2020#  2024#  2035#  2039#  2045#  2046#  2050#  2056#  2057#  2060#  2065#  2066#
                2075#  2076#  2081#  2082#  2087#  2088#  2101#  2103#  2104#  2112#  2117#  2118#  2121#  2133#  2137#
                2146#  2150#  2159#  2160#  2164#  2171#  2177#  2178#  2183#  2184#  2197#  2199#  2200#  2208#  2209#
                2210#  2213#  2227#  2232#  2255#  2259#  2278#  2284#  2296#  2336#  2341#  2369#  2371#  2372#  2384#
                2398#  2407#  2414#  2422#  2430#  2446#  2451#  2459#  2478#  2483#  2487#  2488#  2495#  2514#  2518#
                2519#  2526#  2549#  2559#  2561#  2565#  2566#  2577#  2589#  2626#  2632#  2651#  2665#  2675#  2686#
                2693#  2695#  2702#  2714#  2751#  2755#  2768#  2769#  2771#  2800#  2802#  2804#  2876#  3043#  3080#
                3082#  3127#  3132#  3135#  3138#  3141#  3144#  3147#  3150#  3153#  3157#  3164#  3173#  3180#  3181#
                3188#  3189#  3192#  3204#  3205#  3206#  3207#  3212#  3219#  3220#  3221#  3222#  3435#  3460#  3461#
M$LDRO           474#   476#   478#   480#   482#   531#   615#   631#  1167#  1189#  1211#  1233#  1258#  1280#  1843#
                1853#  1871#  1891#  1942#  1951#  2171#  2210#  3220#
M$MCHI           17#
M$MCLO           17#
M$POP            74#    99#   120#   151#   469#   601#   616#   632#   644#   656#  1144#  1169#  1191#  1213#  1235#
                1264#  1313#  1341#  1342#  1368#  1369#  1391#  1392#  1418#  1419#  1461#  1462#  1498#  1499#  1531#
                1532#  1569#  1570#  1609#  1650#  1691#  1739#  1775#  1829#  1854#  1890#  1892#  1929#  1952#  1988#
                2020#  2035#  2045#  2118#  2121#  2146#  2159#  2209#  2213#  2259#  2372#  2384#  2451#  2488#  2519#
                2566#  2693#  2695#  2769#  2771#  3222#
M$PRIN           640#   652#  1135#  1136#  1137#  2103#  2112#  2199#  2208#  2876#  3043#  3082#  3132#  3135#  3138#
                3141#  3144#  3147#  3150#  3153#  3157#  3164#  3173#  3180#  3181#  3188#  3189#  3192#  3204#  3205#
                3206#  3207#  3219#
M$PUSH            63#    89#   105#   143#   465#   473#   605#   620#   636#   648#  1130#  1157#  1179#  1201#  1223#
                1243#  1279#  1323#  1325#  1352#  1354#  1378#  1380#  1402#  1406#  1429#  1431#  1472#  1474#  1508#
                1510#  1542#  1546#  1583#  1620#  1661#  1702#  1749#  1786#  1841#  1866#  1870#  1902#  1939#  1967#
                2005#  2009#  2024#  2039#  2050#  2133#  2137#  2150#  2164#  2227#  2278#  2296#  2398#  2459#  2495#
                2526#  2577#  2632#  2702#  2755#  3127#
M$PUT            640#   652#  1135#  1136#  1137#  2103#  2112#  2199#  2208#  2876#  3043#  3082#  3132#  3135#  3138#
                3141#  3144#  3147#  3150#  3153#  3157#  3164#  3173#  3180#  3181#  3188#  3189#  3192#  3204#  3205#
                3206#  3207#  3219#
