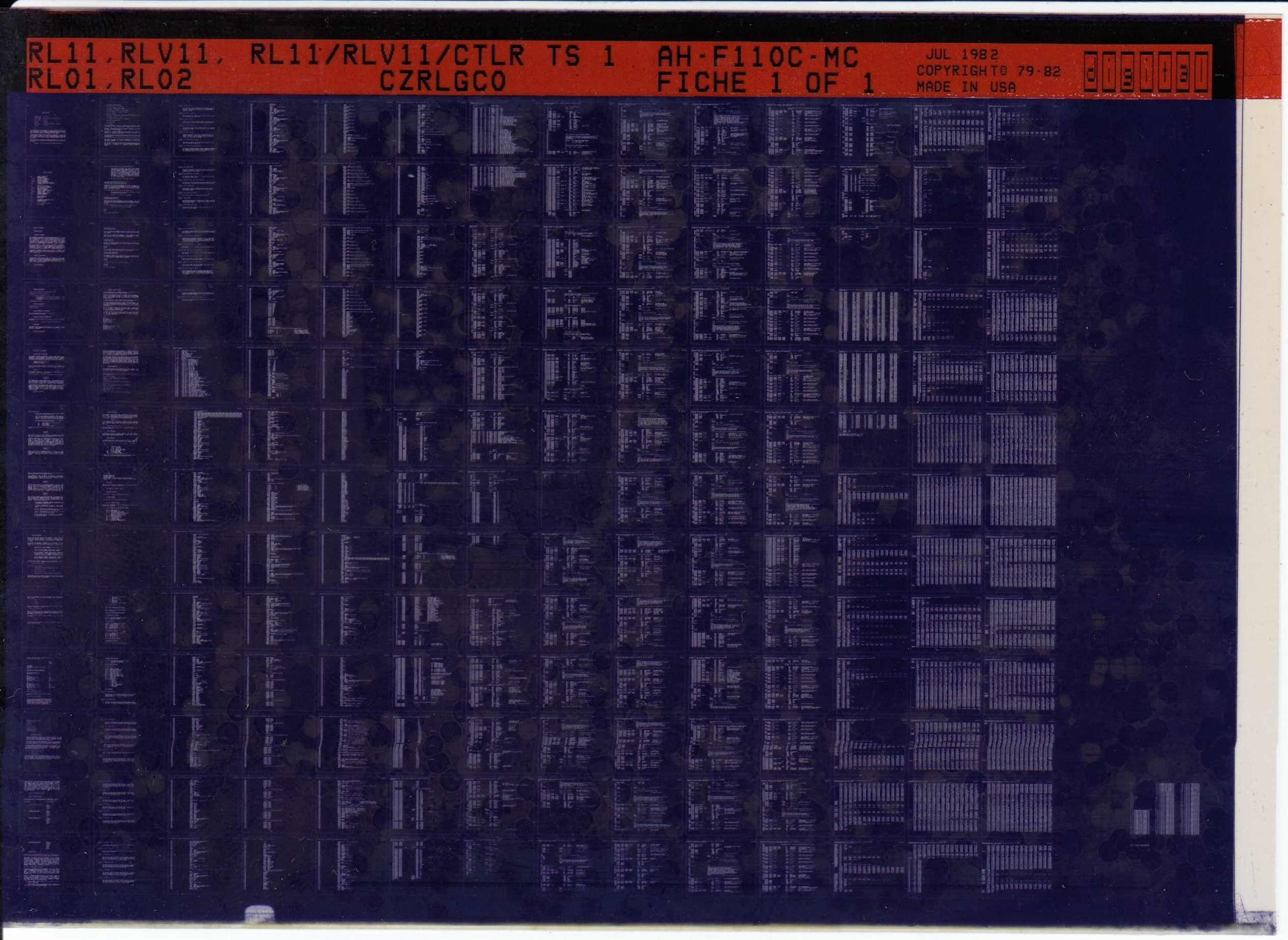
RL11,RLV11, RL11/RLV11/CTLR TS 1 AH-F110C-MC
RL01,RL02 CZRLGC0 FICHE 1 OF 1



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IDENTIFICATION

PRODUCT CODE: AC-F111C-MC
PRODUCT NAME: CZRLGC0 RL11/RLV11 CONTROLLER TEST 1
DATE CREATED: 5-JAN-79
REVISED: 22-FEB-82
MAINTAINER: DIAGNOSTIC ENGINEERING - COLORADO
AUTHORS: D. CLAFLIN

TABLE OF CONTENTS

1.0 GENERAL INFORMATION

1.1 PROGRAM ABSTRACT

1.1.1 STRUCTURE OF PROGRAM

THIS DIAGNOSTIC IS COMPATIBLE WITH BOTH XXDP+ AND ACT. IT CAN BE RUN STANDALONE UNDER XXDP+, AND CAN BE CHAINED UNDER XXDP+, ACT AND APT IN ACT MODE (SEE 2.2 "CHAIN MODE OPERATION" FOR DETAILS OF CHAINING PROCEDURE). IT IS A SINGLE PROGRAM FROM THE STANDPOINT OF THE DIAGNOSTIC USER, WHICH AT RUN TIME IS APPENDED TO A COMMON FRONT-END PIECE OF SUPERVISOR SOFTWARE THROUGH WHICH THE DIAGNOSTIC INTERFACES TO THE ENVIRONMENT AS IT EXECUTES. USING THE DEFAULT VALUES IN THE P TABLES, PROGRAM EXECUTES ONE PASS IN 11 SECONDS.

WHEN THIS DIAGNOSTIC IS STARTED, CONTROL GOES FIRST TO THE SUPERVISOR PORTION, WHICH WILL ASK CERTAIN "HARD CORE" QUESTIONS ABOUT THE ENVIRONMENT. THEN IT WILL ENTER COMMAND MODE, INDICATED BY A PROMPT CHARACTER (DR>). AT COMMAND MODE THE OPERATOR MAY ENTER ANY OF SEVERAL COMMANDS AS DESCRIBED IN 2.0 "OPERATING INSTRUCTIONS".

THE DIAGNOSTIC PROGRAM IS LOADED IN THE LOWER 8K OF MEMORY. THE DIAGNOSTIC SUPERVISOR CODING OCCUPIES 6.25K OF THE UPPER PART OF MEMORY JUST BELOW THE XXDP+ MONITOR WHICH RESIDES IN THE UPPERMOST 1.5K OF MEMORY SPACE.

1.1.2 DIAGNOSTIC INFORMATION

THE RL11/RLV11 CONTROLLER TEST (PART 1) IS A PDP-11 (LSI-11) BASED PROGRAM THAT WILL TEST THE CONTROLLER. IT STARTS BY TESTING BASIC INTERFACE LOGIC, REGISTER MANIPULATION AND FUNCTIONALITY WHICH INCLUDES NOOP, GET STATUS, READ HEADERS AND SEEK OPERATIONS. IT IS AIMED AT FULLY TESTING THE CONTROLLER IN THESE AREAS, BUT BY DEFAULT ALSO EXERCISES THE DRIVE.

1.2 SYSTEM REQUIREMENTS

1.2.1 HARDWARE REQUIREMENTS

* PDP-11/LSI-11 PROCESSOR WITH 16K OR MORE OF MEMORY
* CONSOLE DEVICE (LA30,LA36,VT50,ETC.)
* 1 OR 2 RL11/RLV11 CONTROLLER(S) WITH:
  - 1 - 8 RL01 DRIVES WITH RL01K CARTRIDGES CONTAINING A 'BAD SECTOR FILE'
  - 1 - 8 RL02 DRIVES WITH RL02K CARTRIDGES CONTAINING A 'BAD SECTOR FILE'
* LINE PRINTER (OPTIONAL)

1.2.2 SOFTWARE REQUIREMENTS

CZRLGB0 RL11/RLV11 CTLR TST 1

(FORMERLY CZRLAB)

1.3 RELATED DOCUMENTS AND STANDARDS

RL01 DISK SUBSYSTEM USER'S GUIDE (EK-RL01-UG-002)
XXDP+/SUPERVISOR USER'S MANUAL

1.4 DIAGNOSTIC HIERARCHY PREREQUISITES

THE RL01/02 SUBSYSTEM SHOULD HAVE SUCCESSFULLY RUN THE FOLLOWING PROGRAMS:

CVRLAB0	RLV11 RL01 DISKLESS TEST (RLV11 ONLY)

1.5 ASSUMPTIONS

THE HARDWARE OTHER THAN THE RL01/02 SUBSYSTEM IS ASSUMED TO WORK PROPERLY. FALSE ERRORS MAY BE REPORTED IF THE PROCESSOR, ETC., DO NOT FUNCTION PROPERLY.

2.0 OPERATING INSTRUCTIONS

2.1 HOW TO RUN THIS DIAGNOSTIC

2.1.1 THE FIVE STEPS OF EXECUTION

THIS DIAGNOSTIC SHOULD BE LOADED AND STARTED USING NORMAL XXDP+ PROCEDURES. START THE EXECUTION OF THE XXDP+ MONITOR BY USING THE APPROPRIATE BOOTSTRAP PROGRAM. THE MONITOR WILL PRINT A MESSAGE IDENTIFYING ITSELF AND REQUESTING THAT THE CURRENT DATE BE ENTERED. AN EXAMPLE OF THIS MESSAGE IS GIVEN BELOW FOR THE XXDP+ MONITOR.

```
CHMDKA0 XXDP+ DK MONITOR NNK
BOOTED VIA UNIT#: 0
ENTER DATE (DD-MMM-YY):
```

AFTER THE DATE HAS BEEN ACCEPTED BY THE MONITOR. THE RESTART ADDRESS OF THE MONITOR IS PRINTED. THEN THE FOLLOWING TWO QUESTIONS ARE ASKED:

```
50 HZ?  N
LSI?    N
```

THE DEFAULTS ARE BOTH "NO". TYPE "R" AND THE PROGRAM NAME TO RUN THE PROGRAM. DO NOT TYPE THE EXTENSION.

WHEN THIS DIAGNOSTIC IS STARTED, THE FOLLOWING STEPS WILL OCCUR:

```
**********
* STEP 1 *
**********
```

THE DIAGNOSTIC WILL ISSUE THE PROMPT "DR>". FROM THIS POINT UNTIL THE TIME WHEN YOU RESTART XXDP+, YOU WILL BE TALKING TO THE DIAGNOSTIC, NOT XXDP+. WE WILL REFER TO THE PRESENCE OF THIS PROMPT AS BEING IN DIAGNOSTIC COMMAND MODE, AS OPPOSED TO XXDP+ COMMAND MODE.

AT THIS POINT YOU WILL ENTER A "START" COMMAND. THIS IS NOT THE SAME AS THE XXDP+ "START" COMMAND, WHICH YOU ALREADY ISSUED IN RESPONSE TO THE XXDP+ DOT PROMPT. THIS "START" COMMAND CAN TAKE A NUMBER OF SWITCHES AND FLAGS (ALL OPTIONAL) AND THE DETAILS OF THESE ARE SET FORTH IN 2.3 "DETAILS OF COMMANDS AND SYNTAX". HOWEVER, IN ORDER TO USE THE PROGRAM, ALL YOU NEED TO SAY IS SOMETHING LIKE THIS:

```
STA/PASS:1/FLAGS:HOE
```

THINGS TO NOTE HERE:

1. ONLY THE FIRST THREE CHARACTERS OF THIS OR ANY COMMAND AT THE "DR>" LEVEL NEED TO BE TYPED.

2. THE "PASS" SWITCH SPECIFIES HOW MANY PASSES YOU DESIRE. A PASS CONSISTS OF RUNNING THE FULL DIAGNOSTIC AGAINST ALL UNITS BEING TESTED (THIS WILL BE EXPLAINED SHORTLY). ONE PASS IS SPECIFIED IN THE ABOVE EXAMPLE.

3. THE "FLAGS" SWITCH MAY SPECIFY ANY OF A NUMBER OF FLAGS, BUT THE MAIN USEFUL ONES ARE:

PNT	PRINT NUMBER OF TEST BEING EXECUTED
LOE	LOOP ON ERROR
HOE	HALT ON ERROR
IER	INHIBIT ERROR PRINTOUT

THE HOE FLAG IS SPECIFIED IN THE ABOVE EXAMPLE (WE'LL SEE WHY SHORTLY).

****
* STEP 2 *
****

WHEN YOU HAVE TYPED IN A "START" COMMAND, THE DIAGNOSTIC WILL COME BACK WITH THE QUESTION "# UNITS?" TO WHICH YOU SHOULD RESPOND BY TYPING IN THE NUMBER OF DEVICES YOU WISH TO TEST.

A WORD OF WARNING HERE: THE NUMBER OF UNITS DEPENDS ON THE TARGET DEVICE OF THE DIAGNOSTIC. FOR EXAMPLE, IF THE DIAGNOSTIC IS DIRECTED AT A DISK DRIVE, THEN THE NUMBER OF UNITS WOULD BE THE NUMBER OF DRIVES TO BE TESTED. WHEREAS IF THE DIAGNOSTIC WAS DIRECTED AT THE DISK CONTROLLER, THEN THE NUMBER OF UNITS WOULD BE THE NUMBER OF CONTROLLERS. THE TARGET DEVICE OF A DIAGNOSTIC CAN ALWAYS BE DETERMINED BY INSPECTING THE "HEADER" STATEMENT NEAR THE BEGINNING OF THE SOURCE CODE. ONE OF THE OPERANDS OF THIS "HEADER" STATEMENT SHOULD BE THE DEVICE TYPE OF THE DIAGNOSTIC.

****
* STEP 3 *
****

WHEN YOU HAVE TYPED IN THE NUMBER OF UNITS TO BE TESTED, THE DIAGNOSTIC WILL ASK YOU THE "HARDWARE QUESTIONS". THE ANSWERS TO THESE QUESTIONS ARE USED TO BUILD TABLES IN CORE, CALLED "HARDWARE P-TABLES". ONE HARDWARE P-TABLE WILL BE BUILT FOR EACH UNIT TO BE TESTED.

THERE ARE SEVERAL HARDWARE QUESTIONS AND THE ENTIRE SERIES WILL BE POSED N TIMES, WHERE N IS THE NUMBER OF UNITS.

THIS REPRESENTS A NEW PHILOSOPHY IN DIAGNOSTIC ENGINEERING. DIAGNOSTICS IN THE FUTURE WILL NOT BE WRITTEN TO AUTOSIZE OR ASSUME STANDARD ADDRESSES: INSTEAD, THEY WILL ASK THE OPERATOR FOR ALL THE INFORMATION THEY NEED TO TEST THE DEVICE.

****
* STEP 4 *
****

AFTER YOU HAVE ANSWERED ALL THE HARDWARE QUESTIONS (SEC 2.5) FOR ALL THE UNITS, YOU WILL BE ASKED "CHANGE SW?" IF YOU WANT TO BE ASKED THE SOFTWARE QUESTIONS THAT DETERMINE THE BEHAVIOR OF THIS PROGRAM, TYPE "Y". IF YOU WANT TO TAKE ALL THE DEFAULTS TO THESE QUESTIONS, TYPE "N". IF YOU TYPE "Y" YOU WILL BE ASKED THE SOFTWARE QUESTIONS (SEC 2.6), AND THE ANSWERS WILL BE PUT INTO THE SOFTWARE P-TABLE IN THE PROGRAM. THE SERIES OF QUESTIONS WILL BE ASKED JUST ONCE, REGARDLESS OF THE NUMBER OF UNITS TO BE TESTED.

****
* STEP 5 *
****

AFTER YOU HAVE ANSWERED THE SOFTWARE QUESTIONS, THE DIAGNOSTIC WILL BEGIN TO EXECUTE THE HARDWARE TEST CODE. THERE ARE SEVERAL THINGS THAT CAN HAPPEN NEXT, DEPENDING ON WHETHER A HARDWARE ERROR IS ENCOUNTERED AND ALSO ON WHAT SWITCH VALUES YOU SELECTED ON THE START COMMAND. CONSIDER THE POSSIBILITIES:

1. IF NO ERROR IS ENCOUNTERED, THEN THE DIAGNOSTIC WILL SIMPLY EXECUTE THE DESIRED NUMBER OF PASSES AND RETURN TO COMMAND MODE (PROMPT DR>).

2. IF AN ERROR IS ENCOUNTERED, THEN ONE OF THREE THINGS HAPPENS, DEPENDING ON THE SETTINGS OF THE HOE AND LOE FLAGS.

   HOE SET: THE ERROR WILL BE REPORTED ON THE CONSOLE AND THE DIAGNOSTIC WILL RETURN TO COMMAND MODE.

   LOE SET: THE DIAGNOSTIC WILL LOOP ENDLESSLY ON THE BLOCK OF CODE THAT DETECTED THE ERROR.

   NEITHER HOE NOR LOE SET: THE ERROR WILL BE REPORTED ON THE CONSOLE AND NORMAL EXECUTION WILL RESUME AS IF NO ERROR HAD OCCURRED.

2.1.2 SAMPLE RUN-THROUGH

LET'S SEE HOW ALL THIS WORKS IN A REAL SITUATION. RECALL THAT WE ENTERED THE COMMAND "STA/PASS:1/FLAGS:HOE". THIS WOULD BE A VERY TYPICAL WAY TO RUN THE DIAGNOSTIC. IF NO ERRORS ARE ENCOUNTERED, THE SINGLE REQUESTED PASS WILL BE EXECUTED AND THE PROMPT WILL BE RE-ISSUED.

IF AN ERROR IS ENCOUNTERED, THE ERROR WILL BE REPORTED AND THE PROMPT WILL BE REISSUED (BECAUSE THE HOE FLAG IS SET). AT THIS POINT THERE ARE FOUR DIFFERENT WAYS YOU CAN GET THE PROGRAM GOING AGAIN:

1. ISSUE ANOTHER "START" COMMAND (THUS GOING THRU ALL OF STEPS 1, 2, 3, 4, AND 5 AGAIN).
2. ISSUE A "RESTART" COMMAND (SAME AS START COMMAND EXCEPT THAT THE HARDWARE QUESTIONS ARE NOT ASKED)
3. ISSUE A "CONTINUE" COMMAND (EXECUTION WILL RESUME AT THE BEGINNING OF THE PARTICULAR HARDWARE TEST (MOST DIAGNOSTICS CONSIST OF A NUMBER OF THESE) THAT IT WAS IN WHEN THE ERROR HALT OCCURRED. NO QUESTIONS ASKED.
4. ISSUE A "PROCEED" COMMAND: EXECUTION WILL RESUME AT THE INSTRUCTION FOLLOWING THE ERROR REPORT (THIS IS A SPECIAL COMMAND AND CAN BE ISSUED ONLY AT A HALT

THE MOST TYPICAL THING TO DO HERE IS TO ISSUE THE PROCEED, BUT WITH DIFFERENT FLAG SETTINGS. PROBABLY YOU WOULD WANT TO SAY:

```
PRO/FLAGS:IER:LOE:HOE=0
```

THIS WILL DO THE FOLLOWING:

1. TURN ON THE IER (INHIBIT ERROR PRINTOUT) FLAG
2. TURN ON THE LOE FLAG
3. TURN OFF THE HOE FLAG
4. RESUME EXECUTION AT INSTRUCTION AFTER ERROR REPORT

THE DIAGNOSTIC WILL NOW LOOP ON THE BLOCK OF CODE THAT DETECTED AND REPORTED THE ERROR, BUT NO ERROR PRINTOUT WILL OCCUR. THUS YOU CAN STUDY THE ERROR OR SCOPE IT OR WHATEVER.

WHEN YOU'VE SEEN ENOUGH, YOU MAY HIT CONTROL/C. THIS WILL TAKE YOU OUT OF THE LOOP AND PUT YOU BACK INTO COMMAND MODE. YOU NOW HAVE THREE CHOICES:

1. START
2. RESTART
3. CONTINUE

LET'S SAY YOU'VE REPAIRED THE DEFECT FOUND ABOVE AND WANT TO FINISH RUNNING THE DIAGNOSTIC. YOU WOULD TYPE

```
CON/FLAGS:HOE:IER=0:LOE=0
```

THIS WILL RESTORE THE FLAGS TO THEIR ORIGINAL VALUES AND RESUME EXECUTION AT THE BEGINNING OF THE HARDWARE TEST YOU WERE IN. IF THE ERROR DOES NOT RECUR, THE EXECUTION WILL FLOW RIGHT ON THRU TO THE NEXT ERROR OR TO END OF PASS.

IF AT END OF PASS YOU WANT TO RUN THE DIAGNOSTIC AGAIN, YOU HAVE TWO CHOICES:

1. START
2. RESTART

YOU WOULD CHOOSE ONE, DEPENDING ON WHETHER YOU WANTED TO ANSWER THE HARDWARE QUESTIONS AGAIN.

THE FULL PRINT-OUT FROM THE ABOVE DIALOGUE MIGHT LOOK LIKE THIS
(O=OPERATOR, D=DIAGNOSTIC):

```
                                        BY
                                        WHOM
                                        ENTERED:
                                        -------

.R CZRLGB                               O
DRS LOADED                              D
DIAG. RUN-TIME SERVICES REV D APR-79    D
CZRLG-B-0                               D

CZRLG TESTS CONTROLLER FUNCTIONS,       D
INTERFACE LOGIC, REGISTER OPERATION

UNIT IS RL01, RL02                      D
DR>STA/PASS:1/FLAGS:HOE                 D,O
# UNITS (D) ? 2                         D,O

UNIT 0                                  D
RL11 (L) Y ?                            D,O
BUS ADDRESS (O) 174400 ?                D,O
VECTOR (O) 160 ?                        D,O
BR LEVEL (O) 5 ?                        D,O
DRIVE TYPE = RL01 (L) Y ?               D,O (N=RL02)
DRIVE (O) 0 ?                           D,O

UNIT 1                                  D
RL11 (L) Y ?                            D,O
BUS ADDRESS (O) 174400 ?                D,O
VECTOR (O) 160 ?                        D,O
BR LEVEL (O) 5 ?                        D,O
DRIVE TYPE = RL01 (L) ? Y               D,O (N=RL02)
DRIVE (O) 0 ? 1                         D,O

CHANGE SW (L) ? Y                       D,O

DROP ON ERROR LIMIT (L) N ?             D,O


CZRLG HRD ERR 00004 TST 003 SUB 002 PC:004130
ERR HLT

DR>PRO/FLAGS:IER:LOE:HOE=0              D,O


**********************************************************
AT THIS POINT THE DIAGNOSTIC IS LOOPING ON THE
ERROR WITHOUT PRINTING ANYTHING.  YOU CAN SCOPE
THE ERROR UNTIL YOU HAVE LOCATED IT, THEN ^C OUT.
TYPING ^C ABORTS THE FUNCTION IN PROGRESS AND
RETURNS THE XXDP+ MONITOR TO COMMAND MODE.
**********************************************************
```

```
^C                                      0
DR>CON/FLAGS:HOE:IER:LOE=0              D,0
CHANGE SW (L) ? N                       D,0
CZRLG EOP 1                             D
^C
DR>RESTART/PASS:1                       D,0
CHANGE SW (L) ? N                       D,0
--------------------
--------------------
--------------------
--------------------
```

2.2 CHAIN MODE OPERATION

CHAIN MODE OPERATION CONSISTS OF THE SEQUENTIAL EXECUTION OF PROGRAMS WITHOUT OPERATOR INTERVENTION. ONLY PROGRAMS THAT HAVE BEEN MODIFIED TO RUN IN CHAIN MODE CAN BE CHAINED. CHAINABLE PROGRAMS ARE IDENTIFIED IN THE DIRECTORY BY A BIC EXTENSION.

TO RUN CHAIN MODE, THE XXDP+ MONITOR USES AN ASCII FILE (KNOWN AS A CHAIN FILE) LISTING THE PROGRAMS TO BE RUN AND THE NUMBER OF PASSES EACH PROGRAM SHOULD RUN. THIS FILE MUST BE ON THE SYSTEM DEVICE.

A CHAIN FILE MAY BE GENERATED BY USE OF THE XTECO TEXT EDITOR. THE FILE MUST HAVE A CCC EXTENSION. THE CHAIN FILE MAY CONTAIN ANY OF THE COMMANDS SUPPORTED BY THE XXDP+ MONITOR. THE COMMANDS IN THE ASCII FILE ARE EXECUTED IN THE ORDER IN WHICH THEY ARE ENCOUNTERED. COMMENTS MAY BE INCLUDED IN THE FILE.

TO EXECUTE A CHAIN FILE THE USER TYPES:

C FILNAM <CR> OR

C FILNAM/QV<CR>

IN THE FIRST CASE THE PASS COUNT SPECIFIED IN THE CHAIN FILE IS USED BY THE XXDP+ MONITOR TO DETERMINE THE NUMBER OF PASSES TO EXECUTE EACH PROGRAM. IN THE SECOND CASE THE PASS COUNT IS NOT USED AND EACH PROGRAM IS EXECUTED ONLY ONCE. THE /QV SWITCH PROVIDES A SINGLE EXECUTION MODE OF OPERATION OF QUICK VERIFY.

WHEN PROGRAMS ARE RUN IN CHAIN MODE, THE SOFTWARE SWITCH REGISTER SHOULD BE SET TO 000000. THE XXDP+ MONITOR PRINTS EACH COMMAND TAKEN FROM THE CHAIN FILE AND THEN EXECUTES THE COMMAND. WHEN THE LAST COMMAND OTHER THAN ANOTHER C COMMAND HAS BEEN EXECUTED THE XXDP+ MONITOR TERMINATES CHAIN MODE AND TYPES A PROMPT (.). IT IS READY TO ACCEPT ANOTHER COMMAND FROM THE CONSOLE. IF THE LAST COMMAND IS ANOTHER C COMMAND. THE CHAIN MODE WILL CONTINUE AND THE CHAIN FILE SPECIFIED BY THIS NEW C COMMAND WILL BE USED. IF THE USER WISHES TO TERMINATE CHAIN MODE BEFORE ITS NORMAL TERINATION HE MAY DO SO BY TYPING A CNTL-C. HOWEVER, THE MONITOR WILL NOT ABORT THE CHAIN MODE UNTIL IT RECEIVES PROGRAM CONTROL FROM THE PROGRAM CURRENTLY RUNNING.

2.3 DETAILS OF COMMANDS AND SYNTAX

2.3.1 TABLE OF COMMAND VALIDITY

THERE ARE FOUR WAYS OF ENTERING DIAGNOSTIC COMMAND MODE, AND DIFFERENT SUBSETS OF THE DIAG COMMAND SET ARE AVAILABLE WITH EACH:

	HOW ENTERED	LEGAL COMMANDS
1.	OPERATOR ENTERED 'RUN DIAG'	START PRINT DISPLAY FLAGS ZFLAGS EXIT
2.	DIAGNOSTIC HAS FINISHED ALL ITS REQUESTED PASSES	START RESTART PRINT DISPLAY FLAGS ZFLAGS EXIT
3.	OPERATOR INTERRUPTED THE DIAGNOSTIC WITH CTRL/C	START RESTART CONTINUE PRINT DISPLAY FLAGS ZFLAGS EXIT

4.	AN ERROR WAS ENCOUNTERED WITH THE HOE FLAG SET	START RESTART CONTINUE PROCEED PRINT DISPLAY FLAGS ZFLAGS EXIT

2.3.2 COMMAND SYNTAX

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

THE DIAGNOSTIC IN CORE IS EXECUTED IN ACCORDANCE WITH THE SWITCHES SPECIFIED. THE MESSAGE "# UNITS?" IS PRINTED. THE START COMMAND MAY BE ISSUED WHEN DIAGNOSTIC COMMAND MODE HAS BEEN ENTERED VIA ONE OF THE FOLLOWING: A) OPERATOR TYPED 'RUN DIAGNOSTIC" 3) DIAGNOSTIC FINISHED EXECUTING C) ERROR WAS ENCOUNTERED WITH HOE FLAG SET D) OPERATOR ENTERED CONTROL/C. AFTER THE OPERATOR RESPONDS TO "# UNITS?", THE HARDWARE DIALOGUE IS INITIATED. WHEN IT IS COMPLETED, THE QUESTIONS "CHANGE SW?" IS ISSUED, AND THE ANSWERS, IF GIVEN, BECOME THE NEW DEFAULTS. THEREFORE IT IS NECESSARY TO RELOAD THE PROGRAM IN ORDER TO RETURN TO THE LOAD DEFAULTS.