M$PUT1           640#   652#  1135#  1136#  1137#  2103#  2112#  2199#  2208#  2876#  3043#  3082#  3132#  3135#  3138#
                3141#  3144#  3147#  3150#  3153#  3157#  3164#  3173#  3180#  3181#  3188#  3189#  3192#  3204#  3205#
                3206#  3207#  3219#
M$RADI            64#    66#    68#    69#    70#    71#    73#   106#   108#   110#   111#   113#   114#   115#   116#
                117#   118#   119#
M$RNRO           531#  3435#
M$SETS            63#    89#   105#   143#   465#   473#   605#   620#   636#   648#  1130#  1157#  1179#  1201#  1223#
                1243#  1279#  1323#  1325#  1352#  1354#  1378#  1380#  1402#  1406#  1429#  1431#  1472#  1474#  1508#
                1510#  1542#  1546#  1583#  1620#  1661#  1702#  1749#  1786#  1841#  1866#  1870#  1902#  1939#  1967#
                2005#  2009#  2024#  2039#  2050#  2133#  2137#  2150#  2164#  2227#  2278#  2296#  2398#  2459#  2495#
                2526#  2577#  2632#  2702#  2755#  3127#
M$SVC            474#   476#   478#   480#   482#   518#   522#   531#   601#   614    615#   616#   631#   632#   640#
                644#   652#   656#   929   1135#  1136#  1137#  1138#  1144#  1166   1167#  1168#  1169#  1188   1189#
                1190#  1191#  1210   1211#  1212#  1213#  1232   1233#  1234#  1235#  1257   1258#  1259#  1263   1264#
                1280#  1300   1304   1307   1312   1313#  1325#  1336   1337#  1341#  1342#  1354#  1363   1364#  1368#
                1369#  1380#  1386   1387#  1391#  1392#  1406#  1413   1414#  1418#  1419#  1431#  1443   1444#  1456
                1457#  1461#  1462#  1474#  1484   1485#  1493   1494#  1498#  1499#  1510#  1517   1518#  1526   1527#
                1531#  1532#  1546#  1554   1555#  1564   1565#  1569#  1570#  1594   1595#  1600   1601#  1608   1609#
                1635   1636#  1641   1642#  1649   1650#  1676   1677#  1682   1683#  1690   1691#  1718   1719#  1724
                1725#  1730   1731#  1738   1739#  1765   1766#  1770   1771#  1774   1775#  1808   1809#  1816   1817#
                1818#  1827   1828#  1829#  1843#  1852   1853#  1854#  1870#  1871#  1885   1886#  1890#  1891#  1892#
                1921   1922#  1929#  1942#  1949   1950#  1951#  1952#  1980   1987   1988#  2009#  2020#  2024#  2035#
```

	2039#	2045#	2046#	2050#	2056	2057#	2060#	2065	2066#	2075	2076#	2081	2082#	2087	2088#
	2101	2103#	2104#	2112#	2117	2118#	2121#	2137#	2146#	2150#	2159#	2160#	2164#	2171#	2177
	2178#	2183	2184#	2197	2199#	2200#	2208#	2209#	2210#	2213#	2232#	2255	2259#	2284#	2296#
	2336	2341	2369	2371#	2372#	2384#	2407	2414	2422	2430	2446	2451#	2478	2483	2487
	2488#	2514	2518	2519#	2549	2559	2561	2565	2566#	2589	2626#	2632#	2651	2665	2675
	2686	2693#	2695#	2714	2751#	2755#	2768	2769#	2771#	2800	2802	2804	2876#	3043#	3080#
	3082#	3132#	3135#	3138#	3141#	3144#	3147#	3150#	3153#	3157#	3164#	3173#	3180#	3181#	3188#