THE SWITCH ARGUMENTS ARE AS FOLLOWS:

"TEST-LIST" IS A SEQUENCE OF DECIMAL NUMBERS (1:2 ETC.) OR RANGES OF DECIMAL NUMBERS (1-5:6-10 ETC.) THAT SPECIFY THE TESTS TO BE EXECUTED. THE NUMBERS ARE SEPARATED BY COLONS. THE NUMBERS RANGE FROM 1 TO THE LARGEST TEST NUMBER IN THE DIAGNOSTIC. THEY MAY BE SPECIFIED IN ANY ORDER. TESTS WILL BE EXECUTED IN NUMERICAL ORDER REGARDLESS OF THE ORDER OF SPECIFICATION. THE DEFAULT IS TO EXECUTE ALL TESTS.

"PASS-CNT" IS A DECIMAL NUMBER INDICATING THE DESIRED NUMBER OF PASSES. A PASS IS DEFINED AS THE EXECUTION OF THE FULL DIAGNOSTIC (AL. SELECTED TESTS) AGAINST ALL UNITS SUBMITTED. THE DEFAULT IS NON-ENDING TEST EXECUTION. "FLAG-LIST" IS A SEQUENCE OF ELEMENTS OF THE FORM <FLAG>, <FLAG=1>, OR <FLAG=0>, SEPARATED BY COLONS, WHERE <FLAG> HAS ONE OF THE FOLLOWING VALUES:

HOE HALT ON ERROR, CAUSING COMMAND MODE TO BE ENTERED WHEN AN ERROR IS ENCOUNTERED

LOE LOOP ON ERROR, CAUSING THE DIAGNOSTIC TO LOOP CONTINUOUSLY WITHIN THE SMALLEST DEFINED BLOCK OF CODING (SEGMENT, SUBTEST, OR TEST) CONTAINING THE ERROR

IER INHIBIT ERROR REPORTING

IBE INHIBIT BASIC ERROR REPORTS

IXE INHIBIT EXTENDED ERROR REPORTS

PRI DIRECT ALL MESSAGES TO A LINE PRINTER

PNT PRINT NUMBER OF TEST BEING EXECUTED

BOE BELL ON ERROR

UAM RUN IN UNATTENDED MODE, BYPASSING MANUAL INTERVENTION TESTS

ISR INHIBIT STATISTICAL REPORTS

IDU INHIBIT DROPPING OF UNITS BY DIAGNOSTIC

ADR EXECUTE AUTODROP CODE

LOT LOOP ON TEST

EVL EVALUATE

THESE FLAGS REPLACE THE USE OF THE HARDWARE SWITCH REGISTER. UNDER THE SUPERVISOR THERE IS NO ACCESS TO THE HARDWARE SWITCH REGISTER.

THE FLAGS NAMED OR EQUATED TO 1 ARE SET, THOSE EQUATED TO 0 ARE CLEARED. A FLAG NOT SPECIFIED IS CLEARED. IF THE FLAGS SWITCH IS NOT GIVEN ALL FLAGS ARE CLEARED.

''EOP-INCR'' IS A DECIMAL NUMBER INDICATING HOW OFTEN (IN TERMS OF PASSES) IT IS DESIRED THAT THE END OF PASS MESSAGE BE PRINTED. THE DEFAULT IS AT THE END OF EVERY PASS.

****
RES(TART)/TEST:TEST-LIST/PASS:PASS-CNT/FLAGS:FLAG-LIST/EOP:EOP-INCR/
UNITS:UNIT-LIST
****

THE DIAGNOSTIC IN CORE IS EXECUTED IN ACCORDANCE WITH THE SWITCHES SPECIFIED. HOWEVER, NEW ''P-TABLES'' ARE NOT BUILT. INSTEAD, THE ONES IN CORE ARE USED.

THE QUESTION ''CHANGE SW?'' IS ASKED AND THE ANSWERS GIVEN BECOME THE NEW DEFAULTS. THE COMMAND MAY BE ISSUED WHEN COMAND MODE HAS BEEN ENTERED VIA A) DIAGNOSTIC IS FINISHED B) HALT ON ERROR C) CONTROL/C.

THE SWITCH ARGUMENTS ARE AS IN THE START COMMAND EXCEPT:

1. "UNIT-LIST" IS A SEQUENCE OF LOGICAL UNIT NUMBERS RANGING FROM 1 THRU N (N = NUMBER OF UNITS BEING TESTED) SPECIFYING WHICH UNITS ARE TO BE TESTED. THE LOGICAL UNIT NUMBER DESIGNATES THE POSITION OF THE P-TABLE IN CORE, ACCORDING TO THE ORDER IN WHICH THEY WERE BUILT. THE UNITS SPECIFIED MUST NOT HAVE BEEN DROPPED BY THE OPERATOR DROP COMMAND. THE UNIT-LIST DEFAULTS TO "ALL THAT HAVE NOT BEEN DROPPED BY OPERATOR COMMAND". THE EFFECT OF THE UNIT-LIST LASTS UNTIL THE NEXT START (WHERE IT IS AUTOMATICALLY RESET TO "ALL") OR THE NEXT RESTART.

2. ALL UNSPECIFIED FLAG SETTINGS ARE UNCHANGED.

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

COMMAND MODE MUST HAVE BEEN ENTERED DUE TO A HALT ON ERROR OR A CONTROL/C. THE EFFECT OF THE COMMAND IS TO GO TO THE BEGINNING OF THE TEST THAT WAS BEING EXECUTED WHEN THE HALT OR CONTROL/C TOOK PLACE. SOFTWARE DIALOGUE MAY OPTIONALLY BE RE-EXECUTED. HARDWARE PARAMETERS MAY NOT BE CHANGED.

THE SWITCH ARGUMENTS ARE AS IN THE START COMMAND EXCEPT:

1. DEFAULT FOR PASS-CNT IS THE UNSATISFIED PASS-CNT FROM THE PREVIOUS START OR RESTART

2. UNSPFCIFIED FLAG SETTINGS ARE UNCHANGED

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

COMMAND MODE MUST HAVE BEEN ENTERED VIA A HALT ON ERROR. THE EFFECT OF THE COMMAND IS TO BEGIN EXECUTION AT THE LOCATION FOLLOWING THE ERROR CALL. NEITHER HARDWARE NOR SOFTWARE PARAMETERS MAY BE ALTERED.

THE SWITCH ARGUMENTS ARE THE SAME AS THE START COMMAND EXCEPT:

1. UNSPECIFIED FLAG SETTINGS ARE UNCHANGED

****
EXIT
****

RETURN TO XXDP+ PROMPT MODE.

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

THE UNITS SPECIFIED ARE DROPPED FROM TESTING UNTIL THEY ARE ADDED BACK OR UNTIL A START COMMAND IS GIVEN. A DROP CANNOT BE FOLLOWED BY A PROCEED.

THERE IS ALSO A "DROP" MACRO INTERNAL TO THE DIAGNOSTIC, WHICH GIVES THE FACILITY OF AUTO-DROPPING. THE DURATION OF A PROGRAM DROP, HOWEVER, IS ONLY UNTIL THE NEXT START OR RESTART.

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

THE UNITS SPECIFIED ARE ADDED BACK (THEY MUST HAVE BEEN PREVIOUSLY DROPPED BY THE DROP COMMAND) TO THE TEST SEQUENCE. AN ADD CANNOT BE FOLLOWED BY A PROCEED.

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

ALL STATISTICS TABLES ACCUMULATED BY THE DIAGNOSTIC ARE PRINTED. THE ISR (INHIBIT STATISTICAL REPORTING) FLAG IS CLEARED.

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

THE HARDWARE P-TABLES FOR ALL UNITS UNDER TEST ARE PRINTED OUT IN THE FORMAT IN WHICH THEY WERE ENTERED. ANY UNITS THAT WERE DROPPED BY THE OPERATOR "DROP" COMMAND ARE SO DESIGNATED.

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

THE CURRENT SETTINGS OF ALL FLAGS ARE PRINTED.

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

ALL FLAGS ARE CLEARED.

2.4 EXTENDED P-TABLE DIALOGUE

THE FULL CAPABILITY OF THE HARDWARE DIALOGUE IS REVEALED BY THE FOLLOWING DISCUSSION OF WHAT HAPPENS INTERNALLY.

AS SOON AS THE QUESTION "# UNITS?" IS ANSWERED (WITH THE NUMBER N), SPACE IN CORE IS ALLOCATED FOR "N" P-TABLES. ALL OF THE P-TABLES ARE OF THE SAME FORMAT. AND THERE IS A ONE-TO-ONE CORRESPONDENCE BETWEEN THE HARDWARE PARAMETER QUESTIONS AND THE SLOTS IN THE P-TABLE FORMAT.

IN GIVING A STRING OF VALUES, COMMAS WITHOUT INTERVENING VALUES MAY BE USED TO INDICATE A REPETITION OF THE LAST NAMED VALUE.

A STRING OF VALUES MAY BE GIVEN AS A RANGE (6-10 FOR EXAMPLE). IF THE VALUES REPRESENT PURE NUMERICAL DATA, THIS SAMPLE RANGE TRANSLATES TO THE STRING 6,7,8,9,10 (AN INCREMENT OF 1). IF THE VALUES ARE ADDRESSES, THE SAMPLE RANGE TRANSLATES TO THE STRING 6,8,10 (AN INCREMENT OF 2).

NOW LET US SEE HOW WE COULD USE THESE CAPABILITIES TO CONSTRUCT A SET OF P-TABLES. ASSUME THAT WE HAVE 8 RL UNITS, AND THAT THERE ARE FIVE (5) HARDWARE PARAMETERS FOR EACH (5 SLOTS IN THE P-TABLE, 5 HARDWARE QUESTIONS IN THE DIALOGUE).

FOLLOWING IS THE DIALOGUE FOR THIS 8 RLOX DRIVE SYSTEM. THIS SYSTEM HAS TWO (2) RL11 TYPE CONTROLLERS ALL TO BE SET AT "BR LEVEL" 5. THE FIRST 4 DRIVES ARE RL01'S AND THE LAST 4 DRIVES ARE RL02'S (ON THE SECOND CONTROLLER):

```
# UNITS (D) ? 8

UNIT 0
RL11 (L) Y ?
BUS ADDDRESS (O) 174400 ?
VECTOR (O) 160 ?
BR LEVEL (O) 5 ?
DRIVE TYPE = RL01 (L) Y ?
DRIVE (O) ? 0-3

UNIT 4
RL11 (L) Y ?
BUS ADDRESS (O) 174400 ? 175400
VECTOR (O) 160 ? 164
BR LEVEL (O) 5 ?
DRIVE TYPE = RL01 (L) Y ? N
DRIVE (O) ? 0-3
```

THE FIRST TIME THRU THE P-TABLE QUESTIONS THE DEFAULT VALUES ARE USED FOR THE CONTROLLE . TYPE (QUESTION #1), CSR ADDRESS OF THE CONTROLLER (QUESTION #2), THE CONTROLLER VECTOR ASSIGNMENT (QUESTION #3), THE DRIVE TYPE (QUESTION #5), AND THE "BR LEVEL" (QUESTION #4). THE ACTUAL UNIT NUMBERS OF THE RL01'S FOR QUESTION #6 WAS ASSIGNED 0 THRU 3 FOR THE FIRST 4 P-TABLE SLOTS.

THE SECOND TIME THRU THE P-TABLE QUESTIONS (FOR THE RL02 ASSIGNMENT ON THE SECOND CONTROLLER), THE FIRST QUESTION DEFAULTED TO "RL11" TYPE CONTROLLER. THE SECOND QUESTION WAS ANSWERED TO REFLECT THE CHANGE IN CSR ADDRESS FOR THE RL02 CONTROLLER (175400). THE SECOND CONTROLLER'S VECTOR WAS ALSO CHANGED TO 164 IN QUESTION #3. THE RL02 TEST UNIT NUMBERS WERE ASSIGNED VALUES 0 TO 3 IN QUESTION #6 AND THE DRIVE TYPE WAS SET FOR RL02'S FOR THE REMAINING 4 UNITS IN QUESTION #5. QUESTION #4 WAS DEFAULTED USING THE "BR LEVEL" FROM THE FIRST PASS.

2.5 HARDWARE PARAMETERS

THE FOLLOWING QUESTIONS WILL BE ASKED ON A START COMMAND. THE VALUE LOCATED TO THE LEFT OF THE QUESTION MARK IS THE DEFAULT VALUE THAT WILL BE TAKEN ON A CARRIAGE RETURN RESPONCE.

RL11 (L) Y?

ANSWER YES(Y) IF YOU HAVE AN RL11 CONTROLLER, NO(N) IF YOU HAVE AN RLV11 CONTROLLER.

BUS ADDRESS (O) 174400?

ANSWER WITH THE BUS ADDRESS OF THE CONTROLLER.

VECTOR (O) 160?

ANSWER WITH THE INTERRUPT VECTOR OF THE CONTROLLER.

BR LEVEL (O) 5?

ANSWER WITH THE INTERRUPT PRIORITY OF THE CONTROLLER.

DRIVE TYPE = RL01 (L) ?

ANSWER NO (N) IF DRIVE IS AN RL02

DRIVE (O) 0?

ANSWER WITH THE DRIVE(S) CONNECTED TO THE CONTROLLER.

2.6 SOFTWARE PARAMETERS

THE FOLLOWING QUESTIONS ARE ASKED IF REQUESTED ON A START, RESTART, OR CONTINUE. THEY ALLOW FLEXIBILITY IN THE WAY THE PROGRAM BEHAVES. THE SOFTWARE PARAMETERS GIVE THE PROGRAM FLEXIBILITY IN THE WAY IT RUNS. THE PARAMETERS CAN BE MODIFIED ON A START, RESTART, OR CONTINUE BY ANSWERING (Y)ES TO THE FOLLOWING QUESTION:

"CHANGE SW ?"

A YES ANSWER WILL ASK THE FOLLOWING SOFTWARE PARAMETER QUESTION, WITH THE PRESENT DEFAULT VALUE PRINTED TO THE LEFT OF THE QUESTION MARK. (THE LAST ANSWER GIVEN IS THE DEFAULT) THE DEFAULT IS TAKEN ON A <CR>.

'DROP ON ERROR LIMIT (L) Y?"

TO ALLOW THE UNIT TO BE DROPPED ONCE A PREDETERMINED NUMBER OF ERRORS ARE ENCOUNTERED.

3.0 ERROR INFORMATION

ALL ERRORS ARE PRINTED VIA CONSOLE DEVICE. THE ERROR INCLUDES ERROR NUMBER, TYPE AND PROGRAM LOCATION. ERRORS INCLUDE REGISTERS BEFORE AND AT ERROR WITH RELEVENT DATA.

3.1 ERROR REPORTING

ALL ERROR INFORMATION IS PRINTED ON THE CONSOLE DEvice. ERROR REPORTS ARE AIMED AT BEING SELF EXPLANATORY. THE GENERAL FORMAT IS:

```
DZRL?  XXX    ERR  YYYYY   TST  ZZZ   SUB  PPP   PC:  RRRRRR
```

WHERE:

```
      ?       IS PROGRAM LETTER
      XXX     IS SFT - SOFT ERROR
                 HRD - HARD ERROR
              DV FAT - DEVICE FATAL ERROR
             SYS FAT - SYSTEM FATAL ERROR
      YYYYY    IS THE ERROR NUMBER
      ZZZ      IS THE TEST NUMBER
      PPP      IS THE SUBTEST NUMBER
      RRRRRR   IS THE PROGRAM LISTING LOCATION
```

ERRORS GIVE THE REGISTER CONTENTS BEFORE AND AFTER THE ERROR ALONG WITH A ONE LINE DESCRIPTION AND RELEVENT DATA.

EXAMPLE:

```
ONE LINE DESCRIPTION
(OPTIONAL SECOND LINE)
(OPTIONAL THIRD LINE)
BEFORE COMMAND: CS:XXXXXX BA:XXXXXX DA:XXXXXX MP:XXXXXX
TIME OF ERROR:  CS:XXXXXX BA:XXXXXX DA:XXXXXX MP:XXXXXX XXXXXX
 XXXXXX
```

3.2 ERROR HALTS

ERROR HALTS ARE SUPPORTED PER DESCRIBED IN THE PREVIOUS SECTION WITH /FLAG:HOE. THERE ARE NO OTHER HALTS.

4.0 PERFORMANCE AND PROGRESS REPORTS

4.1 PERFORMANCE REPORTS

THIS PROGRAM WILL NOT GIVE ANY PERFORMANCE REPORTS.

4.2 PROGRESS REPORTS

THIS PROGRAM WILL NOT GIVE ANY PROGRESS REPORTS.

5.0 DEVICE INFORMATION TABLES

THE RL11/RLV11 CONTROLLER HAS THE FOLLOWING FOUR(4) REGISTERS FOR CONTROL OF THE SUBSYSTEM.

RLCS - CONTROL AND STATUS REGISTER (XXXXX0)

```
BIT 15 - COMPOSITE ERROR
BIT 14 - DRIVE ERROR
BIT 13 - NON EXISTANT MEMORY ERROR
BIT 12 - HEADER NOT FOUND (WITH BIT 10 SET)
       - DATA LATE (WITH BIT 10 CLEAR)
BIT 11 - HEADER CRC (WITH BIT 10 SET)
       - DATA CRC (WITH BIT 10 CLEAR)
BIT 10 - OPERATION INCOMPLETE
BIT  9/8 - DRIVE SELECT (0-3)
BIT  7 - CONTROLLER READY
BIT  6 - INTERRUPT ENABLE
BIT  5 - EXTENDED BUS ADDRESS (BIT 17)
BIT  4 - EXTENDED BUS ADDRESS (BIT 16)
```

BIT 3-1 - FUNCTION CODE

0 - NOP (PDP-11) MAINT (LSI-11)
1 - WRITE CHECK
2 - GET DRIVE STATUS
3 - SEEK
4 - READ HEADER
5 - WRITE DATA
6 - READ DATA
7 - READ WITHOUT HEADER COMPARE

BIT 0 - DRIVE READY

RLBA - BUS ADDRESS REGISTER (XXXXX2)

BITS 15-1 BUS ADDRESS OF DATA TRANSFER
BIT 0 SHOULD BE 0

RLDA - DISK ADDRESS REGISTER (XXXXX4)

FOR READ/WRITE FUNCTIONS

BIT 15-7 - CYLINDER ADDRESS FOR TRANSFER
BIT 6 - SURFACE FOR TRANSFER
BIT 5-0 - SECTOR FOR TRANSFER (1-40.)

FOR SEEK FUNCTION

BIT 15-7 - DIFFERENCE TO NEW CYLINDER
BIT 6-5 - MUST BE ZERO (0)
BIT 4 - SURFACE (0=UPPER, 1=LOWER)
BIT 3 - MUST BE ZERO (0)
BIT 2 - SEEK DIRECTION(1=IN / 0=OUT)
BIT 1 - MUST BE ZERO (0)
BIT 0 - MUST BE ONE (1)

FOR GET STATUS FUNCTION

BIT 15-4 - IGNORED SHOULD BE ZERO (0)
BIT 3 - DRIVE RESET
BIT 2 - MUST BE ZERO (0)
BIT 1 - MUST BE ONE (1)
BIT 0 - MUST BE ONE (1)

RLMP - MULTIPURPOSE REGISTER

FOR READ/WRITE FUNCTION

BIT 15 - 0 - WORD COUNT (TWO'S COMPLIMENT)

FOR READ HEADER FUNCTION

BIT 15-0 - DISK HEADER OF SECTOR (FIRST READ)
- ZERO WORD (SECOND READ)
- HEADER CRC (THIRD READ)

FOR GET STATUS FUNCTION

HAS DRIVE STATUS

BIT 15 - WRITE DATA ERROR
BIT 14 - CURRENT HEAD ERROR (CHE)
BIT 13 - WRITE LOCK STATUS (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 - DRIVE TYPE IS RL02 IF SET
BIT 6 - SURFACE (0=UPPPER, 1=LOWER)
BIT 5 - COVER OPEN
BIT 4 - HEADS HOME
BIT 3 - BRUSHES HOME
BIT 2-0 -STATE BITS
0 - LOAD STATE
1 - SPIN UP
2 - BRUSH CYCLE
3 - LOAD HEADS
4 - SEEK - TRACK COUNTING
5 - SEEK - LINEAR MODE
6 - UNLOAD HEADS
7 - SPIN DOWN

6.0 TEST SUMMARIES

TEST 1 - RLCS ADDRESSABILITY
******

THIS TEST WILL CHECK THAT THE CONTROL AND STATUS REGISTER CAN BE ACCESSED. IF THE REGISTER CANNOT BE ACCESSED THE PROCESSOR WILL TRAP TO LOCATION 4, WHICH IS SET UP TO HANDLE THE TRAP.

TEST 2 - RLBA ADDRESSABILITY
******

THIS TEST WILL CHECK THAT THE BUS ADDRESS REGISTER CAN BE ACCESSED. IF THE REGISTER CANNOT BE ACCESSED THE PROCESSOR WILL TRAP TO LOCATION 4, WHICH IS SET UP TO HANDLE THE TRAP.

TEST 3 - RLDA ADDRESSABILITY
******

THIS TEST WILL CHECK THAT THE DISK ADDRESS REGISTER CAN BE ACCESSED. IF THE REGISTER CANNOT BE ACCESSED THE PROCESSOR WILL TRAP TO LOCATION 4, WHICH IS SET UP TO HANDLE THE TRAP.

TEST 4 - RLMP ADDRESSABILITY
******

THIS TEST WILL CHECK THAT THE MULTIPURPOSE REGISTER CAN BE ACCESSED. IF THE REGISTER CANNOT BE ACCESSED THE PROCESSOR WILL TRAP TO LOCATION 4, WHICH IS SET UP TO HANDLE THE TRAP.

TEST 5 - READ WRITE OF RLCS
******

THIS TEST WILL ATTEMPT TO WRITE RLCS BITS 9-1 AND READ THEM BACK. WALKING AND GROWING 0'S AND 1'S ARE USED. BIT 7 (CONTROLLER READY) IS ALWAYS WRITTEN AS A 1 SO NOT TO INITIATE A FUNCTION. BITS 15, 14 AND 0 ARE TREATED AS DON'T CARE FOR THIS TEST.

TEST 6 - READ WRITE OF RLBA
******

THIS TEST WILL ATTEMPT TO WRITE RLBA BITS 15-0 AND READ THEM BACK. WALKING AND GROWING 0'S AND 1'S ARE USED. BIT 0 ON A RL11 SHOULD ALWAYS COME BACK AS A 0, WHILE ON AN RLV11 IT IS LOADABLE.

TEST 7 - READ WRITE OF RLDA
******

THIS TEST WILL ATTEMPT TO WRITE RLDA BITS 15-0 AND READ THEM BACK. WALKING AND GROWING 0'S AND 1'S ARE USED.

TEST 8 - BIS OF RLCS
******

THIS TEST WILL USE THE 11 INSTRUCTION "BIS" TO SHOW THAT A READ-MODIFY-WRITE SEQUENCE OF THE RLCS WORKS. BITS 9-1 ARE USED, BIT SETTING IN WALKING AND GROWING 0'S AND 1'S. BIT 7 (CONTROLLER READY) IS ALWAYS SET. BITS 15, 14 AND 1 ARE DON'T CARES.

TEST 9 - BIC OF RLCS
******

THIS TEST WILL USE THE 11 INSTRUCTION 'BIC" TO SHOW THAT A READ-MODIFY-WRITE SEQUENCE OF THE RLCS WORKS. BITS 9-1 ARE USED, BIT CLEARING IN WALKING AND GROWING 0'S AND 1'S. BIT 7 (CONTROLLER READY) IS ALWAYS SET. BITS 15, 14 AND 1 ARE DON'T CARES.

TEST 10 - BIS OF RLBA
****

THIS TEST WILL USE THE 11 INSTRUCTION 'BIS" TO SHOW THAT A READ-MODIFY-WRITE SEQUENCE OF THE RLBA WORKS. BITS 15-0 ARE BIT SET USING GROWING AND WALKING 0'S AND 1'S. BIT 0 CANNOT SET ON A RL11, BUT CAN ON A RLV11.

TEST 11 - BIC OF RLBA
****

THIS TEST WILL USE THE 11 INSTRUCTION 'BIC" TO SHOW THAT A READ-MODIFY-WRITE SEQUENCE OF THE RLBA WORKS. BITS 15-0 ARE BIT CLEARED USING GROWING AND WALKING 0'S AND 1'S.

TEST 12 - BIS OF RLDA
****

THIS TEST WILL USE THE 11 INSTRUCTION 'BIS" TO SHOW THAT A READ-MODIFY-WRITE SEQUENCE OF THE RLDA WORKS. BITS 15-0 ARE BIT SET USING GROWING AND WALKING 0'S AND 1'S.

TEST 13 - BIC OF RLDA
****

THIS TEST WILL USE THE 11 INSTRUCTION 'BIC" TO SHOW THAT A READ-MODIFY-WRITE SEQUENCE OF THE RLDA WORKS. BITS 15-0 ARE BIT CLEARED USING GROWING AND WALKING 0'S AND 1'S.

TEST 14 - BUS RESET OF RLCS
****

THIS TEST WILL VERIFY THAT THE BUS RESET OF THE PROCESSOR WILL CLEAR ALL BITS OF THE RLCS WITH THE EXCEPTION OF BIT 7 (CONTROLLER READY), BIT 0 (DRIVE READY) AND BIT 15 (COMPOSITE ERROR) IF BIT 14 (DRIVE ERROR) IS SET.

TEST 15 - BUS RESET OF RLBA
****

THIS TEST WILL VERIFY THAT THE BUS RESET OF THE PROCESSOR WILL CLEAR ALL BITS OF THE RLBA.

TEST 16 - BUS RESET OF RLDA
****

THIS TEST WILL VERIFY THAT THE BUS RESET OF THE PROCESSOR WILL CLEAR ALL BITS OF THE RLDA.

TEST 17 - UNIQUENESS OF RLCS
****

THIS TEST WILL VERIFY THAT WHEN THE RLCS (XXXXX0) IS ADDRESSED ONLY THAT REGISTER IS EFFECTED. BOTH THE RLBA AND THE RLDA ARE SET UP WITH KNOWN DATA, THE RLDA IS WRITTEN, THEN THE RLBA AND RLDA ARE VERIFIED THAT THEY DID NOT CHANGE.

TEST 18 - UNIQUENESS OF RLBA
****

THIS TEST WILL VERIFY THAT WHEN THE RLBA (XXXXX2) IS ADDRESSED ONLY THAT REGISTER IS EFFECTED. BOTH THE RLCS AND RLDA ARE WRITTEN WITH KNOWN DATA, THE RLBA IS WRITTEN, THEN THE RLCS AND RLDA ARE VERIFIED THAT THEY DID NOT CHANGE.

TEST 19 - UNIQUENESS OF RLDA
****

THIS TEST WILL VERIFY THAT WHEN THE RLDA (XXXXX4) IS ADDRESSED ONLY THAT REGISTER IS EFFECTED. BOTH THE RLCS AND RLBA ARE WRITTEN with KNOWN DATA, THE RLDA IS WRITTEN, THEN THE RLCS AND RLBA ARE VERIFIED THAT THEY DID NOT CHANGE.

TEST 20 - UNIQUENESS OF RLMP
****

THIS TEST WILL VERIFY THAT WHEN THE RLMP (XXXXX6) IS ADDRESSED ONLY THAT REGISTER IS EFFECTED. THE RLCS, RLBA AND RLDA ARE WRITTEN WITH KNOWN DATA, THE RLMP IS WRITTEN, THEN THE RLCS, RLBA AND RLDA ARE VERIFIED THAT THEY DID NOT CHANGE.

TEST 21 - NOOP FUNCTION
****

THIS TEST WILL VERIFY THE OPERATION OF THE NOOP (0) FUNCTION ON PDP-11'S ONLY, SINCE ON AN LSI-11 IT IS A MAINTENANCE FUNCTION. THE ABILITY OF CONTROLLER READY TO RESET AND NO ERRORS ARE CHECKED.

TEST 22 - TEST NOOP DOES NOTHING
****

THIS TEST WILL CHECK THAT THE NOOP FUNCTION WILL NOT DISTRUB ANY REGISTERS OF THE CONTROLLER.

TEST 23 - TEST OF INTERRUPT
****

THIS TEST WILL CAUSE AN INTERRUPT FROM THE CONTROLLER USING NOOP (RL11 ONLY) TO CHECK THE INTERRUPT LOGIC AND VECTOR.

TEST 24 - TEST PRIORITY BR LEVEL
****

THIS TEST WILL CHECK THAT THE PROPER PRIORITY IS ON THE BOARD. WE VERIFY THAT ABOVE THE LEVEL THE BOARD WILL NOT INTERRUPT AND BELOW IT, IT WILL.

TEST 25 - GET STATUS FUNCTION
****

THIS TEST WILL VERIFY THAT THE GET STATUS FUNCTION (2) WILL COMPLETE CORRECTLY. THE RLDA IS SET UP AND GET STATUS IS ISSUED. CONTROLLER READY IS CHECKED AS WELL AS ERROR BITS. (FIRST TEST A DRIVE MUST BE PRESENT.)

TEST 26 - GET STATUS FUNCTION INTERRUPT
****

THIS TEST WILL VERIFY THAT THE GET STATUS FUNCTION WILL GENERATE AN INTERRUPT ON COMPLETION.

TEST 27 - GET STATUS FUNCTION GENERATES OPI
****

THIS TEST WILL PROVE THE ABILITY FOR OPI (OPERATION INCOMPLETE) TO SET AND THAT THE DRIVE COMMAND IS BEING TRANSMITTED CORRECTLY. THE COMMAND WORD (RLDA) IS SET UP WITH THE MARKER BIT ONLY. AN OPI IS EXPECTED TO RESULT, THIS IS CHECKED.

TEST 28 - OPI UNDER INTERRUPT
****

THIS TEST WILL CHECK THE ABILITY OF AN OPI TO CAUSE AN INTERRUPT TO OCCUR. WE SEND ONLY THE MARKER BIT WITH THE GET STATUS COMMAND AND EXPECT AN OPI ERROR.

TEST 30 - READ HEADER FUNCTION INTERRUPT
****

THIS TEST WILL CHECK THE ABILITY OF THE READ HEADER FUNCTION TO INTERRUPT ON COMPLETION.

TEST 31 - REPEATED RD HDRS YIELD SAME CYL AND HD
****

THIS TEST WILL CHECK THAT ON REPEATED READ HEADERS THE CYLINDER AND HEAD BITS OF THE HEADER WORD (RLMP) ARE ALWAYS THE SAME.

TEST 32 - CHECK OF HEADER CRC
****

THIS TEST WILL VERIFY THE HEADER CRC THAT FOLLOWS THE TWO HEADER WORDS IS ACTUALLY THE CORRECT CRC-16 CALCULATION OF THE TWO HEADER WORDS.

TEST 33 - CHECK CONSECUTIVE HEADERS
****

THIS TEST WILL CHECK THAT HEADERS ARE CONSECUTIVE.

TEST 34 - SEEK FUNCTION
****

THIS TEST WILL CHECK THE SEEK FUNCTION (3) TO RESET CONTROLLER READY AND POST NO ERRORS. COMMAND WORD IS LOADED WITH A ONE CYLINDER FORWARD SEEK.

TEST 35 - CHECK DRIVE READY ON SEEK
****

THIS TEST WILL CHECK THAT DRIVE READY CLEARS AND RESETS ON ISSUANCE OF A SEEK COMMAND.

TEST 36 - SEEK FUNCTION INTERRUPT
****

THIS TEST WILL CHECK THE ABILITY OF A SEEK COMMAND TO GENERATE AN INTERRUPT ON CONTROLLER READY RESETTING AND NOT ONE ON DRIVE READY RESETTING.

TEST 37 - TEST DIFFERENCE WORD TRANSMISSION
****

THIS TEST WILL TRY TO VERIFY THAT BITS 14-7, 6, 2, 0 OF THE COMMAND WORD GET TRANSMITTED CORRECTLY. WE ISSUE SEEKS FROM TRACK 0 WITH COMMAND WORDS OF WALKING AND GROWING 0'S AND 1'S. ALL SEEKS ARE VERIFIED WITH A READ HEADER AND RETURN TO TRACK 0 BEFORE NEXT PATTERN IS ISSUED.

TEST 38 - VERIFY HEAD SELECT 0 VIA RD HEADER
****

THIS TEST WILL VERIFY THAT HEAD 0 CAN BE SELECTED AND READ VIA READ HEADER.

TEST 39 - VERIFY HEAD SELECT 1 VIA RD HEADER
****

THIS TEST WILL VERIFY THAT HEAD 1 CAN BE SELECTED AND READ VIA READ HEADER.

TEST 40 - VERIFY HEAD SELECT 0 VIA GET STATUS
****

THIS TEST WILL VERIFY THE WORD RETURNED TO THE RLMP BY A GET STATUS CONTAINS THE RIGHT HEAD SELECT.

TEST 41 - VERIFY HEAD SELECT 1 VIA GET STATUS
****

THIS TEST WILL VERIFY THE WORD RETURNED TO THE RLMP BY A GET STATUS CONTAINS THE RIGHT HEAD SELECT.

TEST 42 - TEST TIME AT WHICH DP WD GETS
****

THIS TEST WILL CHECK THAT THE DIFFERENCE WORD (RLDA) ACTUALLY DOES GET TRANSMITTED PRIOR TO CONTROLLER READY RESETTING. THIS IS DONE BY ISSUING A SEEK, WAITING FOR CONTROLLER READY AND RE-LOADING THE RLDA THE SEEK IS THEN VERIFIED TO SEE IF IT IS CORRECT.

TEST 43 - EXTENSIVE CHECK OF CRC
****

THIS TEST WILL MORE EXTENSIVELY CHECK THE CRC LOGIC BY POSI-
TIONING AT DIFFERENT POINTS ON THE PACK AND CHECKING THAT THE
HEADER CRC RECEIVED IS CORRECT.

TEST 44 - VERIFY GET STATUS WHILE DRDY IS LOW
****

THIS TEST WILL CHECK THE ABILITY TO PERFORM A GET STATUS WHILE
THE DRIVE IS SEEKING.