	3189#	3192#	3204#	3205#	3206#	3207#	3212#	3219#	3220#	3221#	3222#	3435#			
M$TLAB	474#	476#	478#	480#	482#	518#	522#	531#	601#	614#	615#	616#	631#	632#	640#
	644#	652#	656#	929#	1135#	1136#	1137#	1144#	1166#	1167#	1168#	1169#	1188#	1189#	1190#
	1191#	1210#	1211#	1212#	1213#	1232#	1233#	1234#	1235#	1257#	1258#	1259#	1263#	1264#	1280#
	1300#	1304#	1307#	1312#	1313#	1325#	1336#	1337#	1341#	1342#	1354#	1363#	1364#	1368#	1369#
	1380#	1386#	1387#	1391#	1392#	1406#	1413#	1414#	1418#	1419#	1431#	1443#	1444#	1456#	1457#
	1461#	1462#	1474#	1484#	1485#	1493#	1494#	1498#	1499#	1510#	1517#	1518#	1526#	1527#	1531#
	1532#	1546#	1554#	1555#	1564#	1565#	1569#	1570#	1594#	1595#	1600#	1601#	1608#	1609#	1635#
	1636#	1641#	1642#	1649#	1650#	1676#	1677#	1682#	1683#	1690#	1691#	1718#	1719#	1724#	1725#
	1730#	1731#	1738#	1739#	1765#	1766#	1770#	1771#	1774#	1775#	1808#	1809#	1816#	1817#	1818#
	1827#	1828#	1829#	1843#	1852#	1853#	1854#	1870#	1871#	1885#	1886#	1890#	1891#	1892#	1921#
	1922#	1929#	1942#	1949#	1950#	1951#	1952#	1980#	1987#	1988#	2009#	2020#	2024#	2035#	2039#
	2045#	2046#	2050#	2056#	2057#	2060#	2065#	2066#	2075#	2076#	2081#	2082#	2087#	2088#	2101#
	2103#	2104#	2112#	2117#	2118#	2121#	2137#	2146#	2150#	2159#	2160#	2164#	2171#	2177#	2178#
	2183#	2184#	2197#	2199#	2200#	2208#	2209#	2210#	2213#	2232#	2255#	2259#	2284#	2296#	2336#
	2341#	2369#	2371#	2372#	2384#	2407#	2414#	2422#	2430#	2446#	2451#	2478#	2483#	2487#	2488#
	2514#	2518#	2519#	2549#	2559#	2561#	2565#	2566#	2589#	2626#	2632#	2651#	2665#	2675#	2686#
	2693#	2695#	2714#	2751#	2755#	2768#	2769#	2771#	2800#	2802#	2804#	2876#	3043#	3080#	3082#
	3132#	3135#	3138#	3141#	3144#	3147#	3150#	3153#	3157#	3164#	3173#	3180#	3181#	3188#	3189#
	3192#	3204#	3205#	3206#	3207#	3212#	3219#	3220#	3221#	3222#	3435#				
M$TSTL	474#	476#	478#	480#	482#	518#	522#	531#	601#	614#	615#	616#	631#	632#	640#
	644#	652#	656#	929#	1135#	1136#	1137#	1144#	1166#	1167#	1168#	1169#	1188#	1189#	1190#
	1191#	1210#	1211#	1212#	1213#	1232#	1233#	1234#	1235#	1257#	1258#	1259#	1263#	1264#	1280#
	1300#	1304#	1307#	1312#	1313#	1325#	1336#	1337#	1341#	1342#	1354#	1363#	1364#	1368#	1369#
	1380#	1386#	1387#	1391#	1392#	1406#	1413#	1414#	1418#	1419#	1431#	1443#	1444#	1456#	1457#
	1461#	1462#	1474#	1484#	1485#	1493#	1494#	1498#	1499#	1510#	1517#	1518#	1526#	1527#	1531#
	1532#	1546#	1554#	1555#	1564#	1565#	1569#	1570#	1594#	1595#	1600#	1601#	1608#	1609#	1635#
	1636#	1641#	1642#	1649#	1650#	1676#	1677#	1682#	1683#	1690#	1691#	1718#	1719#	1724#	1725#
	1730#	1731#	1738#	1739#	1765#	1766#	1770#	1771#	1774#	1775#	1808#	1809#	1816#	1817#	1818#
	1827#	1828#	1829#	1843#	1852#	1853#	1854#	1870#	1871#	1885#	1886#	1890#	1891#	1892#	1921#
	1922#	1929#	1942#	1949#	1950#	1951#	1952#	1980#	1987#	1988#	2009#	2020#	2024#	2035#	2039#
	2045#	2046#	2050#	2056#	2057#	2060#	2065#	2066#	2075#	2076#	2081#	2082#	2087#	2088#	2101#
	2103#	2104#	2112#	2117#	2118#	2121#	2137#	2146#	2150#	2159#	2160#	2164#	2171#	2177#	2178#