@

CZRLGCO RL11/RLV11 CTLR TST 1 MACRO V04.00 30-NOV-81 13:38:41
TABLE OF CONTENTS

```
                        .TITLE  SVC.MLB SOURCE FILE
                        .MACRO  M$MCHIGH
                        .MCALL BCOMPL,BERROR,BGNAU,BGNAUTO,BGNCLN,BGNDU,BGNHRD,BGNHW,BGNINI,BGNMOD,BGNMSG,BGNPROT,BG
                        .MCALL BGNSRV,BGNSUB,BGNSW,BGNTST,BNCOMP,BNERRO,BREAK,BRESET,CKLOOP,CLOCK,CLOSE,CLRVEC,COMME
                        .MCALL DISPAT,DISPLA,DOCLN,DODU,DORPT,ENDAU,ENDAUTO,ENDCLN,ENDCOM,ENDDU,ENDHRD,ENDHW,ENDINI,
                        .MCALL ENDRPT,ENDSEG,ENDSET,ENDSFT,ENDSRV,ENDSUB,ENDSW,ENDTST,EQUALS,ERRDF,ERRHRD,ERROR,ERRS
                        .MCALL FEQUAL,GETBYTE,GETPRI,GETWORD,GMANIA,GMANID,GMANIL,GPHARD,GPRMA,GPRMD,GPRML,HEADER,IN
                        .MCALL LASTAD,MANUAL,MEMORY,OPEN,POINTE,PRINTB,PRINTF,PRINTS,PRINTX,READBU,READEF,RFLAGS,SET
                        .MCALL XFER,XFERF,XFERT
                        .MACRO  M$MCHIGH
                        .ENDM
                        .ENDM   M$MCHIGH
                        .MACRO  BCOMPLETE       LABEL
                        .MCALL  M$GNINS
                        M$GNINS <BCS    LABEL>
                        .ENDM   BCOMPLETE
                        .MACRO  BERROR  LABEL
                        .MCALL  M$GNINS
                        M$GNINS <BCS    LABEL>
                        .ENDM   BERROR
                        .MACRO  BGNAU
                        .MCALL  M$PUSH,M$INCR,M$GNGBL
                        I$AU=F$BGN
                        M$PUSH  T$NS,T$NESTLEV,F$AU
                        T$$AU=T$TAGNUM
                        M$INCR  T$TAGNUM
                        M$GNGBL L$AU
                        .ENDM   BGNAU
                        .MACRO  BGNAUTO
                        .MCALL  M$PUSH,M$INCR,M$GNGBL
                        I$AUTO=F$BGN
                        M$PUSH  T$NS,T$NESTLEV,F$AUTO
                        T$$AUTO=T$TAGNUM
                        M$INCR  T$TAGNUM
                        M$GNGBL L$AUTO
                        .ENDM   BGNAUTO
                        .MACRO  BGNCLN
                        .MCALL  M$PUSH,M$INCR,M$GNGBL
                        I$CLN=F$BGN
                        M$PUSH  T$NS,T$NESTLEV,F$CLEAN
                        T$$CLEAN=T$TAGNUM
                        M$INCR  T$TAGNUM
                        M$GNGBL L$CLEAN
                        .ENDM   BGNCLN
                        .MACRO  BGNDU
                        .MCALL  M$PUSH,M$INCR,M$GNGBL
                        I$DU=F$BGN
                        M$PUSH  T$NS,T$NESTLEV,F$DU
                        T$$DU=T$TAGNUM
                        M$INCR  T$TAGNUM
                        M$GNGBL L$DU
                        .ENDM   BGNDU
                        .MACRO  BGNHRD
                        .MCALL  M$PUSH,M$INCR,M$GNINS,M$GNGBL
                        I$HRD=F$BGN
                        M$PUSH  T$NS,T$NESTLEV,F$HARD
                        T$$HARD=T$TAGNUM
```

```
                        M$INCR   T$TAGNUM
                        .IRP    TAG,<\T$$HARD>
                        M$GNINS <.WORD L'TAG'-L$HARD/2>
                        .ENDM
                        M$GNGBL L$HARD
                        .ENDM   BGNHRD
                        .MACRO  BGNHW   LABEL
                        .MCALL  M$PUSH,M$INCR,M$GNINS,M$GNGBL
                        M$PUSH  T$NS,T$NESTLEV,F$HW
                        T$$HW=T$TAGNUM
                        M$INCR  T$TAGNUM
                        .IRP    N,<\T$$HW>
                        M$GNINS <.WORD  L'N-L$HW/2>
                        .ENDM
                        M$GNGBL L$HW
                        M$GNGBL LABEL
                        .ENDM   BGNHW
                        .MACRO  BGNINIT
                        .MCALL  M$PUSH,M$INCR,M$GNGBL
                        I$INIT=F$BGN
                        M$PUSH  T$NS,T$NESTLEV,F$INIT
                        T$$INIT=T$TAGNUM
                        M$INCR T$TAGNUM
                        M$GNGBL L$INIT
                        .ENDM   BGNINIT
                        .MACRO  BGNMOD  ARG
                        .MCALL  M$GNGBL,M$PUSH
                        .IF NE  F$END-I$MOD
                        .ERROR  ;'BGNMOD'' IN MOD
                        .MEXIT
                        .IFF
                        I$MOD=F$BGN
                        .ENDC
                        .IF NB ARG
                        M$GNGBL ARG
                        .ENDC
                        M$PUSH  T$NS,T$NESTLEV,F$MOD
                        .ENDM   BGNMOD
                        .MACRO  BGNMSG  ARG
                        .MCALL  M$PUSH,M$INCR,M$GNGBL
                        I$MSG=F$BGN
                        M$PUSH  T$NS,T$NESTLEV,F$MSG
                        T$$MSG=T$TAGNUM
                        M$INCR T$TAGNUM
                        M$GNGBL ARG
                        .ENDM   BGNMSG
                        .MACRO  BGNPROT
                        .MCALL M$PUSH,M$INCR,M$GNGBL
                        I$PROT=F$BGN
                        M$PUSH T$NS,T$NESTLEV,F$PROT
                        T$$PROT=T$TAGNUM
                        M$INCR T$TAGNUM
                        M$GNGBL L$PROT
                        .ENDM   BGNPROT
                        .MACRO  BGNPTAB
                        .MCALL M$INCR,M$DECR,M$WORD,M$GNINS,M$GNTAG
                        .IF NE F$BGN-I$SETUP
```

```
                        .ERROR  ; MISSING 'BGNSETUP''
                        .MEXIT
                        .ENDC
                        .IF NE F$END-I$PTAB
                        .ERROR  ; MISSING 'ENDPTAB''
                        .MEXIT
                        .ENDC
                        I$PTAB=F$BGN
                        T$PTAB=T$TAGNUM
                        M$INCR   T$TAGNUM
                        M$DECR   T$PCNT
                        .IF LE T$PCNT
                        M$WORD <0>
                        .IFF
                        .IRP N,<\T$PTAB>
                        M$GNINS <.WORD  L'N>
                        .ENDM
                        .ENDC
                        T$$DAT=T$TAGNUM
                        M$INCR   T$TAGNUM
                        .IRP    N,<\T$$DAT>
                        M$GNINS <.WORD  L'N-./2-1>
                        .ENDM
                        M$GNTAG L,T$$PTAB
                        T$$PTAB=T$PTAB
                        M$INCR  T$PTNUM
                        .ENDM   BGNPTAB
                        .MACRO  BGNRPT
                        .MCALL  M$PUSH,M$INCR,M$GNGBL
                        I$RPT=F$BGN
                        M$PUSH  T$NS,T$NESTLEV,F$RPT
                        T$$RPT=T$TAGNUM
                        M$INCR T$TAGNUM
                        M$GNGBL L$RPT
                        .ENDM   BGNRPT
                        .MACRO  BGNSEG
                        .MCALL  M$PUSH,M$INCR,M$SVC
                        I$SEG=F$BGN
                        M$PUSH  T$NS,T$NESTLEV,F$SEG
                        T$$SEG=S$LSYM
                        M$PUSH  T$SEK,T$SEGLEV,T$$SEG
                        M$INCR  S$LSYM
                        M$SVC   C$BSEG
                        .ENDM   BGNSEG
                        .MACRO  BGNSETUP        ARG
                        .MCALL  M$INCR
                        .IF NE  F$END - I$SETUP
                        .ERROR  ; ONLY 1 SETUP!
                        .MEXIT
                        .ENDC
                        .IF NE  T$LAST-1
                        .ERROR  ; 'LASTAD' MUST PRECEDE 'BGNSETUP''
                        .MEXIT
                        .ENDC
                        I$SETUP=F$BGN
                        T$$PTAB=T$TAGNUM
                        M$INCR   T$TAGNUM
```

```
                        .IF NB ARG
                        T$PCNT=ARG
                        T$$PC=ARG
                        .IFF
                        .ERROR  ; MISSING # OF PTABLES
                        T$PCNT=1
                        .ENDC
                        .ENDM   BGNSETUP
                        .MACRO  BGNSFT
                        .MCALL  M$PUSH,M$INCR,M$GNINS,M$GNGBL
                        I$SFT=F$BGN
                        M$PUSH  T$NS,T$NESTLEV,F$SOFT
                        T$$SOFT=T$TAGNUM
                        M$INCR T$TAGNUM
                        .IRP    TAG,<\T$$SOFT>
                        M$GNINS <.WORD L'TAG'-L$SOFT/2>
                        .ENDM
                        M$GNGBL L$SOFT
                        .ENDM   BGNSFT
                        .MACRO  BGNSRV  ARG
                        .MCALL  M$PUSH,M$INCR,M$GNGBL
                        I$SRV=F$BGN
                        M$PUSH  T$NS,T$NESTLEV,F$SRV
                        T$$SRV=T$TAGNUM
                        M$INCR T$TAGNUM
                        M$GNGBL ARG
                        .ENDM   BGNSRV
                        .MACRO  BGNSUB
                        .MCALL  M$INCR,M$GNSUB,M$PUSH,M$SVC
                        .IF NE  F$END-I$SEG
                        .ERROR  ;'BGNSUB'' IN SEG
                        .MEXIT
                        .ENDC
                        .IF NE  F$END-I$SUB
                        .ERROR  ;'BGNSUB'' IN SUB
                        .MEXIT
                        .ENDC
                        .IF NE  F$BGN-I$TST
                        .ERROR  ;'BGNSUB'' NOT IN TST
                        .MEXIT
                        .ENDC
                        I$SUB=F$BGN
                        M$INCR  T$SUBNUM
                        .RADIX  10
                        M$GNSUB \T$TESTNUM,\T$SUBNUM
                        .RADIX  8
                        M$PUSH  T$NS,T$NESTLEV,F$SUB
                        T$$SUB=T$TAGNUM
                        M$INCR  T$TAGNUM
                        M$SVC   C$BSUB
                        .ENDM   BGNSUB
                        .MACRO  BGNSW   LABEL
                        .MCALL  M$PUSH,M$INCR,M$GNINS,M$GNGBL
                        M$PUSH  T$NS,T$NESTLEV,F$SW
                        T$$SW=T$TAGNUM
                        M$INCR  T$TAGNUM
                        .IRP    N,<\T$$SW>
```

```
                        M$GNINS <.WORD  L'N-L$SW/2>
                        .ENDM
                        M$GNGBL L$SW
                        M$GNGBL LABEL
                        .ENDM   BGNSW
                        .MACRO  BGNTST  NUM
                        .MCALL  M$INCR,M$GNTEST,M$PUSH,M$INCR
                        .IF NE  F$END-I$SUB
                        .ERROR  ;'BGNTST'' IN SUB
                        .MEXIT
                        .ENDC
                        .IF NE  F$END-I$SEG
                        .ERROR  ;'BGNTST'' IN SEG
                        .MEXIT
                        .ENDC
                        .IF NE  F$END-I$TST
                        .ERROR  ;'BGNTST'' IN TST
                        .MEXIT
                        .IFF
                        I$TST=F$BGN
                        .ENDC
                        .IF B   NUM
                        M$INCR  T$TESTNUM
                        .IFF
                        T$TESTNUM=NUM
                        .ENDC
                        T$SUBNUM=0
                        .RADIX  10
                        M$GNTEST        \T$TESTNUM
                        .RADIX  8
                        M$PUSH  T$NS,T$NESTLEV,F$TEST
                        T$$TEST=T$TAGNUM
                        M$INCR T$TAGNUM
                        T$TSTSEQ=1
                        .ENDM   BGNTST
                        .MACRO  BNCOMPLETE      LABEL
                        .MCALL  M$GNINS
                        M$GNINS <BCC    LABEL>
                        .ENDM   BNCOMPLETE
                        .MACRO  BNERROR LABEL
                        .MCALL  M$GNINS
                        M$GNINS <BCC    LABEL>
                        .ENDM   BNERROR
                        .MACRO  BREAK
                        .MCALL  M$SVC
                        M$SVC   C$BRK
                        .ENDM   BREAK
                        .MACRO  BRESET
                        .MCALL  M$SVC
                        M$SVC   C$RESET
                        .ENDM   BRESET
                        .MACRO  CKLOOP
                        .MCALL  M$SVC
                        M$SVC   C$CLP1
                        .ENDM   CKLOOP
                        .MACRO  CLOCK ARG1,ARG2
                        .MCALL M$LDR0,M$SVC,M$RNR0
```

```
                        M$LDRO #''ARG1,CLOCK
                        M$SVC  C$CLCK
                        M$RNRO ARG2,CLOCK
                        .ENDM   CLOCK
                        .MACRO  CLOSE
                        .MCALL  M$SVC
                        M$SVC   C$CLOS
                        .ENDM   CLOSE
                        .MACRO  CLRVEC  ARG
                        .MCALL  M$LDRO,M$SVC
                        M$LDRO  ARG,CLRVEC
                        M$SVC   C$CVEC
                        .ENDM   CLRVEC
                        .MACRO  COMMENT NUM
                        .IF B   NUM
                        T$TEMP=1
                        .IFF
                        T$TEMP=NUM
                        .ENDC
                        .IIF GE SVCTAG,.NLIST   SEQ,LOC,BIN
                        .REPT   T$TEMP
                        .IF GE SVCTAG
                        .LIST
                        ;;/*\:/*\:/*\:/*\:/*\:/*\:/*\:/*\:/*\:/*\:/*\:/*\:/*\:/*\:/*\:/*\:/*\:/*\:/*\:/*\:
                                        .NLIST
                        .ENDC
                        .ENDR
                        .IIF GE SVCTAG,.LIST    SEQ,LOC,BIN
                        .ENDM   COMMENT
                        .MACRO  DESCRIPT        STRING
                        .MCALL  M$DATA,M$GNINS
                        M$DATA  L$DESC,.ASCIZ,</STRING/>
                        M$GNINS .EVEN
                        .ENDM   DESCRIPT
                        .MACRO  DELAY   ARG
                        .MCALL M$GNINS
                        .IF LT G$DELM-ARG
                        .ERROR ;ARGUMENT TO 'DELAY'' MUST NOT BE GREATER THAN 250
                        .MEXIT
                        .ENDC
                        .IF B ARG
                        M$GNINS <MOV    R0,(PC)+>
                        .IFF
                        M$GNINS <MOV    #'ARG',(PC)+>
                        .ENDC
                        M$GNINS <.WORD  0>
                        M$GNINS <MOV    L$DLY,(PC)+>
                        M$GNINS <.WORD  0>
                        M$GNINS <DEC    -6(PC)>
                        M$GNINS <BNE    .-4>
                        M$GNINS <DEC    -22(PC)>
                        M$GNINS <BNE    .-20>
                        .ENDM   DELAY
                        .MACRO  DEVTYP  STRING
                        .MCALL M$DATA,M$GNINS
                        M$DATA L$DVTYP,.ASCIZ,</STRING/>
                        M$GNINS .EVEN
```

```
                        .ENDM   DEVTYP
                        .MACRO  DISPATCH        NUM
                        .MCALL  M$WORD,M$GNGBL
                        .RADIX  10
                        M$WORD \NUM
                        M$GNGBL L$DISPATCH
                        T$TEMP=1
                        .REPT   NUM
                        .IRP    N,<\T$TEMP>
                        M$WORD  F'N
                        .ENDM
                        T$TEMP=T$TEMP + 1
                        .ENDR
                        .RADIX  8
                        .ENDM   DISPATCH
                        .MACRO  DISPLAY ARG
                        .MCALL  M$WORD
                        .IF NE I$HRD-F$BGN
                        .IF NE I$SFT-F$BGN
                        .ERROR  ;'DISPLAY'' MUST BE IN H.W. OR S.W. QUES.
                        .MEXIT
                        .ENDC
                        .ENDC
                        .IF B ARG
                        .ERROR  ;MISSING 'DISPLAY'' ARG.
                        .MEXIT
                        .ENDC
                        T$CODE=G$DISP
                        M$WORD  <T$CODE>
                        M$WORD  <ARG>
                        .ENDM   DISPLAY
                        .MACRO  DOCLN
                        .MCALL  M$SVC
                        M$SVC   C$DCLN
                        .ENDM   DOCLN
                        .MACRO  DODU    ARG
                        .MCALL  M$LDRO,M$SVC
                        M$LDRO  ARG,DODU
                        M$SVC   C$DODU
                        .ENDM   DODU
                        .MACRO  DORPT
                        .MCALL  M$SVC
                        M$SVC   C$DRPT
                        .ENDM   DORPT
                        .MACRO  ENDAU
                        .MCALL  M$POP,M$GNTAG,M$SVC,M$ENDERR
                        M$POP   T$NS,T$NESTLEV,T$TEMP
                        .IF EQ F$AU-T$TEMP
                        M$GNTAG L,T$$AU
                        S$LSYM=T$LSYM
                        M$SVC   C$AU
                        I$AU=F$END
                        .IFF
                        M$ENDERR ENDAU,T$TEMP
                        .ENDC
                        .ENDM   ENDAU
                        .MACRO  ENDAUTO
```

```
400                             .MCALL M$POP,M$GNTAG,M$SVC,M$ENDERR
401                             M$POP T$NS,T$NESTLEV,T$TEMP
402                             .IF EQ F$AUTO-T$TEMP
403                             M$GNTAG L,T$$AUTO
404                             S$LSYM=T$LSYM
405                             M$SVC C$AUTO
406                             I$AUTO=F$END
407                             .IFF
408                             M$ENDERR        ENDAUTO,T$TEMP
409                             .ENDC
410                             .ENDM   ENDAUTO
411                             .MACRO  ENDCLN
412                             .MCALL  M$POP,M$GNTAG,M$SVC,M$ENDERR
413                             M$POP   T$NS,T$NESTLEV,T$TEMP
414                             .IF EQ F$CLEAN-T$TEMP
415                             M$GNTAG L,T$$CLEAN
416                             S$LSYM=T$LSYM
417                             M$SVC   C$CLEAN
418                             I$CLN=F$END
419                             .IFF
420                             M$ENDERR        ENDCLN,T$TEMP
421                             .ENDC
422                             .ENDM   ENDCLN
423                             .MACRO  ENDCOMMENT      NUM
424                             .IF B   NUM
425                             T$TEMP=1
426                             .IFF
427                             T$TEMP=NUM
428                             .ENDC
429                             .IIF GE SVCTAG,.NLIST   SEQ,LOC,BIN
430                             .REPT   T$TEMP
431                             .IF GE SVCTAG
432                             .LIST
433                             ;;/*\:/*\:/*\:/*\:/*\:/*\:/*\:/*\:/*\:/*\:/*\:/*\:/*\:/*\:/*\:/*\:/*\:/*\:/*\:
434                                             .NLIST
435                             .ENDC
436                             .ENDR
437                             .IIF GE SVCTAG,.LIST    SEQ,LOC,BIN
438                             .ENDM   ENDCOMMENT
439                             .MACRO  ENDDU
440                             .MCALL  M$POP,M$GNTAG,M$SVC,M$ENDERR
441                             M$POP   T$NS,T$NESTLEV,T$TEMP
442                             .IF EQ F$DU-T$TEMP
443                             M$GNTAG L,T$$DU
444                             S$LSYM=T$LSYM
445                             M$SVC   C$DU
446                             I$DU=F$END
447                             .IFF
448                             M$ENDERR ENDDU,T$TEMP
449                             .ENDC
450                             .ENDM   ENDDU
451                             .MACRO  ENDHRD
452                             .MCALL  M$POP,M$GNINS,M$GNTAG,M$ENDERR
453                             M$POP   T$NS,T$NESTLEV,T$TEMP
454                             .IF EQ F$HARD-T$TEMP
455                             M$GNINS .EVEN
456                             M$GNTAG L,T$$HARD
```

```
                        S$LSYM=T$LSYM
                        I$HRD=F$END
                        .IFF
                        M$ENDERR        ENDHRD,T$TEMP
                        .ENDC
                        .ENDM   ENDHRD
                        .MACRO  ENDHW
                        .MCALL  M$POP,M$GNTAG,M$ENDERR
                        M$POP   T$NS,T$NESTLEV,T$TEMP
                        .IF EQ  F$HW-T$TEMP
                        M$GNTAG L,T$$HW
                        S$LSYM=T$LSYM
                        .IFF
                        M$ENDERR        ENDHW,T$TEMP
                        .ENDC
                        .ENDM   ENDHW
                        .MACRO  ENDINIT
                        .MCALL  M$POP,M$GNTAG,M$SVC,M$ENDERR
                        M$POP   T$NS,T$NESTLEV,T$TEMP
                        .IF EQ F$INIT-T$TEMP
                        M$GNTAG L,T$$INIT
                        S$LSYM=T$LSYM
                        M$SVC   C$INIT
                        I$INIT=F$END
                        .IFF
                        M$ENDERR        ENDINIT,T$TEMP
                        .ENDC
                        .ENDM   ENDINIT
                        .MACRO  ENDMOD
                        .MCALL  M$POP,M$ENDERR
                        .IF EQ  F$BGN-I$MOD
                        I$MOD=F$END
                        .IFF
                        .ERROR  ; MISSING 'BGNMOD'
                        .MEXIT
                        .ENDC
                        M$POP   T$NS,T$NESTLEV,T$TEMP
                        .IF NE F$MOD-T$TEMP
                        M$ENDERR        ENDMOD,T$TEMP
                        .ENDC
                        .ENDM   ENDMOD
                        .MACRO  ENDMSG
                        .MCALL  M$POP,M$GNTAG,M$SVC,M$ENDERR
                        M$POP   T$NS,T$NESTLEV,T$TEMP
                        .IF EQ F$MSG-T$TEMP
                        M$GNTAG L,T$$MSG
                        S$LSYM=T$LSYM
                        M$SVC   C$MSG
                        I$MSG=F$END
                        .IFF
                        M$ENDERR        ENDMSG,T$TEMP
                        .ENDC
                        .ENDM   ENDMSG
                        .MACRO  ENDPROT
                        .MCALL M$POP
                        M$POP T$NS,T$NESTLEV,T$TEMP
                        .IF NE F$PROT-T$TEMP
```

```
                        .ERROR  ;MISSING BGNPROT
                        .MEXIT
                        .ENDC
                        .ENDM   ENDPROT
                        .MACRO  ENDPTAB
                        .MCALL  M$GNTAG
                        .IF NE  F$BGN - I$PTAB
                        .ERROR  ; MISSING 'BGNPTAB''
                        .MEXIT
                        .ENDC
                        I$PTAB=F$END
                        M$GNTAG L,T$$DAT
                        .ENDM   ENDPTAB
                        .MACRO  ENDRPT
                        .MCALL  M$POP,M$GNTAG,M$SVC,M$ENDERR
                        M$POP   T$NS,T$NESTLEV,T$TEMP
                        .IF EQ F$RPT-T$TEMP
                        M$GNTAG L,T$$RPT
                        S$LSYM=T$LSYM
                        M$SVC   C$RPT
                        I$RPT=F$END
                        .IFF
                        M$ENDERR        ENDRPT,T$TEMP
                        .ENDC
                        .ENDM   ENDRPT
                        .MACRO  ENDSEG
                        .MCALL  M$POP,M$GNLS,M$SVC,M$ENDERR
                        M$POP   T$NS,T$NESTLEV,T$TEMP
                        .IF EQ F$SEG-T$TEMP
                        M$POP   T$SEK,T$SEGLEV,T$$SEG
                        M$GNLS  T$$SEG
                        M$SVC   C$ESEG
                        .IF EQ T$SEGLEV+1
                        I$SEG=F$END
                        .ENDC
                        .IFF
                        M$ENDERR        ENDSEG,T$TEMP
                        .ENDC
                        .ENDM   ENDSEG
                        .MACRO  ENDSETUP
                        .IF NE  F$BGN - I$SETUP
                        .ERROR  ; MISSING 'BGNSETUP''
                        .MEXIT
                        .ENDC
                        I$SETUP=F$END
                        .IF NE  T$$PC - T$PTNUM
                        .ERROR  ; PTABLE COUNT INCORRECT
                        .ENDC
                        T$FREE=.
                        T$SIZE=.-L$LAST / 2
                        T$PTHV=T$PTNUM
                        .ENDM   ENDSETUP
                        .MACRO  ENDSFT
                        .MCALL  M$POP,M$GNINS,M$GNTAG,M$ENDERR
                        M$POP   T$NS,T$NESTLEV,T$TEMP
                        .IF EQ F$SOFT-T$TEMP
                        M$GNINS .EVEN
```

```
                        M$GNTAG L,T$$SOFT
                        S$LSYM=T$LSYM
                        I$SFT=F$END
                        .IFF
                        M$ENDERR        ENDSFT,T$TEMP
                        .ENDC
                        .ENDM   ENDSFT
                        .MACRO  ENDSRV  ARG
                        .MCALL  M$POP,M$GNTAG,M$GNINS,M$ENDERR
                        M$POP   T$NS,T$NESTLEV,T$TEMP
                        .IF EQ F$SRV-T$TEMP
                        M$GNTAG L,T$$SRV
                        S$LSYM=T$LSYM
                        .IF NB ARG
                        M$GNINS <BICB   #340,2(SP)>
                        M$GNINS <BISB   ARG,2(SP)>
                        .ENDC
                        M$GNINS RTI
                        I$SRV=F$END
                        .IFF
                        M$ENDERR        ENDSRV,T$TEMP
                        .ENDC
                        .ENDM   ENDSRV
                        .MACRO  ENDSUB
                        .MCALL  M$POP,M$GNTAG,M$SVC,M$ENDERR
                        .IF EQ  F$BGN-I$SUB
                        I$SUB=F$END
                        .IFF
                        .ERROR  ;MISSING 'BGNSUB'
                        .MEXIT
                        .ENDC
                        M$POP   T$NS,T$NESTLEV,T$TEMP
                        .IF EQ F$SUB-T$TEMP
                        M$GNTAG L,T$$SUB
                        S$LSYM=T$LSYM
                        M$SVC   C$ESUB
                        I$SUB=F$END
                        .IFF
                        M$ENDERR        ENDSUB,T$TEMP
                        .ENDC
                        .ENDM   ENDSUB
                        .MACRO  ENDSW
                        .MCALL  M$POP,M$GNTAG,M$ENDERR
                        M$POP   T$NS,T$NESTLEV,T$TEMP
                        .IF EQ  F$SW-T$TEMP
                        M$GNTAG L,T$$SW
                        S$LSYM=T$LSYM
                        .IFF
                        M$ENDERR        ENDSW,T$TEMP
                        .ENDC
                        .ENDM   ENDSW
                        .MACRO  ENDTST
                        .MCALL  M$POP,M$GNTAG,M$SVC,M$ENDERR
                        .IF EQ  F$BGN-I$TST
                        I$TST=F$END
                        .IFF
                        .ERROR  ;MISSING 'BGNTST'
```

```
                        .MEXIT
                        .ENDC
                        M$POP   T$NS,T$NESTLEV,T$TEMP
                        .IF EQ F$TEST-T$TEMP
                        M$GNTAG L,T$$TEST
                        S$LSYM=T$LSYM
                        M$SVC   C$ETST
                        I$TST=F$END
                        .IFF
                        M$ENDERR        ENDTST,T$TEMP
                        .ENDC
                        .ENDM   ENDTST
                        .MACRO  EQUALS
                        .LIST
                        ;
                        ; BIT DIFINITIONS
                        ;
                        BIT15== 100000
                        BIT14== 40000
                        BIT13== 20000
                        BIT12== 10000
                        BIT11== 4000
                        BIT10== 2000
                        BIT09== 1000
                        BIT08== 400
                        BIT07== 200
                        BIT06== 100
                        BIT05== 40
                        BIT04== 20
                        BIT03== 10
                        BIT02== 4
                        BIT01== 2
                        BIT00== 1
                        ;
                        BIT9==  BIT09
                        BIT8==  BIT08
                        BIT7==  BIT07
                        BIT6==  BIT06
                        BIT5==  BIT05
                        BIT4==  BIT04
                        BIT3==  BIT03
                        BIT2==  BIT02
                        BIT1==  BIT01
                        BIT0==  BIT00
                        ;
                        ; EVENT FLAG DEFINITIONS
                        ;   EF32:EF17 RESERVED FOR SUPERVISOR TO PROGRAM COMMUNICATION
                        ;
                        EF.START==      32.                     ; START COMMAND WAS ISSUED
                        EF.RESTART==    31.                     ; RESTART COMMAND WAS ISSUED
                        EF.CONTINUE==   30.                     ; CONTINUE COMMAND WAS ISSUED
                        EF.NEW==        29.                     ; A NEW PASS HAS BEEN STARTED
                        EF.PWR==        28.                     ; A POWER-FAIL/POWER-UP OCCURRED
                        ;
                        ;
                        ; PRIORITY LEVEL DEFINITIONS
                        ;
```

```
                        PRI07== 340
                        PRI06== 300
                        PRI05== 240
                        PRI04== 200
                        PRI03== 140
                        PRI02== 100
                        PRI01== 40
                        PRI00== 0
                        ;
                        ;OPERATOR FLAG BITS
                        ;
                        EVL==        4
                        LOT==       10
                        ADR==       20
                        IDU==       40
                        ISR==      100
                        UAM==      200
                        BOE==      400
                        PNT==     1000
                        PRI==     2000
                        IXE==     4000
                        IBE==    10000
                        IER==    20000
                        LOE==    40000
                        HOE==   100000
                        .NLIST
                        .ENDM   EQUALS
                        .MACRO  ERRDF   NUM,MSGADR,PNTR
                        .MCALL  MSERRINS
                        MSERRINS        NUM,MSGADR,PNTR,C$ERDF
                        .ENDM   ERRDF
                        .MACRO  ERRHRD  NUM,MSGADR,PNTR
                        .MCALL  MSERRINS
                        MSERRINS        NUM,MSGADR,PNTR,C$ERHRD
                        .ENDM   ERRHRD
                        .MACRO  ERROR
                        .MCALL  MSSVC
                        MSSVC   C$ERROR
                        .ENDM   ERROR
                        .MACRO  ERRSF   NUM,MSGADR,PNTR
                        .MCALL  MSERRINS
                        MSERRINS        NUM,MSGADR,PNTR,C$ERSF
                        .ENDM   ERRSF
                        .MACRO  ERRSOFT NUM,MSGADR,PNTR
                        .MCALL  MSERRINS
                        MSERRINS        NUM,MSGADR,PNTR,C$ERSOFT
                        .ENDM   ERRSOFT
                        .MACRO  ERRTBL
                        .MCALL  MSGNGBL
                        MSGNGBL L$ERRTBL
                        .LIST
                        ERRTYP::        .WORD   0
                        ERRNBR::        .WORD   0
                        ERRMSG::        .WORD   0
                        ERRBLK::        .WORD   0
                                .NLIST
                        .ENDM   ERRTBL
```

```
742                             .MACRO  ESCAPE  NAME
743                             .MCALL  M$SVC,M$GETTOP,M$ESCAPE,M$ESCSEG
744                             T$FLAG=F$END
745                             .IF IDN <TST>,<NAME>
746                             T$TEMP=T$$TEST
747                             T$FLAG=I$TST
748                             .ENDC
749                             .IF IDN <SUB>,<NAME>
750                             T$TEMP=T$$SUB
751                             T$FLAG=I$SUB
752                             .ENDC
753                             .IF IDN <SEG>,<NAME>
754                             T$TEMP=T$$SEG
755                             T$FLAG=I$SEG
756                             .ENDC
757                             .IF EQ  T$FLAG-F$BGN
758                             M$SVC   C$ESCAPE
759                             .IF IDN <SEG>,<NAME>
760                             M$GETTOP T$SEK,T$SEGLEV,T$TEMP
761                             M$ESCSEG        \T$TEMP
762                             .IFF
763                             M$ESCAPE        \T$TEMP
764                             .ENDC
765                             .MEXIT
766                             .ENDC
767                             .ERROR  ;ILL. "ESCAPE NAME" STMT.
768                             .ENDM   ESCAPE
769                             .MACRO  EXIT    NAME
770                             .MCALL  M$SVC,M$EXIT,M$EXSEG,M$EXTJ,M$GETTOP,M$CHECK,M$WORD,XFER
771                             T$FLAG=F$END
772                             M$CHECK NAME,T$TEMP,T$FLAG
773                             .IF EQ T$FLAG-F$JMP
774                             M$WORD  J$JMP
775                             M$EXTJ  \T$TEMP
776                             .MEXIT
777                             .ENDC
778                             .IF EQ  T$FLAG-F$BGN
779                             M$SVC   C$EXIT
780                             .IF IDN <SEG>,<NAME>
781                             M$GETTOP T$SEK,T$SEGLEV,T$TEMP
782                             M$EXSEG \T$TEMP
783                             .IFF
784                             M$EXIT  \T$TEMP
785                             .ENDC
786                             .MEXIT
787                             .ENDC
788                             .IF IDN <HRD>,<NAME>
789                             M$GETTOP        T$NS,T$NESTLEV,T$TEMP
790                             .IF EQ  F$HARD-T$TEMP
791                             .IRP    N,<\T$$HARD>
792                             XFER    L'N
793                             .ENDM
794                             .MEXIT
795                             .ENDC
796                             .ENDC
797                             .IF IDN <SFT>,<NAME>
798                             M$GETTOP        T$NS,T$NESTLEV,T$TEMP
```

```
                        .IF EQ  F$SOFT-T$TEMP
                        .IRP    N,<\T$$SOFT>
                        XFER    L'N
                        .ENDM
                        .MEXIT
                        .ENDC
                        .ENDC
                        .ERROR  ;ILL. "EXIT NAME" STMT.
                        .ENDM   EXIT
                        .MACRO  FEQUAL
                        .LIST
                        ;
                        ; FUNCTION-LEVEL I/O DEFINITIONS
                        ;
                        Q.IOFN==        2                       ; DIRECTIVE FUNCTION
                        Q.IOLN==        4                       ; DIRECTIVE LOG UNIT NO.
                        Q.IOEF==        6                       ; DIRECTIVE EVENT FLAG
                        Q.IOSB==        10                      ; DIRECTIVE STATUS BLOCK
                        Q.IOAE==        12                      ; DIRECTIVE AST ENTRY
                        Q.IOPL==        14                      ; DIRECTIVE PARAMETER LIST
                        IS.SUC==        1                       ; REQUEST WAS SUCCESSFUL
                        .NLIST
                        .ENDM   FEQUAL
                        .MACRO  GETBYTE ARG
                        .MCALL  M$SVC,M$RBRO
                        M$SVC   C$GETB
                        M$RBRO  ARG,GETBYTE
                        .ENDM   GETBYTE
                        .MACRO  GETWORD ARG
                        .MCALL  M$SVC M$RNRO
                        M$SVC   C$GETW
                        M$RNRO  ARG,GETWORD
                        .ENDM   GETWORD
                        .MACRO  GETPRI  ARG
                        .MCALL  M$SVC,M$RNRO
                        M$SVC   C$GPRI
                        M$RNRO  ARG,GETPRI
                        .ENDM   GETPRI
                        .MACRO  GMANIA  $MSGADR,$DATADR,$RADIX,$LOLIM,$HILIM,$DFLT
                        .MCALL  M$SVC,M$GENBR,M$WORD,M$GNLS,M$INCR,GPRMA
                        M$SVC   C$GMAN
                        M$GENBR BR,\S$LSYM,$
                        M$WORD  $DATADR
                        GPRMA   $MSGADR,0,$RADIX,<$LOLIM>,<$HILIM>,$DFLT
                        M$GNLS
                        M$INCR  S$LSYM
                        .ENDM   GMANIA
                        .MACRO  GMANID  $MSGADR,$DATADR,$RADIX,$MASK,$LOLIM,$HILIM,$DFLT
                        .MCALL  M$SVC,M$GENBR,M$WORD,M$GNLS,M$INCR,GPRMD
                        T$GMANID=1
                        M$SVC   C$GMAN
                        M$GENBR BR,\S$LSYM,$
                        M$WORD  $DATADR
                        GPRMD   $MSGADR,0,$RADIX,$MASK,<$LOLIM>,<$HILIM>,$DFLT
                        M$GNLS
                        M$INCR  S$LSYM
                        T$GMANID=0
```

```
856                             .ENDM   GMANID
857                             .MACRO  GMANIL  $MSGADR,$DATADR,$MASK,$DFLT
858                             .MCALL  M$SVC,M$GENBR,M$WORD,M$GNLS,M$INCR,GPRML
859                             M$SVC   C$GMAN
860                             M$GENBR BR,\S$LSYM,$
861                             M$WORD  $DATADR
862                             GPRML   $MSGADR,0,$MASK,$DFLT
863                             M$GNLS
864                             M$INCR  S$LSYM
865                             .ENDM   GMANIL
866                             .MACRO  GPHARD  ARG1,ARG2
867                             .MCALL  M$LDR0,M$SVC,M$RNR0
868                             M$LDR0  ARG1,GPHARD
869                             M$SVC   C$GPHRD
870                             M$RNR0  ARG2,GPHARD
871                             .ENDM   GPHARD
872                             .MACRO  GPRMA   $MSGADR,$OFFSET,$RADIX,$LOLIM,$HILIM,$DFLT,$COUNT
873                             .MCALL  M$RADIX,M$DEFAULT,M$EXCP,M$WORD,M$CNTOP
874                             .IF IDN A,$RADIX
875                             .ERROR  ;INVALID RADIX
876                             .ENDC
877                             T$TEMP=$OFFSET&1
878                             .IF NE  T$TEMP & 1
879                             .ERROR  ;ODD OFFSET
880                             .ENDC
881                             .IF LT  G$OFSIZE-$OFFSET
882                             .ERROR  ;OFFSET TOO BIG
883                             .ENDC
884                             T$CODE=G$PRMA + <$OFFSET * G$OFFSET>
885                             M$RADIX $RADIX,T$TEMP
886                             T$CODE=T$CODE ! T$TEMP
887                             M$DEFAULT       $DFLT,T$TEMP
888                             T$CODE=T$CODE ! T$TEMP
889                             T$EXCP=0
890                             M$EXCP  T$CODE,T$EXCP,G$LOLIM,T$LOLIM,$LOLIM
891                             M$EXCP  T$CODE,T$EXCP,G$HILIM,T$HILIM,$HILIM
892                             M$CNTOP <$COUNT>,<T$CODE>
893                             M$WORD  <T$CODE,$MSGADR,T$LOLIM,T$HILIM>
894                             .IF NE  T$EXCP
895                             M$WORD  T$EXCP
896                             .ENDC
897                             .IF NB $COUNT
898                             M$WORD <$COUNT/2>
899                             .ENDC
900                             .ENDM   GPRMA
901                             .MACRO  GPRMD   $MSGADR,$OFFSET,$RADIX,$MASK,$LOLIM,$HILIM,$DFLT,$COUNT
902                             .MCALL  M$RADIX,M$DEFAULT,M$EXCP,M$WORD,M$CNTOP
903                             .IF IDN A,$RADIX
904                             .IF EQ T$GMANID
905                             .ERROR  ;ASCII RADIX VALID ONLY ON "GMANID"
906                             .ENDC
907                             .ENDC
908                             T$TEMP=$OFFSET&1
909                             .IF NE  T$TEMP & 1
910                             .ERROR  ;ODD OFFSET
911                             .ENDC
912                             .IF LT  G$OFSIZE-$OFFSET
```

```
                        .ERROR  ;OFFSET TOO BIG
                        .ENDC
                        T$CODE=G$PRMD + <$OFFSET * G$OFFSET>
                        M$RADIX $RADIX,T$TEMP
                        T$CODE=T$CODE ! T$TEMP
                        M$DEFAULT       $DFLT,T$TEMP
                        T$CODE=T$CODE ! T$TEMP
                        T$EXCP=0
                        M$EXCP  T$CODE,T$EXCP,G$LOLIM,T$LOLIM,$LOLIM
                        M$EXCP  T$CODE,T$EXCP,G$HILIM,T$HILIM,$HILIM
                        M$CNTOP <$COUNT>,<T$CODE>
                        M$WORD  <T$CODE,$MSGADR,$MASK,T$LOLIM,T$HILIM>
                        .IF NE  T$EXCP
                        M$WORD  T$EXCP
                        .ENDC
                        .IF NB $COUNT
                        M$WORD <$COUNT/2>
                        .ENDC
                        .ENDM   GPRMD
                        .MACRO  GPRML   $MSGADR,$OFFSET,$MASK,$DFLT,$COUNT
                        .MCALL  M$RADIX,M$DEFAULT,M$WORD,M$CNTOP
                        T$TEMP=$OFFSET&1
                        .IF NE  T$TEMP & 1
                        .ERROR  ;ODD OFFSET
                        .ENDC
                        .IF LT  G$OFSIZE-$OFFSET
                        .ERROR  ;OFFSET TOO BIG
                        .ENDC
                        T$CODE=G$PRML + <$OFFSET * G$OFFSET>
                        M$RADIX L,T$TEMP
                        T$CODE=T$CODE ! T$TEMP
                        M$DEFAULT       $DFLT,T$TEMP
                        T$CODE=T$CODE ! T$TEMP
                        M$CNTOP <$COUNT>,<T$CODE>
                        M$WORD  <T$CODE,$MSGADR,$MASK>
                        .IF NB $COUNT
                        M$WORD  <$COUNT/2>
                        .ENDC
                        .ENDM   GPRML
                        .MACRO  HEADER  FILNAM,REVLEV,DEPO,LONGST,DIAGTYPE,DIAGPRIO
                        .MCALL  M$HAPT,M$HNAP
                        M$HAPT  FILNAM,REVLEV,DEPO,LONGST,DIAGTYPE,DIAGPRIO
                        M$HNAP
                        .IF EQ O$POINTER
                        .ERROR  ;''POINTER'' MUST PRECEDE ''HEADER''
                        .ENDC
                        .ENDM   HEADER
                        .MACRO  INLOOP
                        .MCALL  M$SVC
                        M$SVC   C$INLP
                        .ENDM   INLOOP
                        .MACRO  IOSETUP FUNC,LOGICAL,EVENT,IOSTAT,IOAST,PARAMS
                        .MCALL  M$BYTE,M$WORD,M$IOSET
                        M$BYTE  <1,12.>
                        M$WORD  <FUNC,LOGICAL>
                        M$BYTE  <0,0>
                        M$WORD  <IOSTAT,IOAST>
```

```
                        M$IOSET PARAMS
                        .ENDM   IOSETUP
                        .MACRO  IOSTART ADR,ERR
                        .MCALL  M$GNINS,M$SVC,M$START
                        M$GNINS <MOV    ADR,-(SP)>
                        M$SVC   C$QIO
                        .IF NB  ERR
                        M$START ERR
                        .ENDC
                        .ENDM   IOSTART
                        .MACRO  KT11    DPAGE,SUP,USE
                        .LIST
                        .SBTTL  MEMORY MANAGEMENT DEFINITIONS

                        ;*KT11 VECTOR ADDRESS

                        MMVEC=  250

                        ;*KT11 STATUS REGISTER ADDRESSES

                        SR0=    177572
                        SR1=    177574
                        SR2=    177576
                        SR3=    172516
                        .IF NB USE

                        ;*USER "I" PAGE DESCRIPTOR REGISTERS

                        UIPDR0= 177600
                        UIPDR1= 177602
                        UIPDR2= 177604
                        UIPDR3= 177606
                        UIPDR4= 177610
                        UIPDR5= 177612
                        UIPDR6= 177614
                        UIPDR7= 177616
                        .IF NB DPAGE

                        ;*USER "D" PAGE DESCRIPTOR REGISTORS

                        UDPDR0= 177620
                        UDPDR1= 177622
                        UDPDR2= 177624
                        UDPDR3= 177626
                        UDPDR4= 177630
                        UDPDR5= 177632
                        UDPDR6= 177634
                        UDPDR7= 177636
                        .ENDC

                        ;*USER "I" PAGE ADDRESS REGISTERS

                        UIPAR0= 177640
                        UIPAR1= 177642
                        UIPAR2= 177644
                        UIPAR3= 177646
                        UIPAR4= 177650
```

```
1027                                    UIPAR5= 177652
1028                                    UIPAR6= 177654
1029                                    UIPAR7= 177656
1030                                    .IF NB DPAGE
1031
1032                                    ;*USER "D" PAGE ADDRESS REGISTERS
1033
1034                                    UDPAR0= 177660
1035                                    UDPAR1= 177662
1036                                    UDPAR2= 177664
1037                                    UDPAR3= 177666
1038                                    UDPAR4= 177670
1039                                    UDPAR5= 177672
1040                                    UDPAR6= 177674
1041                                    UDPAR7= 177676
1042                                    .ENDC
1043                                    .ENDC
1044                                    .IF NB SUP
1045
1046                                    ;*SUPERVISOR "I" PAGE DESCRIPTOR REGISTERS
1047
1048                                    SIPDR0= 172200
1049                                    SIPDR1= 172202
1050                                    SIPDR2= 172204
1051                                    SIPDR3= 172206
1052                                    SIPDR4= 172210
1053                                    SIPDR5= 172212
1054                                    SIPDR6= 172214
1055                                    SIPDR7= 172216
1056                                    .IF NB DPAGE
1057
1058                                    ;*SUPERVISOR "D" PAGE DESCRIPTOR REGISTERS
1059
1060                                    SDPDR0= 172220
1061                                    SDPDR1= 172222
1062                                    SDPDR2= 172224
1063                                    SDPDR3= 172226
1064                                    SDPDR4= 172230
1065                                    SDPDR5= 172232
1066                                    SDPDR6= 172234
1067                                    SDPDR7= 172236
1068                                    .ENDC
1069
1070                                    ;*SUPERVISOR "I" PAGE ADDRESS REGISTERS
1071
1072                                    SIPAR0= 172240
1073                                    SIPAR1= 172242
1074                                    SIPAR2= 172244
1075                                    SIPAR3= 172246
1076                                    SIPAR4= 172250
1077                                    SIPAR5= 172252
1078                                    SIPAR6= 172254
1079                                    SIPAR7= 172256
1080                                    .IF NB DPAGE
1081
1082                                    ;*SUPERVISOR "D" PAGE ADDRESS REGISTERS
1083
```

```
1084                                    SDPAR0= 172260
1085                                    SDPAR1= 172262
1086                                    SDPAR2= 172264
1087                                    SDPAR3= 172266
1088                                    SDPAR4= 172270
1089                                    SDPAR5= 172272
1090                                    SDPAR6= 172274
1091                                    SDPAR7= 172276
1092                                    .ENDC
1093                                    .ENDC
1094
1095                                    ;*KERNEL "I" PAGE DESCRIPTOR REGISTERS
1096
1097                                    KIPDR0= 172300
1098                                    KIPDR1= 172302
1099                                    KIPDR2= 172304
1100                                    KIPDR3= 172306
1101                                    KIPDR4= 172310
1102                                    KIPDR5= 172312
1103                                    KIPDR6= 172314
1104                                    KIPDR7= 172316
1105                                    .IF NB DPAGE
1106
1107                                    ;*KERNEL "D" PAGE DESCRIPTOR REGISTERS
1108
1109                                    KDPDR0= 172320
1110                                    KDPDR1= 172322
1111                                    KDPDR2= 172324
1112                                    KDPDR3= 172326
1113                                    KDPDR4= 172330
1114                                    KDPDR5= 172332
1115                                    KDPDR6= 172334
1116                                    KDPDR7= 172336
1117                                    .ENDC
1118
1119                                    ;*KERNEL "I" PAGE ADDRESS REGISTERS
1120
1121                                    KIPAR0= 172340
1122                                    KIPAR1= 172342
1123                                    KIPAR2= 172344
1124                                    KIPAR3= 172346
1125                                    KIPAR4= 172350
1126                                    KIPAR5= 172352
1127                                    KIPAR6= 172354
1128                                    KIPAR7= 172356
1129                                    .IF NB DPAGE
1130
1131                                    ;*KERNEL "D" PAGE ADDRESS REGISTERS
1132
1133                                    KDPAR0= 172360
1134                                    KDPAR1= 172362
1135                                    KDPAR2= 172364
1136                                    KDPAR3= 172366
1137                                    KDPAR4= 172370
1138                                    KDPAR5= 172372
1139                                    KDPAR6= 172374
1140                                    KDPAR7= 172376
```

```
1141                                    .ENDC
1142
1143                                    .NLIST
1144                                    .ENDM   KT11
1145                                    .MACRO  LASTAD
1146                                    .MCALL  M$GNINS,M$GNGBL
1147                                    M$GNINS .EVEN
1148                                    T$LAST=1
1149                                    .IF EQ O$SETUP
1150                                    M$WORD  <0>
1151                                    M$WORD  <0>
1152                                    .IFF
1153                                    M$GNINS <.WORD T$FREE>
1154                                    M$GNINS <.WORD T$SIZE>
1155                                    .ENDC
1156                                    SVCGBL=0
1157                                    M$GNGBL L$LAST
1158                                    T$LTNO=T$TESTNUM
1159                                    .ENDM   LASTAD
1160                                    .MACRO  MANUAL
1161                                    .MCALL  M$SVC
1162                                    M$SVC   C$MANI
1163                                    .ENDM   MANUAL
1164                                    .MACRO  MEMORY  ARG
1165                                    .MCALL  M$SVC,M$RNRO
1166                                    M$SVC   C$MEM
1167                                    M$RNRO  ARG,MEMORY
1168                                    .ENDM   MEMORY
1169                                    .MACRO  OPEN    ARG
1170                                    .MCALL  M$LDRO,M$SVC
1171                                    M$LDRO  ARG,OPEN
1172                                    M$SVC   C$OPEN
1173                                    .ENDM   OPEN
1174                                    .MACRO  POINTER P1,P2,P3,P4,P5,P6,P7,P8,P9
1175                                    .IRP PX,<P1,P2,P3,P4,P5,P6,P7,P8,P9>
1176                                    .IF IDN <ALL>,<PX>
1177                                    O$BGNSFT=1
1178                                    O$BGNRPT=1
1179                                    O$GNSW=1
1180                                    O$APTS=1
1181                                    O$AU=1
1182                                    O$DU=1
1183                                    O$ERRTBL=1
1184                                    O$SETUP=1
1185                                    O$POINTER=1
1186                                    .MEXIT
1187                                    .ENDC
1188                                    .IF IDN <NONE>,<PX>
1189                                    O$BGNSFT=0
1190                                    O$BGNRPT=0
1191                                    O$GNSW=0
1192                                    O$APTS=0
1193                                    O$AU=0
1194                                    O$DU=0
1195                                    O$ERRTBL=0
1196                                    O$SETUP=0
1197                                    O$POINTER=1
```

```
1198                                    .MEXIT
1199                                    .ENDC
1200                                    .IF IDN <BGNSFT>,<PX>
1201                                    O$BGNSFT=1
1202                                    O$POINTER=1
1203                                    .ENDC
1204                                    .IF IDN <BGNRPT>,<PX>
1205                                    O$BGNRPT=1
1206                                    O$POINTER=1
1207                                    .ENDC
1208                                    .IF IDN <BGNSW>,<PX>
1209                                    O$GNSW=1
1210                                    O$POINTER=1
1211                                    .ENDC
1212                                    .IF IDN <APTSTAT>,<PX>
1213                                    O$APTS=1
1214                                    O$POINTER=1
1215                                    .ENDC
1216                                    .IF IDN <BGNAU>,<PX>
1217                                    O$AU=1
1218                                    O$POINTER=1
1219                                    .ENDC
1220                                    .IF IDN <BGNDU>,<PX>
1221                                    O$DU=1
1222                                    O$POINTER=1
1223                                    .ENDC
1224                                    .IF IDN <ERRTBL>,<PX>
1225                                    O$ERRTBL=1
1226                                    O$POINTER=1
1227                                    .ENDC
1228                                    .IF IDN <BGNSETUP>,<PX>
1229                                    O$SETUP=1
1230                                    O$POINTER=1
1231                                    .ENDC
1232                                    .ENDM
1233                                    .IF EQ O$POINTER
1234                                    .ERROR  ;ILL. ARGS. ON 'POINTER'
1235                                    .ENDC
1236                                    .ENDM   POINTER
1237                                    .MACRO  PRINTB  FORM,P1,P2,P3,P4,P5,P6,P7,P8
1238                                    .MCALL  M$PRINT
1239                                    .IF B   FORM
1240                                    .ERROR  ;MISSING FORMAT
1241                                    .MEXIT
1242                                    .ENDC
1243                                    .IF B   <P1>
1244                                    M$PRINT C$PNTB,FORM
1245                                    .MEXIT
1246                                    .ENDC
1247                                    .IF B   <P2>
1248                                    M$PRINT C$PNTB,FORM,<P1>
1249                                    .MEXIT
1250                                    .ENDC
1251                                    .IF B   <P3>
1252                                    M$PRINT C$PNTB,FORM,<P1>,<P2>
1253                                    .MEXIT
1254                                    .ENDC
```

```
1255                            .IF B   <P4>
1256                            MSPRINT C$PNTB,FORM,<P1>,<P2>,<P3>
1257                            .MEXIT
1258                            .ENDC
1259                            .IF B   <P5>
1260                            MSPRINT C$PNTB,FORM,<P1>,<P2>,<P3>,<P4>
1261                            .MEXIT
1262                            .ENDC
1263                            .IF B   <P6>
1264                            MSPRINT C$PNTB,FORM,<P1>,<P2>,<P3>,<P4>,<P5>
1265                            .MEXIT
1266                            .ENDC
1267                            .IF B   <P7>
1268                            MSPRINT C$PNTB,FORM,<P1>,<P2>,<P3>,<P4>,<P5>,<P6>
1269                            .MEXIT
1270                            .ENDC
1271                            .IF B   <P8>
1272                            MSPRINT C$PNTB,FORM,<P1>,<P2>,<P3>,<P4>,<P5>,<P6>,<P7>
1273                            .MEXIT
1274                            .ENDC
1275                            MSPRINT C$PNTB,FORM,<P1>,<P2>,<P3>,<P4>,<P5>,<P6>,<P7>,<P8>
1276                            .ENDM   PRINTB
1277                            .MACRO  PRINTF  FORM,P1,P2,P3,P4,P5,P6,P7,P8
1278                            .MCALL  MSPRINT
1279                            .IF B   FORM
1280                            .ERROR  ;MISSING FORMAT
1281                            .MEXIT
1282                            .ENDC
1283                            .IF B   <P1>
1284                            MSPRINT C$PNTF,FORM
1285                            .MEXIT
1286                            .ENDC
1287                            .IF B   <P2>
1288                            MSPRINT C$PNTF,FORM,<P1>
1289                            .MEXIT
1290                            .ENDC
1291                            .IF B   <P3>
1292                            MSPRINT C$PNTF,FORM,<P1>,<P2>
1293                            .MEXIT
1294                            .ENDC
1295                            .IF B   <P4>
1296                            MSPRINT C$PNTF,FORM,<P1>,<P2>,<P3>
1297                            .MEXIT
1298                            .ENDC
1299                            .IF B   <P5>
1300                            MSPRINT C$PNTF,FORM,<P1>,<P2>,<P3>,<P4>
1301                            .MEXIT
1302                            .ENDC
1303                            .IF B   <P6>
1304                            MSPRINT C$PNTF,FORM,<P1>,<P2>,<P3>,<P4>,<P5>
1305                            .MEXIT
1306                            .ENDC
1307                            .IF B   <P7>
1308                            MSPRINT C$PNTF,FORM,<P1>,<P2>,<P3>,<P4>,<P5>,<P6>
1309                            .MEXIT
1310                            .ENDC
1311                            .IF B   <P8>
```

```
1312                            M$PRINT C$PNTF,FORM,<P1>,<P2>,<P3>,<P4>,<P5>,<P6>,<P7>
1313                            .MEXIT
1314                            .ENDC
1315                            M$PRINT C$PNTF,FORM,<P1>,<P2>,<P3>,<P4>,<P5>,<P6>,<P7>,<P8>
1316                            .ENDM   PRINTF
1317                            .MACRO  PRINTS  FORM,P1,P2,P3,P4,P5,P6,P7,P8
1318                            .MCALL  M$PRINT
1319                            .IF B   FORM
1320                            .ERROR  ;MISSING FORMAT
1321                            .MEXIT
1322                            .ENDC
1323                            .IF B   <P1>
1324                            M$PRINT C$PNTS,FORM
1325                            .MEXIT
1326                            .ENDC
1327                            .IF B   <P2>
1328                            M$PRINT C$PNTS,FORM,<P1>
1329                            .MEXIT
1330                            .ENDC
1331                            .IF B   <P3>
1332                            M$PRINT C$PNTS,FORM,<P1>,<P2>
1333                            .MEXIT
1334                            .ENDC
1335                            .IF B   <P4>
1336                            M$PRINT C$PNTS,FORM,<P1>,<P2>,<P3>
1337                            .MEXIT
1338                            .ENDC
1339                            .IF B   <P5>
1340                            M$PRINT C$PNTS,FORM,<P1>,<P2>,<P3>,<P4>
1341                            .MEXIT
1342                            .ENDC
1343                            .IF B   <P6>
1344                            M$PRINT C$PNTS,FORM,<P1>,<P2>,<P3>,<P4>,<P5>
1345                            .MEXIT
1346                            .ENDC
1347                            .IF B   <P7>
1348                            M$PRINT C$PNTS,FORM,<P1>,<P2>,<P3>,<P4>,<P5>,<P6>
1349                            .MEXIT
1350                            .ENDC
1351                            .IF B   <P8>
1352                            M$PRINT C$PNTS,FORM,<P1>,<P2>,<P3>,<P4>,<P5>,<P6>,<P7>
1353                            .MEXIT
1354                            .ENDC
1355                            M$PRINT C$PNTS,FORM,<P1>,<P2>,<P3>,<P4>,<P5>,<P6>,<P7>,<P8>
1356                            .ENDM   PRINTS
1357                            .MACRO  PRINTX  FORM,P1,P2,P3,P4,P5,P6,P7,P8
1358                            .MCALL  M$PRINT
1359                            .IF B   FORM
1360                            .ERROR  ;MISSING FORMAT
1361                            .MEXIT
1362                            .ENDC
1363                            .IF B   <P1>
1364                            M$PRINT C$PNTX,FORM
1365                            .MEXIT
1366                            .ENDC
1367                            .IF B   <P2>
1368                            M$PRINT C$PNTX,FORM,<P1>
```

```
1369                            .MEXIT
1370                            .ENDC
1371                            .IF B   <P3>
1372                            MSPRINT C$PNTX,FORM,<P1>,<P2>
1373                            .MEXIT
1374                            .ENDC
1375                            .IF B   <P4>
1376                            MSPRINT C$PNTX,FORM,<P1>,<P2>,<P3>
1377                            .MEXIT
1378                            .ENDC
1379                            .IF B   <P5>
1380                            MSPRINT C$PNTX,FORM,<P1>,<P2>,<P3>,<P4>
1381                            .MEXIT
1382                            .ENDC
1383                            .IF B   <P6>
1384                            MSPRINT C$PNTX,FORM,<P1>,<P2>,<P3>,<P4>,<P5>
1385                            .MEXIT
1386                            .ENDC
1387                            .IF B   <P7>
1388                            MSPRINT C$PNTX,FORM,<P1>,<P2>,<P3>,<P4>,<P5>,<P6>
1389                            .MEXIT
1390                            .ENDC
1391                            .IF B   <P8>
1392                            MSPRINT C$PNTX,FORM,<P1>,<P2>,<P3>,<P4>,<P5>,<P6>,<P7>
1393                            .MEXIT
1394                            .ENDC
1395                            MSPRINT C$PNTX,FORM,<P1>,<P2>,<P3>,<P4>,<P5>,<P6>,<P7>,<P8>
1396                            .ENDM   PRINTX
1397                            .MACRO  READBUS
1398                            .MCALL  M$SVC
1399                            M$SVC   C$RDBU
1400                            .ENDM   READBUS
1401                            .MACRO  READEF  EFN
1402                            .MCALL  M$LDR0,M$SVC
1403                            M$LDR0  EFN,READEF
1404                            M$SVC   C$REFG
1405                            .ENDM   READEF
1406                            .MACRO  RFLAGS  ARG
1407                            .MCALL  M$SVC,M$RNR0
1408                            M$SVC   C$RFLA
1409                            M$RNR0  ARG,RFLAGS
1410                            .ENDM   RFLAGS
1411                            .MACRO  SETPRI  ARG
1412                            .MCALL  M$LDR0,M$SVC
1413                            M$LDR0  ARG,SETPRI
1414                            M$SVC   C$SPRI
1415                            .ENDM   SETPRI
1416                            .MACRO  SETVEC  ARG1,ARG2,ARG3
1417                            .MCALL  M$PUT,M$SVC,M$GNINS
1418                            M$PUT   #3,ARG1,ARG2,ARG3
1419                            M$SVC   C$SVEC
1420                            M$GNINS <ADD    #10.SP>
1421                            .ENDM   SETVEC
1422                            .MACRO  SLASH   NUM
1423                            .IF B NUM
1424                            T$TEMP=1
1425                            .IFF
```

```
1426                            T$TEMP=NUM
1427                            .ENDC
1428                            .REPT   T$TEMP
1429                            .IF GE SVCTAG
1430                            .LIST
1431                            ;;////////////////////////////////////////////////////////////////////////
1432                                            .NLIST
1433                            .ENDC
1434                            .ENDR
1435                            .ENDM   SLASH
1436                            .MACRO  STARS   NUM
1437                            .IF B NUM
1438                            T$TEMP=1
1439                            .IFF
1440                            T$TEMP=NUM
1441                            .ENDC
1442                            .REPT   T$TEMP
1443                            .IF GE SVCTAG
1444                            .LIST
1445                            ;;************************************************************************
1446                                            .NLIST
1447                            .ENDC
1448                            .ENDR
1449                            .ENDM   STARS
1450                            .MACRO  SVC
1451                            C$REVISION=3
1452                            C$EDIT=3
1453                            SVCINS=-1
1454                            SVCTST=-1
1455                            SVCSUB=-1
1456                            SVCGBL=-1
1457                            SVCTAG=-1
1458                            .RADIX          10
1459                            C$RESERV=0
1460                            C$ETST=1
1461                            C$BSUB=2
1462                            C$ESUB=3
1463                            C$BSEG=4
1464                            C$ESEG=5
1465                            C$CLP1=6
1466                            C$RDBU=7
1467                            C$ESCAPE=8
1468                            C$INIT=9
1469                            C$CLEAN=10
1470                            C$TPRI=11
1471                            C$PNTB=12
1472                            C$PNTX=13
1473                            C$PNTS=14
1474                            C$PNTF=15
1475                            C$INLP=16
1476                            C$RFLA=17
1477                            C$BRK=18
1478                            C$MSG=19
1479                            C$DRPT=20
1480                            C$RPT=21
1481                            C$GETB=22
1482                            C$GETW=23
```

```
1483                            C$GPLO=24
1484                            C$MEM=25
1485                            C$EXIT=26
1486                            C$RESET=27
1487                            C$OPEN=28
1488                            C$CLOS=29
1489                            C$CVEC=30
1490                            C$SVEC=31
1491                            C$GPRI=32
1492                            C$SPRI=33
1493                            C$GPHRD=34
1494                            C$GMAN=35
1495                            C$DCLN=36
1496                            C$CEFG=37
1497                            C$SEFG=38
1498                            C$REFG=39
1499                            C$MANI=40
1500                            C$DODU=41
1501                            C$AU=42
1502                            C$DU=43
1503                            C$ERSF=44
1504                            C$ERDF=45
1505                            C$ERHRD=46
1506                            C$ERSOFT=47
1507                            C$ERROR=48
1508                            C$AUTO=49
1509                            C$CLCK=50
1510                            C$QIO=255
1511                            .RADIX          8
1512                            E$LOAD=35
1513                            E$END=2100
1514                            T$TESTNUM=0
1515                            T$SUBNUM=0
1516                            T$ERRNUM=0
1517                            T$TAGNUM=10000
1518                            T$LSYM=10000
1519                            T$TAGLEV=-1
1520                            T$NESTLEV=-1
1521                            T$SAVLEV=-1
1522                            T$SEGLEV=-1
1523                            T$TSTMAC=-1
1524                            T$TSTSEQ=0
1525                            T$PTNUM=0
1526                            T$LAST=0
1527                            T$GMANID=0
1528                            F$MOD=0
1529                            F$TEST=1
1530                            F$SUB=2
1531                            F$SEG=3
1532                            F$HARD=4
1533                            F$SOFT=5
1534                            F$INIT=6
1535                            F$CLEAN=7
1536                            F$SRV=10
1537                            F$MSG=11
1538                            F$RPT=12
1539                            F$HW=13
```

```
1540                                    F$SW=14
1541                                    F$AU=15
1542                                    F$DU=16
1543                                    F$PWR=17
1544                                    F$AUTO=20
1545                                    F$PROT=21
1546                                    F$BGN=40
1547                                    F$END=41
1548                                    F$JMP=50
1549                                    I$MOD=F$END
1550                                    I$TST=F$END
1551                                    I$SUB=F$END
1552                                    I$SEG=F$END
1553                                    I$INIT=F$END
1554                                    I$CLN=F$END
1555                                    I$SRV=F$END
1556                                    I$MSG=F$END
1557                                    I$RPT=F$END
1558                                    I$AU=F$END
1559                                    I$DU=F$END
1560                                    I$PWR=F$END
1561                                    I$SETUP=F$END
1562                                    I$PTAB=F$END
1563                                    I$AUTO=F$END
1564                                    I$PROT=F$END
1565                                    G$PRML=0
1566                                    G$PRMA=1
1567                                    G$PRMD=2
1568                                    G$DISP=3
1569                                    G$XFER=4
1570                                    G$NO=0*^D8
1571                                    G$YES=1*^D8
1572                                    G$RADB=0*^D16
1573                                    G$RADO=1*^D16
1574                                    G$RADD=2*^D16
1575                                    G$RADL=5*^D16
1576                                    G$RADA=6*^D16
1577                                    G$OFSIZE=^D254
1578                                    G$DELM=^D250
1579                                    G$OFFSET=1*^D256
1580                                    X$OFFSET=1*^D256
1581                                    G$CNTOP=1*^D128
1582                                    G$EXCP=1*^D256
1583                                    G$LOLIM=1
1584                                    G$HILIM=2
1585                                    X$ALWAYS=0*^D16
1586                                    X$TRUE=1*^D16
1587                                    X$FALSE=2*^D16
1588                                    O$BGNSFT=0
1589                                    O$BGNRPT=0
1590                                    O$GNSW=0
1591                                    O$APTS=0
1592                                    O$AU=0
1593                                    O$DU=0
1594                                    O$ERRTBL=0
1595                                    O$SETUP=0
1596                                    O$POINTER=0
```

```
1597                            S$LSYM=T$LSYM
1598                            J$JMP=167
1599                            .IIF NDF ASSEMBLY,      ASSEMBLY=10
1600                            .IIF NDF DIAGMCALLS,    DIAGMCALLS=0
1601                            .IF EQ DIAGMCALLS
1602                            .MCALL M$MCHIGH
1603                            M$MCHIGH
1604                            .ENDC
1605                            .IF EQ ASSEMBLY-10
1606                            .MCALL M$MCLOW
1607                            M$MCLOW
1608                            .ENDC
1609                            .ENDM   SVC
1610                            .MACRO  XFER    $TAG
1611                            .MCALL  M$XFER
1612                            M$XFER  X$ALWAYS,$TAG
1613                            .ENDM   XFER
1614                            .MACRO  XFERF   $TAG
1615                            .MCALL  M$XFER
1616                            M$XFER  X$FALSE,$TAG
1617                            .ENDM   XFERF
1618                            .MACRO  XFERT   $TAG
1619                            .MCALL  M$XFER
1620                            M$XFER  X$TRUE,$TAG
1621                            .ENDM   XFERT
1622                            .MACRO  M$MCLOW
1623                            .MCALL M$PUSH,M$PRIN,M$ERRI,M$MASK,M$MSK1,M$XFER,M$IOSE,M$STAR,M$HAPT,M$HNAP,M$DATA,M$GETT,M
1624                            .MCALL M$GNGB,M$GNLS,M$TSTL,M$TLAB,M$SVC,M$GENB,M$LDR0,M$RBR0,M$RNR0,M$PUT,M$PUT1,M$WORD,M$B
1625                            .MCALL M$EXSE,M$INCR,M$DECR,M$SETS,M$GETS,M$GEN,M$GNIN,M$COUN,M$ENDE,M$RADI,M$EXCP,M$CHEC,M$
1626                            .MACRO  M$MCLOW
1627                            .ENDM
1628                            .ENDM   M$MCLOW
1629                            .MACRO  M$PUSH  STACK,LEVEL,VALUE
1630                            .MCALL  M$INCR,M$SETS
1631                            M$INCR  LEVEL
1632                            M$SETS  STACK,\LEVEL,VALUE
1633                            .ENDM   M$PUSH
1634                            .MACRO  M$PRINT CODE,FORMAT,P1,P2,P3,P4,P5,P6,P7,P8
1635                            .MCALL  M$COUNT,M$PUT,M$GNINS,M$SVC
1636                            T$ARGCNT=1
1637                            M$COUNT T$ARGCNT,<P1>,<P2>,<P3>,<P4>,<P5>,<P6>,<P7>,<P8>
1638                            .IRP    N,<\T$ARGCNT>
1639                            M$PUT   #N,FORMAT,<P1>,<P2>,<P3>,<P4>,<P5>,<P6>,<P7>,<P8>
1640                            .ENDM
1641                            M$GNINS <MOV    SP,R0>
1642                            M$SVC   CODE
1643                            .IRP    N,<\T$ARGCNT*2+2>
1644                            M$GNINS <ADD    #N,SP>
1645                            .ENDM
1646                            .ENDM   M$PRINT
1647                            .MACRO  M$ERRINS        NUMBER,ADDRESS,POINTER,CODE
1648                            .MCALL  M$GNINS,M$WORD,M$TSTLAB
1649                            M$SVC   CODE
1650                            .RADIX  10
1651                            .IF NB  NUMBER
1652                            T$ERRNUM=NUMBER
1653                            .IFF
```

```
1654                            .ERROR  ;MISSING ERROR-NR
1655                            .ENDC
1656                            M$WORD  \T$ERRNUM
1657                            .RADIX  8
1658                            .IF NB ADDRESS
1659                            M$WORD  ADDRESS
1660                            .IFF
1661                            M$WORD  0
1662                            .ENDC
1663                            .IF NB POINTER
1664                            M$WORD  POINTER
1665                            .IFF
1666                            M$WORD  0
1667                            .ENDC
1668                            .ENDM   M$ERRINS
1669                            .MACRO  M$MASK P1,P2,P3,P4,P5
1670                            .MCALL  M$WORD
1671                            .IRP NR,<P1,P2,P3,P4,P5>
1672                            M$WORD NR
1673                            .ENDM
1674                            .ENDM   M$MASK
1675                            .MACRO  M$MSK1 P1,P2,P3,P4,P5
1676                            .MCALL  M$WORD
1677                            .NARG   NR
1678                            M$WORD  \NR
1679                            .ENDM   M$MSK1
1680                            .MACRO  M$XFER  $XFER,$ADDRESS
1681                            .MCALL  M$GETTOP,M$WORD
1682                            M$GETTOP        T$NS,T$NESTLEV,T$CODE
1683                            .IF NE F$HARD - T$CODE
1684                            .IF NE F$SOFT - T$CODE
1685                            .ERROR  ;''XFER'S'' MUST BE IN GPRM CODING.
1686                            .MEXIT
1687                            .ENDC
1688                            .ENDC
1689                            T$CODE=$ADDRESS - .
1690                            .IF GT T$CODE-376
1691                            .ERROR  ;''XFER'' RANGE TOO BIG
1692                            .MEXIT
1693                            .ENDC
1694                            T$CODE=T$CODE * X$OFFSET
1695                            T$CODE=T$CODE + G$XFER + $XFER
1696                            M$WORD  T$CODE
1697                            .ENDM   M$XFER
1698                            .MACRO  M$IOSET P1,P2,P3,P4,P5,P6
1699                            .MCALL  M$WORD
1700                            .IF NB P1
1701                            M$WORD  P1
1702                            .IFF
1703                            M$WORD  0
1704                            .ENDC
1705                            .IF NB P2
1706                            M$WORD  P2
1707                            .IFF
1708                            M$WORD  0
1709                            .ENDC
1710                            .IF NB P3
```

```
1711                            M$WORD  P3
1712                            .IFF
1713                            M$WORD  0
1714                            .ENDC
1715                            .IF NB P4
1716                            M$WORD  P4
1717                            .IFF
1718                            M$WORD  0
1719                            .ENDC
1720                            .IF NB P5
1721                            M$WORD  P5
1722                            .IFF
1723                            M$WORD  0
1724                            .ENDC
1725                            .IF NB P6
1726                            M$WORD  P6
1727                            .IFF
1728                            M$WORD  0
1729                            .ENDC
1730                            .ENDM   M$IOSET
1731                            .MACRO  M$START ERR,?TAG
1732                            .MCALL  M$GNINS,M$GNTAG,BNERROR
1733                            BNERROR TAG
1734                            M$GNINS <JSR    PC,ERR>
1735                            M$GNTAG TAB
1736                            .ENDM   M$START
1737                            .MACRO  M$HAPT  FILNAM,REVLEV,DEPO,LONGST,DIAGTYPE,DIAGPRO
1738                            .MCALL  M$GNGBL,M$GNINS,M$BYTE,M$DATA
1739                            .IF B   FILNAM
1740                            .ERROR  ; MISSING DIAG. NAME
1741                            .MEXIT
1742                            .ENDC
1743                            M$GNGBL L$NAME,<<;DIAGNOSTIC NAME>>
1744                            T$ARGCNT=^D7
1745                            .IRPC   CHAR,<FILNAM>
1746                            M$GNINS <.ASCII /CHAR/>
1747                            T$ARGCNT=T$ARGCNT-1
1748                            .IF LT T$ARGCNT
1749                            .ERROR  ;PROG NAME TOO BIG
1750                            .MEXIT
1751                            .ENDC
1752                            .ENDM
1753                            .REPT   T$ARGCNT
1754                            M$BYTE  0
1755                            .ENDR
1756                            M$BYTE  0
1757                            .IF NB REVLEV
1758                            M$DATA  L$REV,,ASCII,</REVLEV/>,<<;REVISION LEVEL>>
1759                            .IFF
1760                            .ERROR  ; MISSING REV. LEVEL
1761                            M$DATA  L$REV,,ASCII,</?/>,<<;REVISION LEVEL>>
1762                            .ENDC
1763                            .IF NB DEPO
1764                            M$DATA  L$DEPO,,ASCII,</DEPO/>,<<;DEPO>>
1765                            .IFF
1766                            .ERROR  ; MISSING DEPO.
1767                            M$DATA  L$DEPO,,ASCII,</?/>,<<;DEPO>>
```

```
1768                            .ENDC
1769                            .IF EQ O$SETUP
1770                            M$DATA  L$UNIT,.WORD,0,<<;NUMBER OF UNITS>>
1771                            .IFF
1772                            M$DATA  L$UNIT,.WORD,T$PTHV,<<;NUMBER OF UNITS>>
1773                            .ENDC
1774                            .IF B   LONGST
1775                            .ERROR  ; LONGEST TEST TIME MISSING
1776                            M$DATA  L$TIML,.WORD,0,<<;LONGEST TEST TIME>>
1777                            .IFF
1778                            M$DATA  L$TIML,.WORD,LONGST,<<;LONGEST TEST TIME>>
1779                            .ENDC
1780                            M$DATA  L$HPCP,.WORD,L$HARD,<<;POINTER TO H.W. QUES.>>
1781                            .IF EQ O$BGNSFT
1782                            M$DATA  L$SPCP,.WORD,0,<<;POINTER TO S.W. QUES.>>
1783                            .IFF
1784                            M$DATA  L$SPCP,.WORD,L$SOFT,<<;POINTER TO S.W. QUES.>>
1785                            .ENDC
1786                            M$DATA  L$HPTP,.WORD,L$HW,<<;PTR. TO DEF. H.W. PTABLE>>
1787                            .IF EQ O$GNSW
1788                            M$DATA  L$SPTP,.WORD,0,<<;PTR. TO S.W. PTABLE>>
1789                            .IFF
1790                            M$DATA  L$SPTP,.WORD,L$SW,<<;PTR. TO S.W. PTABLE>>
1791                            .ENDC
1792                            M$DATA  L$LADP,.WORD,L$LAST,<<;DIAG. END ADDRESS>>
1793                            .IF EQ O$APTS
1794                            M$DATA  L$STA,.WORD,0,<<;RESERVED FOR APT STATS>>
1795                            .IFF
1796                            M$DATA  L$STA,.WORD,0,<<;RESERVED FOR APT STATS>>
1797                            .ENDC
1798                            M$DATA  L$CO,.WORD,0
1799                            .IF B   DIAGTYPE
1800                            .ERROR  ; MISSING DIAG. TYPE
1801                            M$DATA  L$DTYP,.WORD,0,<<;DIAGNOSTIC TYPE>>
1802                            .IFF
1803                            .IF IDN 0,DIAGTYPE
1804                            M$DATA  L$DTYP,.WORD,DIAGTYPE,<<;DIAGNOSTIC TYPE>>
1805                            .IFF
1806                            .IF IDN 1,DIAGTYPE
1807                            M$DATA  L$DTYP,.WORD,DIAGTYPE,<<;DIAGNOSTIC TYPE>>
1808                            .IFF
1809                            M$DATA  L$DTYP,.WORD,0,<<;DIAGNOSTIC TYPE>>
1810                            .ERROR  ; INVALID DIAG. TYPE (0=DIAG, 1=EXERCISER)
1811                            .ENDC
1812                            .ENDC
1813                            .ENDC
1814                            M$DATA  L$APT,.WORD,0,<<;APT EXPANSION>>
1815                            M$DATA  L$DTP,.WORD,L$DISPATCH,<<;PTR. TO DISPATCH TABLE>>
1816                            .IF B DIAGPRIO
1817                            M$DATA  L$PRIO,.WORD,0,<<;DIAGNOSTIC RUN PRIORITY>>
1818                            .IFF
1819                            M$DATA  L$PRIO,.WORD,DIAGPRIO,<<;DIAGNOSTIC RUN PRIORITY>>
1820                            .ENDC
1821                            .ENDM   M$HAPT
1822                            .MACRO  M$HNAP
1823                            .MCALL  M$DATA,M$WORD,M$GNINS
1824                            M$DATA  L$ENVI,.WORD,0,<<;FLAGS DESCRIBE HOW IT WAS SETUP>>
```

```
1825                            M$DATA  L$EXP1,,WORD,0,<<;EXPANSION WORD>>
1826                            M$DATA  L$MREV,,BYTE,C$REVISION,<<;SVC REV AND EDIT #>>
1827                            M$GNINS <.BYTE  C$EDIT>
1828                            M$DATA  L$EF,,WORD,0    ,<<;DIAG. EVENT FLAGS>>
1829                            M$WORD  0
1830                            M$DATA  L$SPC,,WORD,0
1831                            M$DATA  L$DEVP,,WORD,L$DVTYP            ,<<; POINTER TO DEVICE TYPE LIST>>
1832                            .IF EQ O$BGNRPT
1833                            M$DATA  L$REPP,,WORD,0,<<;PTR. TO REPORT CODE>>
1834                            .IFF
1835                            M$DATA  L$REPP,,WORD,L$RPT,<<;PTR. TO REPORT CODE>>
1836                            .ENDC
1837                            M$DATA  L$EXP4,,WORD,0
1838                            M$DATA  L$EXP5,,WORD,0
1839                            .IF EQ O$AU
1840                            M$DATA L$AUT,,WORD,0,<<;PTR. TO ADD UNIT CODE>>
1841                            .IFF
1842                            M$DATA L$AUT,,WORD,L$AU,<<;PTR. TO ADD UNIT CODE>>
1843                            .ENDC
1844                            .IF EQ O$DU
1845                            M$DATA L$DUT,,WORD,0,<<;PTR. TO DROP UNIT CODE>>
1846                            .IFF
1847                            M$DATA L$DUT,,WORD,L$DU,<<;PTR. TO DROP UNIT CODE>>
1848                            .ENDC
1849                            M$DATA  L$LUN,,WORD,0                   ,<<;LUN FOR EXERCISERS TO FILL>>
1850                            M$DATA  L$DESP,,WORD,L$DESC             ,<<;POINTER TO DIAG. DESCRIPTION>>
1851                            M$DATA  L$LOAD,EMT,E$LOAD               ,<<;GENERATE SPECIAL AUTOLOAD EMT>>
1852                            .IF EQ O$ERRTBL
1853                            M$DATA  L$ETP,,WORD,0,<<;POINTER TO ERRTBL>>
1854                            .IFF
1855                            M$DATA  L$ETP,,WORD,L$ERRTBL,<<;POINTER TO ERRTBL>>
1856                            .ENDC
1857                            M$DATA  L$ICP,,WORD,L$INIT,<<;PTR. TO INIT CODE>>
1858                            M$DATA  L$CCP,,WORD,L$CLEAN,<<;PTR. TO CLEAN-UP CODE>>
1859                            M$DATA  L$ACP,,WORD,L$AUTO,<<;PTR. TO AUTO CODE>>
1860                            M$DATA  L$PRT,,WORD,L$PROT,<<;PTR. TO PROTECT TABLE>>
1861                            M$DATA  L$TEST,,WORD,0,<<;TEST NUMBER>>
1862                            M$DATA  L$DLY,,WORD,0,<<;DELAY COUNT>>
1863                            M$DATA  L$HIME,,WORD,0,<<;PTR. TO HIGH MEM>>
1864                            .ENDM   M$HNAP
1865                            .MACRO  M$DATA  LABEL,DTYPE,DATA,COMMENT
1866                            .MCALL  M$GNGBL,M$GNINS
1867                            .IF NB COMMENT
1868                            M$GNGBL LABEL,<COMMENT>
1869                            .ENDC
1870                            .IF B COMMENT
1871                            M$GNGBL LABEL
1872                            .ENDC
1873                            M$GNINS <DTYPE  DATA>
1874                            .ENDM   M$DATA
1875                            .MACRO  M$GETTOP        STACK,LEVEL,VALUE
1876                            .MCALL  M$GETS
1877                            M$GETS  STACK,\LEVEL,VALUE
1878                            .ENDM   M$GETTOP
1879                            .MACRO  M$POP   STACK,LEVEL,VALUE
1880                            .MCALL  M$GETS,M$DECR
1881                            .IF LT  LEVEL
```

```
1882                            .ERROR  LEVEL   ; MACRO STACK UNDERFLOW
1883                            .MEXIT
1884                            .ENDC
1885                            M$GETS  STACK,\LEVEL,VALUE
1886                            M$DECR  LEVEL
1887                            .ENDM   M$POP
1888                            .MACRO  M$GNTAG $P,$T
1889                            .MCALL  M$GEN
1890                            M$GEN   $P,\$T,SVCTAG
1891                            .ENDM   M$GNTAG
1892                            .MACRO  M$GNTEST $TN
1893                            .MCALL  M$GEN
1894                            M$GEN   T,'$TN':,SVCTST
1895                            .ENDM   M$GNTEST
1896                            .MACRO  M$GNSUB $TN,$SN
1897                            .MCALL  M$GEN
1898                            M$GEN   T'$TN'.,'$SN',SVCSUB
1899                            .ENDM   M$GNSUB
1900                            .MACRO  M$GNGBL TAG,COMMENT
1901                            .MCALL  M$GEN
1902                            .IF NB,TAG
1903                            .IF NB,COMMENT
1904                            M$GEN   TAG,:,SVCGBL,COMMENT
1905                            .ENDC
1906                            .IF B,COMMENT
1907                            M$GEN   TAG,:,SVCGBL,< >
1908                            .ENDC
1909                            .ENDC
1910                            .ENDM   M$GNGBL
1911                            .MACRO  M$GNLS  ARG
1912                            .MCALL  M$GEN
1913                            .IF NB ARG
1914                            M$GEN   \ARG,$,SVCTAG
1915                            .IFF
1916                            M$GEN   \S$LSYM,$,SVCTAG
1917                            .ENDC
1918                            .ENDM   M$GNLS
1919                            .MACRO  M$TSTLAB
1920                            .MCALL  M$TLABEL,M$INCR
1921                            .IIF LT T$TSTMAC, .MEXIT
1922                            .RADIX  10
1923                            M$TLABEL        \T$TESTNUN,\T$TSTSEQ
1924                            .RADIX  8
1925                            M$INCR  T$TSTSEQ
1926                            .ENDM   M$TSTLAB
1927                            .MACRO  M$TLABEL        TST,SEQ
1928                            .MCALL  M$GEN
1929                            M$GEN   S'TST,$'SEQ,SVCTAG
1930                            .ENDM   M$TLABEL
1931                            .MACRO  M$SVC   CODE
1932                            .MCALL  M$GNINS,M$TSTLAB
1933                            M$TSTLAB
1934                            M$GNINS <TRAP   CODE>
1935                            .ENDM   M$SVC
1936                            .MACRO  M$GENBR $$BR,$$SYM,$$TAG
1937                            .MCALL  M$GNINS
1938                            M$GNINS <$$BR   $$SYM'$$TAG>
```

```
1939                            .ENDM   M$GENBR
1940                            .MACRO  M$LDR0  ARG,NAME
1941                            .MCALL  M$GNINS
1942                            .IF NB ARG
1943                            .IF DIF R0,ARG
1944                            M$GNINS <MOV    ARG,R0>
1945                            .ENDC
1946                            .IFF
1947                            .ERROR  ;MISSING ARG. ON 'NAME'
1948                            .ENDC
1949                            .ENDM   M$LDR0
1950                            .MACRO  M$RBR0  ARG,NAME
1951                            .MCALL  M$GNINS
1952                            .IF NB  ARG
1953                            .IF DIF R0,ARG
1954                            M$GNINS <MOVB   R0,ARG>
1955                            .ENDC
1956                            .IFF
1957                            .ERROR  ;MISSING ARG. ON 'NAME'
1958                            .ENDC
1959                            .ENDM   M$RBR0
1960                            .MACRO  M$RNR0  ARG,NAME
1961                            .MCALL  M$GNINS
1962                            .IF NB  ARG
1963                            .IF DIF R0,ARG
1964                            M$GNINS <MOV    R0,ARG>
1965                            .ENDC
1966                            .IFF
1967                            .ERROR  ;MISSING ARG. ON 'NAME'
1968                            .ENDC
1969                            .ENDM   M$RNR0
1970                            .MACRO  M$PUT   P0,P1,P2,P3,P4,P5,P6,P7,P8,P9
1971                            .MCALL  M$PUT1
1972                            .IF NB  <P1>
1973                            M$PUT   <P1>,<P2>,<P3>,<P4>,<P5>,<P6>,<P7>,<P8>,<P9>
1974                            .ENDC
1975                            .IF NB  <P0>
1976                            M$PUT1  P0
1977                            .ENDC
1978                            .ENDM   M$PUT
1979                            .MACRO  M$PUT1  ARG1,ARG2
1980                            .MCALL  M$GNINS
1981                            .IF B   ARG2
1982                            M$GNINS <MOV    ARG1,-(SP)>
1983                            .IFF
1984                            .IF DIF B,<ARG1>
1985                            .ERROR  ;ILL. ARG. 'ARG1' ONLY 'B' IS ALLOWED.
1986                            .MEXIT
1987                            .ENDC
1988                            M$GNINS <CLR    -(SP)>
1989                            M$GNINS <BISB   ARG2,(SP)>
1990                            .ENDC
1991                            .ENDM   M$PUT1
1992                            .MACRO  M$WORD  ARG
1993                            .MCALL  M$GNINS
1994                            .IRP    N,<ARG>
1995                            M$GNINS <.WORD  N>
```

```
1996                                    .ENDM
1997                                    .ENDM   M$WORD
1998                                    .MACRO  M$BYTE  ARG
1999                                    .MCALL  M$GNINS
2000                                    .IRP    N,<ARG>
2001                                    M$GNINS <.BYTE  N>
2002                                    .ENDM
2003                                    .ENDM   M$BYTE
2004                                    .MACRO  M$ESCAPE TAG1
2005                                    .MCALL  M$GNINS
2006                                    M$GNINS <.WORD  L'TAG1-.>
2007                                    .ENDM   M$ESCAPE
2008                                    .MACRO  M$ESCSEG        TAG1
2009                                    .MCALL  M$GNINS
2010                                    M$GNINS <.WORD  TAG1'$-.>
2011                                    .ENDM   M$ESCSEG
2012                                    .MACRO  M$EXIT  TAG1
2013                                    .MCALL  M$GNINS
2014                                    M$GNINS <.WORD  L'TAG1-.>
2015                                    .ENDM   M$EXIT
2016                                    .MACRO  M$EXTJ  TAG1
2017                                    .MCALL  M$GNINS
2018                                    M$GNINS <.WORD  L'TAG1-2-.>
2019                                    .ENDM   M$EXTJ
2020                                    .MACRO  M$EXSEG TAG1
2021                                    .MCALL  M$GNINS
2022                                    M$GNINS <.WORD  TAG1'$-.>
2023                                    .ENDM   M$EXSEG
2024                                    .MACRO  M$INCR  VAL
2025                                    VAL=VAL+1
2026                                    .ENDM   M$INCR
2027                                    .MACRO  M$DECR  VAL
2028                                    VAL=VAL-1
2029                                    .ENDM   M$DECR
2030                                    .MACRO  M$SETS  $STACK,$LEVEL,$VALUE
2031                                    $STACK'$LEVEL=$VALUE
2032                                    .ENDM   M$SETS
2033                                    .MACRO  M$GETS  $STACK,$LEVEL,$VALUE
2034                                    $VALUE=$STACK'$LEVEL
2035                                    .ENDM   M$GETS
2036                                    .MACRO  M$GEN   $$P,$$T,LSTCNTRL,COMMENT
2037                                    .IF LE  LSTCNTRL
2038                                    .IIF EQ LSTCNTRL,.LIST
2039                                    $$P'$$T:                        COMMENT
2040                                    .IIF EQ LSTCNTRL,.NLIST
2041                                    .MEXIT
2042                                    .ENDC
2043                                    .LIST
2044                                                                            $$P'$$T:
2045                                            .NLIST
2046                                    .ENDM   M$GEN
2047                                    .MACRO  M$GNINS INSTR
2048                                    .IF LT SVCINS
2049                                    INSTR
2050                                    .MEXIT
2051                                    .ENDC
2052                                    .IF EQ SVCINS
```

```
2053                            .LIST
2054                                    INSTR
2055                                            .NLIST
2056                            .MEXIT
2057                            .ENDC
2058                            .IF GT SVCINS
2059                            .LIST
2060                                                                    INSTR
2061                                            .NLIST
2062                            .ENDC
2063                            .ENDM   M$GNINS
2064                            .MACRO  M$COUNT COUNT,P0,P1,P2,P3,P4,P5,P6,P7,P8
2065                            .IF NB <P1>
2066                            M$COUNT COUNT,<P1>,<P2>,<P3>,<P4>,<P5>,<P6>,<P7>,<P8>
2067                            .ENDC
2068                            .IF NB <P0>
2069                            COUNT=COUNT+1
2070                            .ENDC
2071                            .ENDM   M$COUNT
2072                            .MACRO  M$ENDERR        $NAME,$FLAG
2073                            .ERROR  ;'"$NAME" STMT OUT OF SEQUENCE.
2074                            .ENDM   M$ENDERR
2075                            .MACRO  M$RADIX $IN,$OUT
2076                            .IF IDN B,$IN
2077                            $OUT=G$RADB
2078                            .MEXIT
2079                            .ENDC
2080                            .IF IDN O,$IN
2081                            $OUT=G$RADO
2082                            .MEXIT
2083                            .ENDC
2084                            .IF IDN D,$IN
2085                            $OUT=G$RADD
2086                            .MEXIT
2087                            .ENDC
2088                            .IF IDN L,$IN
2089                            $OUT=G$RADL
2090                            .MEXIT
2091                            .ENDC
2092                            .IF IDN A,$IN
2093                            $OUT=G$RADA
2094                            .MEXIT
2095                            .ENDC
2096                            $OUT=-1
2097                            .ERROR  ;ILL. RADIX '"$IN"'
2098                            .ENDM   M$RADIX
2099                            .MACRO  M$EXCP  WORD1,EXWD,EXCD,LIMIT,LIM1,LIM2
2100                            .IF IDN <@>,<LIM1>
2101                            .IF LT G$OFSIZE-LIM2
2102                            .ERROR  ;INDIRECT PAR. TOO BIG
2103                            .MEXIT
2104                            .ENDC
2105                            LIMIT=LIM2/2
2106                            WORD1=WORD1 ! G$EXCP
2107                            EXWD=EXWD ! EXCD
2108                            .IFF
2109                            .IF B,LIM2
```

```
2110                                    LIMIT=LIM1
2111                                    .IFF
2112                                    .ERROR  ;ILL. DEFERRED MODE
2113                                    .ENDC
2114                                    .ENDC
2115                                    .ENDM   M$EXCP
2116                                    .MACRO  M$CHECK NAME,TAG,FLAG
2117                                    .IF IDN <TST>,<NAME>
2118                                    TAG=T$$TEST
2119                                    FLAG=I$TST
2120                                    .MEXIT
2121                                    .ENDC
2122                                    .IF IDN <SUB>,<NAME>
2123                                    TAG=T$$SUB
2124                                    FLAG=I$SUB
2125                                    .MEXIT
2126                                    .ENDC
2127                                    .IF IDN <SEG>,<NAME>
2128                                    TAG=T$$SEG
2129                                    FLAG=I$SEG
2130                                    .MEXIT
2131                                    .ENDC
2132                                    .IF IDN <INIT>,<NAME>
2133                                    TAG=T$$INIT
2134                                    FLAG=I$INIT
2135                                    .MEXIT
2136                                    .ENDC
2137                                    .IF IDN <CLN>,<NAME>
2138                                    TAG=T$$CLEAN
2139                                    FLAG=I$CLN
2140                                    .MEXIT
2141                                    .ENDC
2142                                    .IF IDN <SRV>,<NAME>
2143                                    TAG=T$$SRV
2144                                    FLAG=I$SRV
2145                                    .MEXIT
2146                                    .ENDC
2147                                    .IF IDN <MSG>,<NAME>
2148                                    TAG=T$$MSG
2149                                    FLAG=F$JMP
2150                                    .MEXIT
2151                                    .ENDC
2152                                    .IF IDN <RPT>,<NAME>
2153                                    TAG=T$$RPT
2154                                    FLAG=F$JMP
2155                                    .MEXIT
2156                                    .ENDC
2157                                    .IF IDN <DU>,<NAME>
2158                                    TAG=T$$DU
2159                                    FLAG=F$JMP
2160                                    .MEXIT
2161                                    .ENDC
2162                                    .IF IDN <AU>,<NAME>
2163                                    TAG=T$$AU
2164                                    FLAG=F$JMP
2165                                    .MEXIT
2166                                    .ENDC
```

```
2167                                    .ENDM   M$CHECK
2168                                    .MACRO  M$DEFAULT       $IN,$OUT
2169                                    .IF IDN YES,$IN
2170                                    $OUT=G$YES
2171                                    .MEXIT
2172                                    .ENDC
2173                                    .IF IDN NO,$IN
2174                                    $OUT=G$NO
2175                                    .MEXIT
2176                                    .ENDC
2177                                    $OUT=-1
2178                                    .ERROR  ;DEFAULT 'SIN'' MUST BE ''YES'' OR 'NO''
2179                                    .ENDM   M$DEFAULT
2180                                    .MACRO  M$CNTOP $IN,WORD1
2181                                    .IF NB  $IN
2182                                    .IF NE  I$SFT - F$BGN
2183                                    .ERROR  ; ''COUNT'' OPTION VALID ONLY IN S.W. QUES.
2184                                    .MEXIT
2185                                    .ENDC
2186                                    WORD1=WORD1 ! G$CNTOP
2187                                    .ENDC
2188                                    .ENDM   M$CNTOP
```

```
                                .TITLE  CZRLGCO RL11/RLV11 CTLR TST 1
                                .ENABLE AMA
000000                          .ENABLE ABS
                                .NLIST  ME,CND,MD
                                .MCALL SVC

000000                          SVC
        000000                  SVCINS=0
        000000                  SVCTAG=0
        002000                  .=2000


002000                                  POINTER BGNSFT,BGNSW,BGNDU,BGNAU

002000                          BGNMOD  MDHEDR

002000                                  HEADER  CZRLG,C,0,7,0
002000      103                         .ASCII /C/
002001      132                         .ASCII /Z/
002002      122                         .ASCII /R/
002003      114                         .ASCII /L/
002004      107                         .ASCII /G/
002005      000                         .BYTE   0
002006      000                         .BYTE   0
002007      000                         .BYTE   0
002010      103                         .ASCII  /C/
002011      060                         .ASCII  /0/
002012   000000                         .WORD   0
002014   000007                         .WORD   7
002016   024426                         .WORD   L$HARD
002020   024606                         .WORD   L$SOFT
002022   011606                         .WORD   L$HW
002024   011624                         .WORD   L$SW
002026   024674                         .WORD   L$LAST
002030   000000                         .WORD   0
002032   000000                         .WORD   0
002034   000000                         .WORD   0
002036   000000                         .WORD   0
002040   011634                         .WORD   L$DISPATCH
002042   000000                         .WORD   0
002044   000000                         .WORD   0
002046   000000                         .WORD   0
002050      003                         .BYTE   C$REVISION
002051      003                         .BYTE   C$EDIT
002052   000000                         .WORD   0
002054   000000                         .WORD   0
002056   000000                         .WORD   0
002060   002230                         .WORD   L$DVTYP
002062   000000                         .WORD   0
002064   000000                         .WORD   0
002066   000000                         .WORD   0
002070   013030                         .WORD   L$AU
002072   013024                         .WORD   L$DU
002074   000000                         .WORD   0
002076   002122                         .WORD   L$DESC
002100   104035                         EMT     E$LOAD
002102   000000                         .WORD   0
```

```
        002104  011772                          .WORD   L$INIT
        002106  012756                          .WORD   L$CLEAN
        002110  012534                          .WORD   L$AUTO
        002112  011764                          .WORD   L$PROT
        002114  000000                          .WORD   0
        002116  000000                          .WORD   0
        002120  000000                          .WORD   0
    18
    19 002122                                   ENDMOD
    20
    21 002122                           DESCRIPT <CZRLG TESTS CONTROLLER FUNCTIONS, INTERFACE LOGIC, REGISTER OPERATION>
        002122      103     132     122         .ASCIZ  /CZRLG TESTS CONTROLLER FUNCTIONS, INTERFACE LOGIC, REGISTER OPERATION/
        002125      114     107     040
        002130      124     105     123
        002133      124     123     040
        002136      103     117     116
        002141      124     122     117
        002144      114     114     105
        002147      122     040     106
        002152      125     116     103
        002155      124     111     117
        002160      116     123     054
        002163      040     111     116
        002166      124     105     122
        002171      106     101     103
        002174      105     040     114
        002177      117     107     111
        002202      103     054     040
        002205      122     105     107
        002210      111     123     124
        002213      105     122     040
        002216      117     120     105
        002221      122     101     124
        002224      111     117     116
        002227      000
                                            .EVEN
    22 002230                           DEVTYP  <RL01,RL02>
        002230      122     114     060         .ASCIZ  /RL01,RL02/
        002233      061     054     122
        002236      114     060     062
        002241      000
                                            .EVEN
    23
    24 002242                           BGNMOD  GLBEQAT
    25
    26 002242                                   EQUALS
                                        ;
                                        ; BIT DIFINITIONS
                                        ;
                100000                      BIT15== 100000
                040000                      BIT14== 40000
                020000                      BIT13== 20000
                010000                      BIT12== 10000
                004000                      BIT11== 4000
                002000                      BIT10== 2000
                001000                      BIT09== 1000
                000400                      BIT08== 400
```

```
000200                  BIT07== 200
000100                  BIT06== 100
000040                  BIT05== 40
000020                  BIT04== 20
000010                  BIT03== 10
000004                  BIT02== 4
000002                  BIT01== 2
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
                        ;
000004                  EVL==       4
000010                  LOT==      10
000020                  ADR==      20
000040                  IDU==      40
000100                  ISR==     100
000200                  UAM==     200
000400                  BOE==     400
001000                  PNT==    1000
002000                  PRI==    2000
004000                  IXE==    4000
010000                  IBE==   10000
020000                  IFR==   20000
040000                  LOE==   40000
100000                  HOE==  100000
```

```
                000001          DRDY=BIT0               ;DRIVE READY (RLCS)
                000100          INTEN=BIT6              ;INTERRUPT ENABLE (RLCS)
                100000          ERR=BIT15               ;RL11 ERROR (RLCS)
                040000          DERR=BIT14              ;RL01 DRIVE ERROR (RLCS)
                002000          OPI=BIT10               ;OPERATION INCOMPLETE (RLCS)
                000200          CRDY=BIT7               ;CONTROLLER READY (RLCS)
                000040          BA17=BIT5               ;EXTENDED ADDRESS BIT 17 (RLCS)
                000020          BA16=BIT4               ;EXTENDED ADDRESS BIT 16 (RLCS)
                020000          NXM=BIT13               ;NON-EXISTANT MEMORY (RLCS)
                000000          DS0=0                   ;DRIVE SELECT 0 (RLCS)
                000400          DS1=BIT8                ;DRIVE SELECT 1 (RLCS)
                001000          DS2=BIT9                ;DRIVE SELECT 2 (RLCS)
                001400          DS3=BIT8!BIT9           ;DRIVE SELECT 3 (RLCS)
                000000          NOOP0=0                 ;FUNCTION-NOOP(0)
                000016          NOOP7=BIT1!BIT2!BIT3    ;FUNCTION-NOOP(7)
                000002          WRCHK=BIT1              ;WRITE CHECK FUNCTION
                000004          GSTAT=BIT2              ;GET STATUS FUNCTION
                000006          SEEK=BIT2!BIT1          ;SEEK FUNCTION
                000010          RDHDR=BIT3              ;READ HEADER FUNCTION
                000012          WRITE=BIT3!BIT1         ;WRITE DATA FUNCTION
                000014          READ=BIT3!BIT2          ;READ DATA FUNCTION
                000202          GODRVR=BIT1!BIT7        ;CRDY AND DRDY
                000010          DRST=BIT3               ;DRIVE RESET (RLDA)
                000002          GSBIT=BIT1              ;GET STATUS BIT (RLDA)
                000001          MK=BIT0                 ;MARKER BIT (RLDA)
                000004          SIGN=BIT2               ;SIGN BIT (RLDA)
                000100          RHHS=BIT6               ;HEAD SELECT IN READ HEADER
                000100          STHS=BIT6               ;HEAD SELECT IN STATUS BACK
                000020          DAHS=BIT4               ;HEAD SELECT IN SEEK

                                ;OFFSET FOR HARDWARE P-TABLE

                000000          CSR=0
                000002          VECT=2
                000004          PRIOR=4
                000006          TYPDR=6
                000010          DRBT=10
                000012          CNT=12

                                ;OFFSET FOR SOFTWARE P-TABLE

                000000          DLT=0
                000002          ELT=2
                000004          SIZE=4

002242                          ENDMOD

002242          BGNMOD  GLBDAT

                .SBTTL  GLOBAL DATA

002242  000000  PWRFLG: .WORD   0
002244  000000  UUT:    .WORD   0
002246  000000  UNITST: .WORD   0
002250  000000  RLCS:   .WORD   0               ;LOGICAL ADDRESS OF CS
002252  000000  RLBA:   .WORD   0               ;LOGICAL ADDRESS OF BA
002254  000000  RLDA:   .WORD   0               ;LOGICAL ADDRESS OF DA
```