	2183#	2184#	2197#	2199#	2200#	2208#	2209#	2210#	2213#	2232#	2255#	2259#	2284#	2296#	2336#
	2341#	2369#	2371#	2372#	2384#	2407#	2414#	2422#	2430#	2446#	2451#	2478#	2483#	2487#	2488#
	2514#	2518#	2519#	2549#	2559#	2561#	2565#	2566#	2589#	2626#	2632#	2651#	2665#	2675#	2686#
	2693#	2695#	2714#	2751#	2755#	2768#	2769#	2771#	2800#	2802#	2804#	2876#	3043#	3080#	3082#
	3132#	3135#	3138#	3141#	3144#	3147#	3150#	3153#	3157#	3164#	3173#	3180#	3181#	3188#	3189#
	3192#	3204#	3205#	3206#	3207#	3212#	3219#	3220#	3221#	3222#	3435#				
M$WORD	50#	64#	65#	66#	67#	68#	69#	70#	71#	72#	73#	106#	107#	108#	109#
	110#	111#	112#	113#	114#	115#	116#	117#	118#	119#	614#	929#	1138#	1166#	1188#
	1210#	1232#	1257#	1263#	1300#	1304#	1307#	1312#	1336#	1363#	1386#	1413#	1443#	1456#	1484#
	1493#	1517#	1526#	1554#	1564#	1594#	1600#	1608#	1635#	1641#	1649#	1676#	1682#	1690#	1718#
	1724#	1730#	1738#	1765#	1770#	1774#	1808#	1816#	1818#	182?#	1852#	1885#	1921#	1949#	1980#
	1987#	2046#	2056#	2060#	2065#	2075#	2081#	2087#	2101#	2117#	2160#	2177#	2183#	2197#	2232#
	2255#	2284#	2336#	2341#	2369#	2407#	2414#	2422#	2430#	2446#	2478#	2483#	2487#	2514#	2518#
	2549#	2559#	2561#	2565#	2589#	2626#	2651#	2665#	2675#	2686#	2714#	2751#	2768#	2800#	2802#
	2804#	3121#	3461#												
M$XFER	65#	67#	72#	109#	112#										

```
CVRLB80    RLV12 DISKLESS.      MACY11 30(1046)  12 JUN-85  15:42  PAGE 49-5
CVRLBB.P11    12-JUN-85 15:33          CROSS REFERENCE TABLE    MACRO NAMES                                                    SEQ 0158

POINTE     49
PRINTB   2112    2208    3132    3135    3138    3141    3144    3147    3150    3153    3157    3164    3173    3204    3205
         3206    3207
PRINTF    640     652    1135    1136    1137    2876    3043    3082    3219
PRINTX   2103    2199    3180    3181    3188    3189    3192
READEF    474     476     478     480     482
SETPRI    631    1280    1843    1853    1871    1891    1942    1951    2171    2210
SFERR     207#    614    1166    1188    1210    1232    1257
STARS    1151    1156    1173    1178    1195    1200    1217    1222    1239    1242    1268    1278    1317    1322    1346
         1351    1373    1377    1396    1401    1423    1428    1466    1471    1503    1507    1536    1541    1574    1582
         1613    1619    1654    1660    1695    1701    1743    1748    1779    1785    1833    1840    1858    1865    1896
         1901    1934    1938    1956    1966    1992    2004    2125    2132    2217    2226    2263    2276    2389    2397
         2455    2458    2492    2494    2523    2525    2570    2576    2699    2701
SVC        16#     17
XFER       67      72    1138#   1818#   2046#   2060#   2160#   2232#   2284#   2626#   2751#
XFERF      65     109
XFERT     112

. ABS.  040434     000


 ERRORS DETECTED:  0

 CVRLBB.BIC,CVRLBB.LST/LI:TOC/CRF=SVC33/ML,CVRLBB.P11
 RUN-TIME: 33 34 4 SECONDS
 RUN TIME RATIO: 128/72-1.7
 CORE USED:  19K  (38 PAGES)
```