GLOBAL DATA

```
     84 002256  000000                RLMP:    .WORD   0               ;LOGICAL ADDRESS OF MP
     85 002260  000000                RLBE:    .WORD   0               ;LOGICAL ADDRESS OF BE
     86 002262  000000                BCSR:    .WORD   0
     87 002264  000000                BPRIOR:  .WORD   0
     88 002266  000000                BVEC:    .WORD   0
     89 002270  000000                DRIVE:   .WORD   0               ;DRIVE UNDER TEST
     90 002272  000000                B.CS:    .WORD   0               ;CS - BEFORE OPERATION
     91 002274  000000                B.BA:    .WORD   0               ;BA - BEFORE OPERATION
     92 002276  000000                B.DA:    .WORD   0               ;DA - BEFORE OPERATION
     93 002300  000000                B.MP:    .WORD   0               ;MP - BEFORE OPERATION
     94 002302  000000                B.BE:    .WORD   0               ;BE - BEFORE OPERATION
     95 002304  000000                DERFLG:  .WORD
     96 002306  000000                E.CS:    .WORD   0               ;CS - AT OCCURANCE OF ERROR
     97 002310  000000                E.BA:    .WORD   0               ;BA - AT OCCRUANCE OF ERROR
     98 002312  000000                E.DA:    .WORD   0               ;DA - AT OCCURANCE OF ERROR
     99 002314  000000                E.MP:    .WORD   0               ;MP - AT OCCURANCE OF ERROR
    100 002316  000000                E.MP1:   .WORD   0
    101 002320  000000                E.MP2:   .WORD   0               ;MP - AT OCCURANCE OF ERROR READ HEADER
    102 002322  000000                E.BE:    .WORD   0               ;BE - AT OCCURANCE OF ERROR RLV12 ONLY
    103 002324  000000                PFLG:    .WORD   0               ;PROCESSOR TYPE, 0=UNIBUS, 1=Q-BUS
    104 002326  000000                TRPFLG:  .WORD   0
    105 002330  000000                INTFLG:  .WORD   0               ;INTERRUPT OCCURRENCE FLAG
    106 002332  000000                LDCSR:   .WORD   0               ;LOCATION TO FORM RLCS
    107 002334  000077                SECMSK:  .WORD   77              ;MASK OUT SECTOR
    108 002336  120001                XPOLY:   .WORD   120001          ;POLYNOMIAL FOR CRC 16
    109 002340  000004                ERRVEC:  .WORD   4
    110 002342  000000                BCCFBK:  .WORD   0               ;LOCATION USED BY "SIMBCC"
    111 002344  000000                CALBCC:  .WORD   0               ;LOCATION USED BY "SIMBCC"
    112 002346  000000                TEMP2:   .WORD   0               ;LOCATION USED BY "SIMBCC"
    113 002350  000000                TEMP3:   .WORD   0               ;LOCATION USED BY "SIMBCC"
    114 002352  000000                TEMP4:   .WORD   0               ;LOCATION USED BY "SIMBCC"
    115 002354  000000                TMP0:    .WORD   0
    116 002356  000000                TMP1:    .WORD   0
    117 002360  000000                TMP2:    .WORD   0
    118 002362  000000                GDDAT:   .WORD   0
    119 002364  000000                BDDAT:   .WORD   0
    120 002366  000000                FIRST:   .WORD   0               ;FIRST SECTOR READ
    121 002370  177700                CYLMSK:  .WORD   177700          ;MASK CYLINDER AND HEAD SELECT
    122 002372  000050                MXSEC1:  .WORD   40.             ;MAX SECTOR ADDRESS +1
    123 002374  000047                MAXSEC:  .WORD   39.             ;MAX SECTOR ADDRESS
    124 002376  000000                DWORD:   .WORD   0               ;DIFFERENCE WORD (SEEK)
    125 002400  177600                MAXCYL:  .WORD   177600          ;MAXIMUM CYLINDER ADDRESS
    126 002402  000000                SVHD:    .WORD   0               ;SAVE CURRENT HEAD SELECT
    127 002404  000000                WHY:     .WORD   0               ;REASON FOR DROP UNIT
    128
    129 002406  000000                T.DRIVE:         .WORD   0       ;DRIVE TYPE
    130 002410  000000                T.CNTLR:         .WORD   0       ;CONTOLLER TYPE
    131 002412  000000                TMPFNC:          .WORD   0
    132 002414  000000                DLYCNT:          .WORD   0       ;DELAY COUNTER
    133
    134                               ;
    135                               ;PATTERNS USED FOR LOADING/READING REGISTERS
    136
    137 002416  000000                BEGPAT: 0                        ;GROWING 1
    138 002420  000001                        1
    139 002422  000003                        3
    140 002424  000007                        7
```

GLOBAL DATA

```
    141 002426  000017                      17
    142 002430  000037                      37
    143 002432  000077                      77
    144 002434  000177                      177
    145 002436  000377                      377
    146 002440  000777                      777
    147 002442  001777                      1777
    148 002444  003777                      3777
    149 002446  007777                      7777
    150 002450  017777                      17777
    151 002452  037777                      37777
    152 002454  077777                      77777
    153 002456  177777                      177777
    154 002460  177776                      177776          ;GROWING 0
    155 002462  177774                      177774
    156 002464  177770                      177770
    157 002466  177760                      177760
    158 002470  177740                      177740
    159 002472  177700                      177700
    160 002474  177600                      177600
    161 002476  177400                      177400
    162 002500  177000                      177000
    163 002502  176000                      176000
    164 002504  174000                      174000
    165 002506  170000                      170000
    166 002510  160000                      160000
    167 002512  140000                      140000
    168 002514  100000                      100000
    169
    170 002516  000000                      000000
    171 002520  000001                      1               ;WALKING 1
    172 002522  000002                      2
    173 002524  000004                      4
    174 002526  000010                      10
    175 002530  000020                      20
    176 002532  000040                      40
    177 002534  000100                      100
    178 002536  000200                      200
    179 002540  000400                      400
    180 002542  001000                      1000
    181 002544  002000                      2000
    182 002546  004000                      4000
    183 002550  010000                      10000
    184 002552  020000                      20000
    185 002554  040000                      40000
    186 002556  100000                      100000
    187 002560  177777                      177777          ;WALKING 0
    188 002562  177776                      177776
    189 002564  177775                      177775
    190 002566  177773                      177773
    191 002570  177767                      177767
    192 002572  177757                      177757
    193 002574  177737                      177737
    194 002576  177677                      177677
    195 002600  177577                      177577
    196 002602  177377                      177377
    197 002604  176777                      176777
```

GLOBAL DATA

```
    198 002606  175777                          175777
    199 002610  173777                          173777
    200 002612  167777                          167777
    201 002614  157777                          157777
    202 002616  137777                          137777
    203 002620  077777                          077777
    204 002622  177777                          177777
    205 002624  000000              ENDPAT:     000000
    206
    207                             .SBTTL  PATTERNS FOR DIFFERENCE WORD
    208
    209 002626  000200              SKLST:  .WORD   BIT7
    210 002630  000400                      .WORD   BIT8            ;SHIFTING 1
    211 002632  001000                      .WORD   BIT9
    212 002634  002000                      .WORD   BIT10
    213 002636  004000                      .WORD   BIT11
    214 002640  010000                      .WORD   BIT12
    215 002642  020000                      .WORD   BIT13
    216 002644  040000                      .WORD   BIT14
    217 002646  077600                      .WORD   77600           ;SHIFTING 0
    218 002650  077400                      .WORD   77400
    219 002652  076600                      .WORD   76600
    220 002654  075600                      .WORD   75600
    221 002656  073600                      .WORD   73600
    222 002660  067600                      .WORD   67600
    223 002662  057600                      .WORD   57600
    224 002664  037600                      .WORD   37600
    225 002666  077600                      .WORD   77600
    226 002670  000200                      .WORD   200
    227 002672  000600                      .WORD   600             ;GROWING 1
    228 002674  001600                      .WORD   1600
    229 002676  003600                      .WORD   3600
    230 002700  007600                      .WORD   7600
    231 002702  017600              QUAMAX: .WORD   17600
    232 002704  037600              HALMAX: .WORD   37600
    233 002706  077600                      .WORD   77600
    234 002710  077400                      .WORD   77400           ;GROWING 0
    235 002712  077000                      .WORD   77000
    236 002714  076000                      .WORD   76000
    237 002716  074000                      .WORD   74000
    238 002720  070000                      .WORD   70000
    239 002722  060000                      .WORD   60000
    240 002724  040000                      .WORD   40000
    241 002726  000000              SKEND:  .WORD   00000
    242 002730  100000              RL2:    .WORD   BIT15
    243 002732  037600              QMAX:   .WORD   37600
    244 002734  077600              HMAX:   .WORD   77600
    245
    246 002736  177600                      .WORD   177600
    247 002740  177400                      .WORD   177400
    248 002742  176600                      .WORD   176600
    249 002744  173600                      .WORD   173600
    250 002746  167600                      .WORD   167600
    251 002750  157600                      .WORD   157600
    252 002752  137600                      .WORD   137600
    253 002754  177000                      .WORD   177000
    254 002756  176000                      .WORD   176000
```

PATTERNS FOR DIFFERENCE WORD

```
255 002760  174000                        .WORD   174000
256 002762  170000                        .WORD   170000
257 002764  060000                        .WORD   60000
258 002766  040000                        .WORD   40000
259 002770  000000              SKEEND:   .WORD   000000
260
261                             ;PATTERNS FOR TEST OF RLCS
262
263 002772  000000              CSPAT:    .WORD   0               ;SHIFTING 1
264 002774  000002                        .WORD   BIT1
265 002776  000004                        .WORD   BIT2
266 003000  000010                        .WORD   BIT3
267 003002  000020                        .WORD   BIT4
268 003004  000040                        .WORD   BIT5
269 003006  000100                        .WORD   BIT6
270 003010  000400                        .WORD   BIT8
271 003012  001000                        .WORD   BIT9
272 003014  001576                        .WORD   1576            ;GROWING 0
273 003016  001574                        .WORD   1574
274 003020  001570                        .WORD   1570
275 003022  001560                        .WORD   1560
276 003024  001540                        .WORD   1540
277 003026  001500                        .WORD   1500
278 003030  001400                        .WORD   1400
279 003032  001576                        .WORD   1576            ;SHIFT 0
280 003034  001574                        .WORD   1574
281 003036  001566                        .WORD   1566
282 003040  001556                        .WORD   1556
283 003042  001536                        .WORD   1536
284 003044  001436                        .WORD   1436
285 003046  001136                        .WORD   1136
286 003050  000076                        .WORD   76
287 003052  000006                        .WORD   6               ;GROWING 1
288 003054  000016                        .WORD   16
289 003056  000036                        .WORD   36
290 003060  000076                        .WORD   76
291 003062  000176                        .WORD   176             ;
292 003064  000576                        .WORD   576
293 003066  001576                        .WORD   1576
294 003070  000000              CSEND:    .WORD   0
295 003072  000000              ERPOINT:  .WORD   0
296 003074                      ERCOUNT:  .BLKW   64.
297 003274                      HDRBUF:   .BLKW   160.
298 003774                      ENDMOD
299
```

PATTERNS FOR DIFFERENCE WORD

```
    1 003774                                BGNMOD  GLBTXT
    2                                       .SBTTL  GLOBAL TEXT
    3
    7 003774    040     104     122  DEMES:  .ASCIZ  / DRV/
    8 004001    040     116     130  NXMMES: .ASCIZ  / NXM/
    9 004006    040     117     120  OPIMES: .ASCIZ  / OPI/
   10 004013    040     110     103  HCRCMES:.ASCIZ  / HCRC/
   11 004021    040     110     116  HNFMES: .ASCIZ  / HNF/
   12 004026    040     104     103  DCKMES: .ASCIZ  / DCK/
   13 004033    040     104     114  DLTMES: .ASCIZ  / DLT/
   14 004040    015     012     000  MSCRLF: .ASCIZ  <15><12>
   15 004043    015     000          LF:     .ASCIZ  <15>
   16 004045    040     103     117  COMP:   .ASCIZ  / COMP/
   17 004053    106     117     122  OPIERR: .ASCIZ  /FORCED OPI(GET STATUS) CAUSED OTHER ERRORS/
   18 004126    116     117     117  NOPMES: .ASCIZ  /NOOP OPERATION-FLAG MODE/
   19 004157    116     117     117  NOPINT: .ASCIZ  /NOOP OPERATION-INTR. MODE/
   20 004211    127     122     111  WCKMES: .ASCIZ  /WRITE CHECK OPERATION-FLAG MODE/
   21 004251    127     122     111  WCKINT: .ASCIZ  /WRITE CHECK OPERATION-INTR. MODE/
   22 004312    122     105     101  RHDMES: .ASCIZ  /READ HEADER OPERATION-FLAG MODE/
   23 004352    122     105     101  RHDINT: .ASCIZ  /READ HEADER OPERATION-INTR. MODE/
   24 004413    123     105     105  SEKMES: .ASCIZ  /SEEK OPERATION-FLAG MODE/
   25 004444    123     105     105  SEKINT: .ASCIZ  /SEEK OPERATION-INTR. MODE/
   26 004476    107     105     124  GSTMES: .ASCIZ  /GET STATUS OPERATION-FLAG MODE/
   27 004535    107     105     124  GSTINT: .ASCIZ  /GET STATUS OPERATION-INTR MODE/
   28 004574    103     123     072  ARLCS:  .ASCIZ  /CS: /
   29 004601    040     102     101  ARLBA:  .ASCIZ  / BA: /
   30 004607    040     104     101  ARLDA:  .ASCIZ  / DA: /
   31 004615    040     115     120  ARLMP:  .ASCIZ  / MP: /
   32 004623    102     105     106  BEREG:  .ASCIZ  /BEFORE COMMAND: /
   33 004644    124     111     115  AFREG:  .ASCIZ  /TIME OF ERROR:  /
   34 004665    103     117     116  CRTIM:  .ASCIZ  /CONTROLLER TIMED OUT/
   35 004712    104     122     111  DRTIM:  .ASCIZ  /DRIVE READY TIMED OUT/
   36 004740    103     101     116  EM1:    .ASCIZ  /CAN NOT ADDRESS RLCS/
   37 004765    103     101     116  EM2:    .ASCIZ  /CAN NOT ADDRESS RLBA/
   38 005012    103     101     116  EM3:    .ASCIZ  /CAN NOT ADDRESS RLDA/
   39 005037    103     101     116  EM4:    .ASCIZ  /CAN NOT ADDRESS RLMP/
   40 005064    122     114     103  EM5:    .ASCIZ  %RLCS READ/WRITE ERROR (BIT 0 DON'T CARE)%
   41 005135    122     114     102  EM6:    .ASCIZ  %RLBA READ/WRITE ERROR%
   42 005163    122     114     104  EM7:    .ASCIZ  %RLDA READ/WRITE ERROR%
   43 005211    117     120     111  EM11:   .ASCIZ  /OPI WOULD NOT GENERATE INTERRUPT/
   44 005252    116     117     040  EM13:   .ASCIZ  /NO INTERRUPT FROM NOOP(0)/
   45 005304    116     117     117  EM14:   .ASCIZ  /NOOP(0) MODIFIED RLMP/
   46 005332    116     117     117  EM15:   .ASCIZ  /NOOP(0) MODIFIED RLBA/
   47 005360    116     117     117  EM16:   .ASCIZ  /NOOP(0) MODIFIED RLDA/
   48 005406    111     116     124  EM17:   .ASCIZ  /INTERRUPT PRIORITY FAILURE/
   49 005441    107     105     124  EM30:   .ASCIZ  /GET STATUS WOULD NOT INTERRUPT/
   50 005500    107     105     124  EM30A:  .ASCIZ  /GET STATUS SHOULD NOT INTERRUPT/
   51 005540    122     114     115  EM32:   .ASCIZ  /RLMP CONTAINED WRONG STATUS/
   52 005574    117     120     111  EM33:   .ASCIZ  /OPI DID NOT SET-GSTAT WITHOUT GS BIT/
   53 005641    117     120     111  EM34:   .ASCIZ  /OPI DID NOT SET-GSTAT WITHOUT GS AND MK BITS/
   54 005716    122     105     101  EM37:   .ASCIZ  /READ HEADER WOULD NOT INTERRUPT/
   55 005756    102     101     104  EM41:   .ASCIZ  /BAD CYLINDER OR HEAD SELECT IN REPEATED READ HEADER TEST/
   56 006047    102     101     104  EM42:   .ASCIZ  /BAD HEADER CRC ON READ HEADER/
   57 006105    123     105     103  EM43:   .ASCIZ  /SECTOR ADDRESS OUT OF SEQUENCE DURING CONSECUTIVE READ HEADERS/
   58 006204    127     122     111  EM44:   .ASCIZ  /WRITING RLMP MODIFIED RLCS/
   59 006237    127     122     111  EM45:   .ASCIZ  /WRITING RLMP MODIFIED RLBA/
   60 006272    127     122     111  EM46:   .ASCIZ  /WRITING RLMP MODIFIED RLDA/
```

GLOBAL TEXT

```
     61 006325      123      105      105  EM47:    .ASCIZ  /SEEK WOULD NOT INTERRUPT/
     62 006356      104      122      111  EM52:    .ASCIZ  /DRIVE READY CAUSED EXTRANEOUS INTERRUPT/
     63 006426      102      101      104  EM54:    .ASCIZ  /BAD SEEK-TEST OF DIFFENCE WORD/
     64 006465      102      101      104  EM55:    .ASCIZ  /BAD HEAD SELECT VIA RD HDR/
     65 006520      102      101      104  EM56:    .ASCIZ  /BAD HEAD SELECT VIA GET STATUS/
     66 006557      114      117      101  EM57:    .ASCII  /LOADING RLDA BEFORE DRIVE READY ON SEEK/<15><12>
     67 006630      104      122      111           .ASCIZ  /DRIVE READY DID NOT SET/
     68 006660      102      111      124  EM61:    .ASCIZ  /BIT SET INSTRUCTION ON RLCS YIELDED WRONG RESULT/
     69 006741      102      111      124  EM62:    .ASCIZ  /BIT CLEAR INSTRUCTION ON RLCS YIELDED WRONG RESULT/
     70 007024      102      111      124  EM63:    .ASCIZ  /BIT SET INSTRUCTION ON RLBA YIELDED WRONG RESULT/
     71 007105      102      111      124  EM64:    .ASCIZ  /BIT CLEAR INSTRUCTION ON RLBA YIELDED WRONG RESULT/
     72 007170      102      111      124  EM65:    .ASCIZ  /BIT SET INSTRUCTION ON RLDA YIELDED WRONG RESULT/
     73 007251      102      111      124  EM66:    .ASCIZ  /BIT CLEAR INSTRUCTION ON RLDA YIELDED WRONG RESULT/
     74 007334      102      125      123  EM67:    .ASCIZ  /BUS RESET DID NOT CLEAR RLCS/
     75 007371      102      125      123  EM70:    .ASCIZ  /BUS RESET DID NOT CLEAR RLBA/
     76 007426      102      125      123  EM71:    .ASCIZ  /BUS RESET DID NOT CLEAR RLDA/
     77 007463      127      122      111  EM72:    .ASCIZ  /WRITING RLCS MODIFIED RLBA/
     78 007516      127      122      111  EM73:    .ASCIZ  /WRITING RLCS MODIFIED RLDA/
     79 007551      127      122      111  EM74:    .ASCIZ  /WRITING RLBA MODIFED RLCS/
     80 007603      127      122      111  EM75:    .ASCIZ  /WRITING RLBA MODIFED RLDA/
     81 007635      127      122      111  EM76:    .ASCIZ  /WRITING RLDA MODIFIED RLCS/
     82 007670      127      122      111  EM77:    .ASCIZ  /WRITING RLDA MODIFIED RLBA/
     83 007723      122      114      103  EM101:   .ASCIZ  /RLCS CONTAINED FOLLOWING ERROR(S):  /
     84 007770                            EM102:   .BLKB   120.
     85
     86                                    .EVEN
     87
     91 010160                            ENDMOD
     92
```

```
                                .SBTTL  GLOBAL ERRORS
                        
010160                          BGNMOD  GLBERR
                        
010160                          BGNMSG  ERR0
                        
010160  004737  010504                JSR     PC,LINE1
010164  004737  010540                JSR     PC,LINE2
                        
010170  004537  013034                JSR     R5,CKERLT       ;CHECK ERROR LIMIT
010174                                  ENDMSG
010174                          L10000:
010174  104423                        TRAP    C$MSG
                        
010176                          BGNMSG  ERR1
                        
010176  004737  010504                JSR     PC,LINE1
                        
010202  004537  013034                JSR     R5,CKERLT       ;CHECK ERROR LIMIT
010206                                  ENDMSG
010206                          L10001:
010206  104423                        TRAP    C$MSG
                        
010210                          BGNMSG  ERR2
                        
010210  004737  010504                JSR     PC,LINE1
010214                                  PRINTB  #FRMT4,GDDAT,BDDAT
010214  013746  002364                MOV     BDDAT,-(SP)
010220  013746  002362                MOV     GDDAT,-(SP)
010224  012746  011137                MOV     #FRMT4,-(SP)
010230  012746  000003                MOV     #3,-(SP)
010234  010600                        MOV     SP,R0
010236  104414                        TRAP    C$PNTB
010240  062706  000010                ADD     #10,SP
                        
010244  004537  013034                JSR     R5,CKERLT       ;CHECK ERROR LIMIT
010250                                  ENDMSG
010250                          L10002:
010250  104423                        TRAP    C$MSG
                        
010252                          BGNMSG  ERR3
                        
010252  004737  010504                JSR     PC,LINE1
010256  004737  010540                JSR     PC,LINE2
010262                                  PRINTB  #FRMT5,TMP0,BDDAT,GDDAT
010262  013746  002362                MOV     GDDAT,-(SP)
010266  013746  002364                MOV     BDDAT,-(SP)
010272  013746  002354                MOV     TMP0,-(SP)
010276  012746  011175                MOV     #FRMT5,-(SP)
010302  012746  000004                MOV     #4,-(SP)
010306  010600                        MOV     SP,R0
010310  104414                        TRAP    C$PNTB
010312  062706  000012                ADD     #12,SP
                        
010316  004537  013034                JSR     R5,CKERLT       ;CHECK ERROR LIMIT
010322                                  ENDMSG
010322                          L10003:
```

GLOBAL ERRORS

```
      010322  104423                          TRAP    C$MSG
   36
   37 010324                          BGNMSG  ERR4
   38
   39 010324  004737  010504                  JSR     PC,LINE1
   40 010330  004737  010540                  JSR     PC,LINE2
   41 010334                                  PRINTB  #FRMT4,GDDAT,BDDAT
      010334  013746  002364                  MOV     BDDAT,-(SP)
      010340  013746  002362                  MOV     GDDAT,-(SP)
      010344  012746  011137                  MOV     #FRMT4,-(SP)
      010350  012746  000003                  MOV     #3,-(SP)
      010354  010600                          MOV     SP,R0
      010356  104414                          TRAP    C$PNTB
      010360  062706  000010                  ADD     #10,SP
   42
   43 010364  004537  013034                  JSR     R5,CKERLT       ;CHECK ERROR LIMIT
   44 010370                                  ENDMSG
      010370                          L10004:
      010370  104423                          TRAP    C$MSG
   45
   46 010372                          BGNMSG  ERR5
   47
   48 010372  004737  010504                  JSR     PC,LINE1
   49
   50 010376  004537  013034                  JSR     R5,CKERLT       ;CHECK ERROR LIMIT
   51 010402                                  ENDMSG
      010402                          L10005:
      010402  104423                          TRAP    C$MSG
   52
   53 010404                          BGNMSG  ERR6
   54
   55 010404  004737  010504                  JSR     PC,LINE1
   56 010410  004737  010752                  JSR     PC,LINE3
   57 010414  004737  010540                  JSR     PC,LINE2
   58
   59
   60 010420                          1$:     PRINTB  #FRMT99
      010420  012746  011172                  MOV     #FRMT99,-(SP)
      010424  012746  000001                  MOV     #1,-(SP)
      010430  010600                          MOV     SP,R0
      010432  104414                          TRAP    C$PNTB
      010434  062706  000004                  ADD     #4,SP
   61 010440  004537  013034                  JSR     R5,CKERLT       ;CHECK ERROR LIMIT
   62 010444                                  ENDMSG
      010444                          L10006:
      010444  104423                          TRAP    C$MSG
   63
   64 010446                          BGNMSG  ERR7
   65
   66 010446  004737  010504                  JSR     PC,LINE1
   67 010452                                  PRINTB  #FRMT6,BDDAT
      010452  013746  002364                  MOV     BDDAT,-(SP)
      010456  012746  011245                  MOV     #FRMT6,-(SP)
      010462  012746  000002                  MOV     #2,-(SP)
      010466  010600                          MOV     SP,R0
      010470  104414                          TRAP    C$PNTB
      010472  062706  000006                  ADD     #6,SP
```

GLOBAL ERRORS

```
                                                JSR     R5,CKERLT

                                                ENDMSG
                                        L10007:
                                                TRAP    C$MSG

                                        LINE1:  PRINTB  #FRMT1,RLCS,<B,DRIVE+1>
                                                CLR     -(SP)
                                                BISB    DRIVE+1,(SP)
                                                MOV     RLCS,-(SP)
                                                MOV     #FRMT1,-(SP)
                                                MOV     #3,-(SP)
                                                MOV     SP,R0
                                                TRAP    C$PNTB
                                                ADD     #10,SP
                                                RTS     PC

                                        LINE2:  PRINTB  #FRMT2,#BEREG,#ARLCS,B.CS,#ARLBA,B.BA
                                                MOV     B.BA,-(SP)
                                                MOV     #ARLBA,-(SP)
                                                MOV     B.CS,-(SP)
                                                MOV     #ARLCS,-(SP)
                                                MOV     #BEREG,-(SP)
                                                MOV     #FRMT2,-(SP)
                                                MOV     #6,-(SP)
                                                MOV     SP,R0
                                                TRAP    C$PNTB
                                                ADD     #16,SP
                                                PRINTB  #FRMT2A,#ARLDA,B.DA,#ARLMP,B.MP
                                                MOV     B.MP,-(SP)
                                                MOV     #ARLMP,-(SP)
                                                MOV     B.DA,-(SP)
                                                MOV     #ARLDA,-(SP)
                                                MOV     #FRMT2A,-(SP)
                                                MOV     #5,-(SP)
                                                MOV     SP,R0
                                                TRAP    C$PNTB
                                                ADD     #14,SP
                                                PRINTB  #FRMT2,#AFREG,#ARLCS,E.CS,#ARLBA,E.BA
                                                MOV     E.BA,-(SP)
                                                MOV     #ARLBA,-(SP)
                                                MOV     E.CS,-(SP)
                                                MOV     #ARLCS,-(SP)
                                                MOV     #AFREG,-(SP)
                                                MOV     #FRMT2,-(SP)
                                                MOV     #6,-(SP)
                                                MOV     SP,R0
                                                TRAP    C$PNTB
                                                ADD     #16,SP
                                                PRINTB  #FRMT2B,#ARLDA,E.DA,#ARLMP,E.MP
                                                MOV     E.MP,-(SP)
                                                MOV     #ARLMP,-(SP)
                                                MOV     E.DA,-(SP)
                                                MOV     #ARLDA,-(SP)
                                                MOV     #FRMT2B,-(SP)
                                                MOV     #5,-(SP)
```

GLOBAL ERRORS

```
        010740  C10600                          MOV     SP,R0
        010742  104414                          TRAP    C$PNTB
        010744  062706  000014                  ADD     #14,SP
     80 010750  000207                          RTS     PC
     81
     82 010752                          LINE3:  PRINTB  #FRMT3,#EM101
        010752  012746  007723                  MOV     #EM101,-(SP)
        010756  012746  011132                  MOV     #FRMT3,-(SP)
        010762  012746  000002                  MOV     #2,-(SP)
        010766  010600                          MOV     SP,R0
        010770  104414                          TRAP    C$PNTB
        010772  062706  000006                  ADD     #6,SP
     83 010776                                  PRINTB  #FRMT3,#EM102
        010776  012746  007770                  MOV     #EM102,-(SP)
        011002  012746  011132                  MOV     #FRMT3,-(SP)
        011006  012746  000002                  MOV     #2,-(SP)
        011012  010600                          MOV     SP,R0
        011014  104414                          TRAP    C$PNTB
        011016  062706  000006                  ADD     #6,SP
     84 011022  000207                          RTS     PC
     85
     89
     90 011024      045     101     103  FRMT1:  .ASCIZ  /%ACONTROLLER: %06%A  DRIVE: %01/
     91 011064      045     116     045  FRMT2:  .ASCIZ  /%N%T%T%06%T%06/
     92 011103      045     124     045  FRMT2A: .ASCIZ  /%T%06%T%06/
     93 011116      045     124     045  FRMT2B: .ASCIZ  /%T%06%T%06%/
     94 011132      045     116     045  FRMT3:  .ASCIZ  /%N%T/
     95 011137      045     116     045  FRMT4:  .ASCII  /%N%AEXP'D: %06%A REC'D: %06/
     96 011172      045     116     000  FRMT99: .ASCIZ  /%N/
     97 011175      045     116     045  FRMT5:  .ASCIZ  /%N%ALAST: %06%A PRES: %06%A EXP'D: %06%N/
     98 011246      045     116     045  FRMT6:  .ASCIZ  /%N%AAT PROCESSOR LEVEL %06%N/
     99 011303      045     101     105  FRMT11: .ASCIZ  /%AERROR LIMIT EXCEEDED-DROPPED%N/
    100 011344      045     116     045  FRMT12: .ASCIZ  /%N%ADRIVE DID NOT RECOVER FROM POWER FAILURE%N/
    101 011423      045     116     045  FRMT13: .ASCIZ  /%N%T%A - WILL NOT TEST%N/
    102 011454      045     116     045  FRMT14: .ASCIZ  /%N%ADRIVE DROPPED - NO CONTROLLER%N/
    103 011520      045     116     045  FRMT15: .ASCIZ  /%N%ADRIVE DROPPED - DID NOT RESPOND WITH 'READY'%N/
    104
    105                                  .EVEN
    106
    107
    111
    112
    113
    114 011604                                  ENDMOD
    115
    116 011604                          BGNMOD  HPTCODE
    117
    118 011604                          BGNHW                           ;DEFAULT HARDWARE TABLE
        011604  000006                          .WORD   L10010-L$HW/2
    119 011606  174400                          .WORD   174400          ;CSR
    120 011610  000160                          .WORD   160             ;VECTOR
    121 011612  000240                          .WORD   240             ;PRIORITY
    122 011614  000001                          .WORD   1               ;RL01 = 1
    123 011616  000000                          .WORD   0               ;DRIVE (BITS 8,9,10)
    124 011620  000001                          .WORD   1               ;RL11 = 1, RLV11 = 0
    125
    126 011622                          ENDHW
```

GLOBAL ERRORS

```
      011622                            L10010:
  127
  128 011622                                    ENDMOD
  129
  130 011622                            BGNMOD  SPTCODE
  131
  132 011622                            BGNSW                         ;DEFAULT SOFTWARE TABLE
      011622  000003                            .WORD   L10011-L$SW/2
  133
  134 011624  000000                    DROP:   .WORD   0
  135 011626  000012                    MERLMT: .WORD   10.
  136 011630  000000                    T.SIZE: .WORD   0
  137
  138 011632                            ENDSW
      011632                            L10011:
  139
  140 011632                                    ENDMOD
  141
  142 011632                            BGNMOD  DSPCODE
  143
  144 011632                            DISPATCH        44
      011632  000054                            .WORD   44
      011634  014406                            .WORD   T1
      011636  014502                            .WORD   T2
      011640  014576                            .WORD   T3
      011642  014672                            .WORD   T4
      011644  014766                            .WORD   T5
      011646  015106                            .WORD   T6
      011650  015212                            .WORD   T7
      011652  015300                            .WORD   T8
      011654  015424                            .WORD   T9
      011656  015550                            .WORD   T10
      011660  015656                            .WORD   T11
      011662  015756                            .WORD   T12
      011664  016046                            .WORD   T13
      011666  016146                            .WORD   T14
      011670  016256                            .WORD   T15
      011672  016332                            .WORD   T16
      011674  016370                            .WORD   T17
      011676  016514                            .WORD   T18
      011700  016654                            .WORD   T19
      011702  017014                            .WORD   T20
      011704  017220                            .WORD   T21
      011706  017252                            .WORD   T22
      011710  017460                            .WORD   T23
      011712  017546                            .WORD   T24
      011714  017714                            .WORD   T25
      011716  017744                            .WORD   T26
      011720  020116                            .WORD   T27
      011722  020204                            .WORD   T28
      011724  020332                            .WORD   T29
      011726  020354                            .WORD   T30
      011730  020434                            .WORD   T31
      011732  020600                            .WORD   T32
      011734  020736                            .WORD   T33
      011736  021254                            .WORD   T34
      011740  021350                            .WORD   T35
```

GLOBAL ERRORS

```
        011742  021414                          .WORD   T36
        011744  021540                          .WORD   T37
        011746  022156                          .WORD   T38
        011750  022310                          .WORD   T39
        011752  022452                          .WORD   T40
        011754  022612                          .WORD   T41
        011756  022764                          .WORD   T42
        011760  023412                          .WORD   T43
        011762  024132                          .WORD   T44
    145
    146 011764                                  ENDMOD
    147
    148
```

GLOBAL ERRORS

```
                                .SBTTL  LOAD PROTECTION TABLE
011764                          BGNPROT
011764  000000                  .WORD    0                      ;P-TABLE OFFSET OF CSR
011766  177777                  .WORD   -1                      ;NOT A MASS-BUS DRIVE
011770  000012                  .WORD   10.                     ;P-TABLE OFFSET OF DRIVE
011772                          ENDPROT

                                .SBTTL  INITIALIZATION CODE
011772                          BGNMOD  INITCODE

011772                                  BGNINIT

011772                                  BRESET
011772  104433                          TRAP    C$RESET
011774                                  READEF  #EF.PWR                 ;POWER UP?????
011774  012700  000034                  MOV     #EF.PWR,R0
012000  104447                          TRAP    C$REFG
012002                                  BNCOMPLETE      NOPWR           ;NO,BRANCH
012002  103004                          BCC     NOPWR
012004  013737  002012  002242          MOV     L$UNIT,PWRFLG           ;YES, SET POWER FLAG
012012  000475                          BR      CONT                    ;GO TO CONTINUE POINT
012014                          NOPWR:  READEF  #EF.RESTART     ;RESTART?
012014  012700  000037                  MOV     #EF.RESTART,R0
012020  104447                          TRAP    C$REFG
012022                                  BCOMPLETE START1
012022  103404                          BCS     START1
012024                                  READEF  #EF.START               ;START???
012024  012700  000040                  MOV     #EF.START,R0
012030  104447                          TRAP    C$REFG
012032                                  BNCOMPLETE      CONTINUE
012032  103010                          BCC     CONTINUE
012034  012700  003074          START1: MOV     #ERCOUNT,R0
012040  012701  000100                  MOV     #64.,R1
012044  005020                  1$:     CLR     (R0)+
012046  005301                          DEC     R1
012050  001375                          BNE     1$
012052  000407                          BR      START

012054                          CONTINUE:       READEF  #EF.CONTINUE    ;CONTINUE????
012054  012700  000036                  MOV     #EF.CONTINUE,R0
012060  104447                          TRAP    C$REFG
012062                                  BCOMPLETE       CONT
012062  103451                          BCS     CONT

012064  005737  002244          NXT:    TST     UUT                     ;DONE ALL UUT'S
012070  001011                          BNE     XXX                     ;NO
012072  012737  177777  002246  START:  MOV     #-1,UNITST
012100  013737  002012  002244          MOV     L$UNIT,UUT
012106  012737  003072  003072          MOV     #ERCOUNT-2,ERPOINT

012114  005237  002246          XXX:    INC     UNITST
012120  062737  000002  003072          ADD     #2,ERPOINT
012126  005337  002244                  DEC     UUT
012132                          REST:   GPHARD  UNITST,R0
012132  013700  002246                  MOV     UNITST,R0
012136  104442                          TRAP    C$GPHRD
```

INITIALIZATION CODE

```
     012140                                 BCOMPLETE       1$
     012140  103406                         BCS     1$
     012142  005737  002242                 TST     PWRFLG                  ;POWER FLAG TO 0
     012146  001746                         BEQ     NXT                     ;YES, DONT DEC IT
     012150  005337  002242                 DEC     PWRFLG
     012154  000743                         BR      NXT                     ;GET NEXT ONE

     012156  012037  002262         1$:     MOV     (R0)+,BCSR
     012162  012037  002266                 MOV     (R0)+,BVEC
     012166  012037  002264                 MOV     (R0)+,BPRIOR
     012172  012037  002406                 MOV     (R0)+,T.DRIVE
     012176  012037  002270                 MOV     (R0)+,DRIVE
     012202  012037  002410                 MOV     (R0)+,T.CNTLR   ;GET CONTROLLER TYPE

     012206  013700  002262         CONT:   MOV     BCSR,R0         ;BUILD LOGICAL ADDRESSES OF REGISTERS
     012212  010037  002250                 MOV     R0,RLCS
     012216  062700  000002                 ADD     #2,R0
     012222  010037  002252                 MOV     R0,RLBA
     012226  062700  000002                 ADD     #2,R0
     012232  010037  002254                 MOV     R0,RLDA
     012236  062700  000002                 ADD     #2,R0
     012242  010037  002256                 MOV     R0,RLMP
     012246  022737  000002  002410         CMP     #2,T.CNTLR              ;IF THIS IS AN RLV12, BUILD LOGICAL
     012254  001004                         BNE     1$                      ;ADDRESS FOR BUS ADDRESS EXTENSION.
     012256  062700  000002                 ADD     #2,R0
     012262  010037  002260                 MOV     R0,RLBE

     012266  005737  002242         1$:     TST     PWRFLG                  ;RECENT POWER FAILURE?
     012272  001476                         BEQ     END                     ;NO

                                     ;THERE WAS A RECENT POWER FAILURE, THEREFORE WE WILL WAIT
                                     ;FOR THE DRIVE TO COME READY

     012274  012701  000170                 MOV     #120.,R1                ;INITIALIZE WAIT COUNT
     012300  012777  000200  167742         MOV     #200,@RLCS              ;SET CRDY
     012306  053777  002270  167734         BIS     DRIVE,@RLCS             ;SET IN DRIVE SELECT
     012314  032777  000001  167726 DRVRDY: BIT     #DRDY,@RLCS             ;DRIVE READY???
     012322  001042                         BNE     BGNTST                  ;YES, THEN START TEST
     012324  012737  000050  002414         MOV     #40.,DLYCNT             ;INITIALIZE DELAY COUNT
     012332                         WAIT0:  DELAY   1                       ;IMPLEMENT 100-USEC DELAY
     012332  012727  000001                 MOV     #1,(PC)+
     012336  000000                         .WORD   0
     012340  013727  002116                 MOV     L$DLY,(PC)+
     012344  000000                         .WORD   0
     012346  005367  177772                 DEC     -6(PC)
     012352  001375                         BNE     .-4
     012354  005367  177756                 DEC     -22(PC)
     012360  001367                         BNE     .-20
     012362  005337  002414                 DEC     DLYCNT                  ;DECREMENT DELAY COUNT
     012366  001361                         BNE     WAIT0                   ;BRANCH IF TIME DELAY NOT EXPIRED
     012370  005301                         DEC     R1                      ;SIXTY SECONDS GONE BY
     012372  001350                         BNE     DRVRDY                  ;NO, GO BACK
     012374                                 PRINTB  #FRMT12                 ;DROPPING DRIVE - DRIVE DID NOT RECOVER
     012374  012746  011344                 MOV     #FRMT12,-(SP)
     012400  012746  000001                 MOV     #1,-(SP)
     012404  010600                         MOV     SP,R0
     012406  104414                         TRAP    C$PNTB
```

```
  012410  062706  000004                      ADD      #4,SP
                                                                         ;/FROM POWER FAILURE
  012414  004737  010504            6$:       JSR      PC,LINE1          ;GIVE DRIVE INFO
  012420                                      DODU     UNITST            ;TELL SUPERVISOR TO DROP IT
  012420  013700  002246                      MOV      UNITST,R0
  012424  104451                              TRAP     C$DODU
  012426                                      DOCLN                      ;FORCE AN ABORT
  012426  104444                              TRAP     C$DCLN
  012430  012777  000013  167616    BGNTST:   MOV      #13,@RLDA         ;SETUP DR RST
  012436  012777  000204  167604              MOV      #204,@RLCS        ;GS FUNC
  012444  053777  002270  167576              BIS      DRIVE,@RLCS       ;SELECT DRIVE
  012452  042777  000200  167570              BIC      #200,@RLCS        ;ISSUE IT
  012460  032777  000200  167562    4$:       BIT      #200,@RLCS        ;WAIT FOR READY
  012466  001774                              BEQ      4$
  012470                            END:      SETVEC   BVEC,#INTSRV,#340
  012470  012746  000340                      MOV      #340,-(SP)
  012474  012746  014212                      MOV      #INTSRV,-(SP)
  012500  013746  002266                      MOV      BVEC,-(SP)
  012504  012746  000003                      MOV      #3,-(SP)
  012510  104437                              TRAP     C$SVEC
  012512  062706  000010                      ADD      #10,SP
  012516  005037  002324                      CLR      PFLG           ;CLR PROCESSOR FLAG
  012522                                      READBUS                 ;Q-BUS
  012522  104407                              TRAP     C$RDBU
  012524                                      BNCOMPLETE       1$
  012524  103002                              BCC      1$
  012526  005237  002324                      INC      PFLG           ;NO, Q-BUS THEN
  012532                            1$:
  012532                                      ENDINIT
  012532                            L10013:
  012532  104411                              TRAP     C$INIT

  012534                                      ENDMOD


                                    .SBTTL    AUTO DROP SECTION
  012534                            BGNAUTO
  012534  005037  002326                      CLR      TRPFLG         ;CLEAR TRAP FLAG
                                                                      ;SET UP VECTOR TO DETECT NON-EXISTENT
                                                                      ;/CONTROLLER
  012540                                      SETVEC   ERRVEC,#TRPHAN,#340
  012540  012746  000340                      MOV      #340,-(SP)
  012544  012746  014204                      MOV      #TRPHAN,-(SP)
  012550  013746  002340                      MOV      ERRVEC,-(SP)
  012554  012746  000003                      MOV      #3,-(SP)
  012560  104437                              TRAP     C$SVEC
  012562  062706  000010                      ADD      #10,SP
  012566  012746  000340                      MOV      #340,-(SP)
  012572  012746  014204                      MOV      #TRPHAN,-(SP)
  012576  013746  002340                      MOV      ERRVEC,-(SP)
  012602  012746  000003                      MOV      #3,-(SP)
  012606  104037                              EMT      C$SVEC
  012610  062706  000010                      ADD      #10,SP

  012614  005777  167430                      TST      @RLCS          ;ACCESS CONTROLLER
  012620                                      CLRVEC   ERRVEC         ;RELEASE VECTOR
  012620  013700  002340                      MOV      ERRVEC,R0
  012624  104436                              TRAP     C$CVEC
```

AUTO DROP SECTION

```
    122 012626  013700  002340                    MOV     ERRVEC,R0
    123 012632  104036                            EMT     C$CVEC
    124 012634  005737  002326                    TST     TRPFLG          ;DID IT TRAP?
    125 012640  001416                            BEQ     1$              ;NO - CHECK ITS DRIVE
    126 012642                                    PRINTB  #FRMT14         ;ELSE, PRINT MSG. 'DRIVE DROPPED - NO CONTROLLER''
        012642  012746  011454                    MOV     #FRMT14,-(SP)
        012646  012746  000001                    MOV     #1,-(SP)
        012652  010600                            MOV     SP,R0
        012654  104414                            TRAP    C$PNTB
        012656  062706  000004                    ADD     #4,SP
    127 012662  004737  010504                    JSR     PC,LINE1        ;PROVIDE DRIVE INFORMATION
    128 012666                                    DODU    UNITST          ;DO DROP UNIT ON DRIVE
        012666  013700  002246                    MOV     UNITST,R0
        012672  104451                            TRAP    C$DODU
    129 012674  000427                            BR      2$              ;EXIT
    130
    131 012676  012777  000200  167344  1$:       MOV     #200,@RLCS      ;SET CONTROLLER READY
    132 012704  053777  002270  167336            BIS     DRIVE,@RLCS     ;SELECT DRIVE
    133 012712  032777  000001  167330            BIT     #1,@RLCS        ;IS DRIVE READY?
    134 012720  001015                            BNE     2$              ;YES - EXIT
    135                                                                   ;ELSE, PRINT MSG. 'DRIVE DROPPED - DID NOT
    136                                                                   ;/RESPOND WITH 'READY''
    137 012722                                    PRINTB  #FRMT15
        012722  012746  011520                    MOV     #FRMT15,-(SP)
        012726  012746  000001                    MOV     #1,-(SP)
        012732  010600                            MOV     SP,R0
        012734  104414                            TRAP    C$PNTB
        012736  062706  000004                    ADD     #4,SP
    138 012742  004737  010504                    JSR     PC,LINE1        ;PROVIDE DRIVE INFORMATION
    139 012746                                    DODU    UNITST          ;DO DROP UNIT ON DRIVE
        012746  013700  002246                    MOV     UNITST,R0
        012752  104451                            TRAP    C$DODU
    140 012754                          2$:
    141 012754                          ENDAUTO
        012754                          L10014:
        012754  104461                            TRAP    C$AUTO
    142
    143 012756                          BGNMOD  CLNCODE
    144
    145 012756                                  BGNCLN
    146
    147 012756                                  SETPRI  #PRI07
        012756  012700  000340                  MOV     #PRI07,R0
        012762  104441                          TRAP    C$SPRI
    148
    149 012764  032777  000200  167256  1$:     BIT     #CRDY,@RLCS
    150 012772  001774                          BEQ     1$
    151
    152 012774  042777  000100  167246          BIC     #INTEN,@RLCS
    153
    154 013002                                  CLRVEC  BVEC
        013002  013700  002266                  MOV     BVEC,R0
        013006  104436                          TRAP    C$CVEC
    155
    156
    157
    158 013010  005737  002242                  TST     PWRFLG                  ;TREAT POWER FAILURE
```

AUTO DROP SECTION

```
    013014  001402                          BEQ     2$
    013016  005337  002242                  DEC     PWRFLG
    013022                          2$:
    013022                                  ENDCLN
    013022                          L10015:
    013022  104412                          TRAP    C$CLEAN
    013024                                  ENDMOD
    013024                          BGNMOD  DRPCODE
    013024                                  BGNDU
    013024  000240                          NOP
    013026                                  ENDDU
    013026                          L10016:
    013026  104453                          TRAP    C$DU
    013030                          ENDMOD
    013030                          BGNMOD  ADDCODE
    013030                                  BGNAU
    013030  000240                          NOP
    013032                                  ENDAU
    013032                          L10017:
    013032  104452                          TRAP    C$AU
    013034                          ENDMOD
```

```
                                .SBTTL  GLOBAL SUBROUTINES

013034                          BGNMOD  GLBSUB

                        CKERLT: INLOOP
013034  104420                  TRAP    C$INLP
                                BCOMPLETE       99$
013036  103427                  BCS     99$
013040  005737  011624          TST     DROP
013044  001424                  BEQ     99$
013046  005277  170020          INC     @ERPOINT
013052  027737  170014  011626  CMP     @ERPOINT,MERLMT
013060  002416                  BLT     99$

013062                          PRINTF  #FRMT11
013062  012746  011303          MOV     #FRMT11,-(SP)
013066  012746  000001          MOV     #1,-(SP)
013072  010600                  MOV     SP,R0
013074  104417                  TRAP    C$PNTF
013076  062706  000004          ADD     #4,SP
013102  004737  010504          JSR     PC,LINE1
013106                          DODU    UNITST          ;DROP THE UNIT
013106  013700  002246          MOV     UNITST,R0
013112  104451                  TRAP    C$DODU
013114                          DOCLN
013114  104444                  TRAP    C$DCLN
013116                  99$:
013116  000205                  RTS     R5


                                .SBTTL  ROUTINE TO CHECK FOR CONTROLLER ERRORS

                                ;*******************************************************************
                                ;*THIS ROUTINE WILL CHECK RLCS FOR ERRORS AND PRINT THEM
                                ;*ACCORDINGLY.  IT WILL MERGE THE ERROR PRINTOUT WITH THE TEST
                                ;*ERROR MESSAGE.
                                ;*
                                ;*EXAMPLE:   RLCS CONTAINED FOLLOWING ERROR(S):
                                ;*                  DRV   OPI   HCRC   HNF
                                ;*           SEEK UNDER INTERRUPT
                                ;*
                                ;*
                                ;*
                                ;*ROUTINE USES R0,R1 AND PICKS HEADER FROM R3
                                ;*
                                ;*      CALL    JSR     R5,CHERR
                                ;*
                                ;*
                                ;*

013120  005037  002304  CHERR:  CLR     DERFLG          ;CLEAR OUT DRIVE ERROR FLAG
013124  032737  176000  002306  BIT     #176000,E.CS    ;ANY ERRORS SET
013132  001001                  BNE     199$            ;IF YES, INVESTIGATE
013134  000205                  RTS     R5              ;NO, EXIT
```

ROUTINE TO CHECK FOR CONTROLLER ERRORS

```
013136  023727  002412  000004  199$:   CMP     TMPFNC,#GSTAT   ;FUNCTION-NOP, RESET, GETSTATUS
013144  002401                          BLT     98$             ;YES, GO CHECK IF ONLY DRIVE ERROR
013146  000414                          BR      1$              ;YES SERVICE ERROR
013150  023727  002412  000002  98$:    CMP     TMPFNC,#WRCHK
013156  001410                          BEQ     1$
013160  013700  002306                  MOV     E.CS,R0         ;GET E.CS
013164  042700  001777                  BIC     #1777,R0        ;
013170  022700  140000                  CMP     #140000,R0      ;DRIVE ERROR ALONE?
013174  001001                          BNE     1$              ;NO, GO SERVICE
013176  000205                  2$:     RTS     R5              ;YES, EXIT

013200  012701  007770          1$:     MOV     #EM102,R1       ;GET START OF STRING
013204  005737  002306                  TST     E.CS            ;IS COMPOSITE ERROR SET?(BETTER BE)
013210  100003                          BPL     99$             ;IT'S NOT SOMETHING IS WRONG
013212  004537  013664                  JSR     R5,FIX          ;YES, PUT "COMP" IN STRING
013216  004045                          COMP                    ;"COMP"
013220  032737  040000  002306  99$:    BIT     #DERR,E.CS      ;DRIVE ERROR SET?
013226  001405                          BEQ     3$              ;NO, CONTINUE
013230  005237  002304                  INC     DERFLG          ;SET DRV ERROR FLAG
013234  004537  013664                  JSR     R5,FIX          ;YES, PUT "DRV" INTO STRING
013240  003774                          DEMES                   ;"DRV"
013242  032737  020000  002306  3$:     BIT     #NXM,E.CS       ;NON-EXISTENT MEMORY ERROR?
013250  001403                          BEQ     4$              ;NO, CONTINUE
013252  004537  013664                  JSR     R5,FIX          ;YES, PUT "NXM" INTO STRING
013256  004001                          NXMMES                  ;"NXM"
013260  032737  002000  002306  4$:     BIT     #OPI,E.CS       ;IS OPI SET?
013266  001422                          BEQ     6$              ;NO, GO CHECK BITS 11 & 12
013270  004537  013664                  JSR     R5,FIX          ;PUT "OPI" INTO STRING
013274  004006                          OPIMES                  ;"OPI"
013276  032737  004000  002306          BIT     #BIT11,E.CS     ;HEADERCRC ERROR?
013304  001403                          BEQ     5$              ;NO, GO CHECK HEADER NOT FOUND
013306  004537  013664                  JSR     R5,FIX          ;GO PUT "HCRC" IN STRING
013312  004013                          HCRCMES                 ;"HCRC"
013314  032737  010000  002306  5$:     BIT     #BIT12,E.CS     ;HEADER NOT FOUND?
013322  001422                          BEQ     8$              ;NO, GO PUT "CRLF" IN STRING
013324  004537  013664                  JSR     R5,FIX          ;PUT "HNF" IN STRING
013330  004021                          HNFMES                  ;"HNF"
013332  000416                          BR      8$              ;PUT "CRLF" IN STRING
013334  032737  004000  002306  6$:     BIT     #BIT11,E.CS     ;DATA CRC ERROR?
013342  001403                          BEQ     7$              ;NO, GO CHECK DATA LATE
013344  004537  013664                  JSR     R5,FIX          ;PUT "DCK" IN STRING
013350  004026                          DCKMES                  ;"DCK"
013352  032737  010000  002306  7$:     BIT     #BIT12,E.CS     ;DATA LATE ERROR?
013360  001403                          BEQ     8$              ;NO, GO PUT IN "CRLF"
013362  004537  013664                  JSR     R5,FIX          ;PUT "DLT" IN STRING
013366  004033                          DLTMES                  ;"DLT"
013370  004537  013664          8$:     JSR     R5,FIX
013374  004040                          MSCRLF
013376  004537  013664                  JSR     R5,FIX
013402  000000          RESTMS: .WORD   0               ;HEADER FROM TEST
013404  105011                  CLRB    (R1)            ;PUT TERMINATOR IN

013406                          ERRDF   300.,LF,ERR6
013406  104455                  TRAP    C$ERDF
013410  000454                  .WORD   300
013412  004043                  .WORD   LF
013414  010404                  .WORD   ERR6
```

ROUTINE TO CHECK FOR CONTROLLER ERRORS

```
                                        RTS     R5              ;EXIT ROUTINE

                                .SBTTL  LOAD RLCS
                                ;*******************************************************************
                                ;* ROUTINE TO LOAD RLCS WITH FUNCTION TO BE PERFORMED
                                ;*      CALL:   JSR     R5,LDFUNC
                                ;*              .WORD           ;BITS TO BE LOADED, FUNCTION
                                ;*                              ;AND INTR ENABLE ONLY
                                ;*
                                ;

013420  012537  002332          LDFUNC: MOV     (R5)+,LDCSR     ;GET BITS TO LOAD
013424  005737  002304                  TST     DERFLG
013430  001424                          BEQ     98$
013432  013746  002272                  MOV     B.CS,-(SP)
013436  012777  000013  166610          MOV     #13,@RLDA
013444  012737  000004  002272          MOV     #GSTAT,B.CS
013452  053737  002270  002272          BIS     DRIVE,B.CS
013460  013777  002272  166562          MOV     B.CS,@RLCS
013466  012637  002272                  MOV     (SP)+,B.CS
013472  032777  000200  166550  99$:    BIT     #200,@RLCS
013500  001774                          BEQ     99$
013502  010346                  98$:    MOV     R3,-(SP)        ;SAVE R3
013504  042737  177661  002332          BIC     #177661,LDCSR   ;CLEAR ALL BUT FUNC & INTR EN
013512  013737  002332  013636          MOV     LDCSR,FNDFNC    ;SAVE FUNCTION
013520  042737  000100  013636          BIC     #INTEN,FNDFNC   ;ONLY FUNCTION
013526  013737  013636  002412          MOV     FNDFNC,TMPFNC
013534  012703  013640                  MOV     #HDRLST,R3      ;GET HEADER LIST
013540  006237  013636                  ASR     FNDFNC          ;ALIGN TO RIGHT
013544  001404                          BEQ     2$
013546  022323                  1$:     CMP     (R3)+,(R3)+     ;BUMP R3 BY 4
013550  005337  013636                  DEC     FNDFNC          ;FOUND IT
013554  001374                          BNE     1$              ;NO,KEEP LOOKING
013556  032737  000100  002332  2$:     BIT     #INTEN,LDCSR    ;YES,DO WE WANT FLAG OR INTR
013564  001401                          BEQ     3$              ;FLAG BRANCH
013566  005723                          TST     (R3)+           ;INTR POINT TO THAT ONE
013570  011303                  3$:     MOV     (R3),R3         ;SET HEADER
013572  010337  013402                  MOV     R3,RESTMS       ;SET UP HEADER
013576  053737  002270  002332          BIS     DRIVE,LDCSR     ;SELECT DRIVE
013604  052737  000200  002332  4$:     BIS     #200,LDCSR      ;CONTROLLER READY
013612  013777  002332  166430          MOV     LDCSR,@RLCS
013620  004537  013676                  JSR     R5,BEFORE
013624  042777  000200  166416  5$:     BIC     #200,@RLCS
013632  012603                          MOV     (SP)+,R3        ;RESTORE R3
013634  000205                          RTS     R5              ;EXIT

013636  000000          FNDFNC: .WORD   0

013640  004126          HDRLST: NOPMES
013642  004157                  NOPINT
013644  004211                  WCKMES
013646  004251                  WCKINT
013650  004476          OKHDR:  GSTMES
013652  004535                  GSTINT
013654  004413                  SEKMES
013656  004444                  SEKINT
```

LOAD RLCS

```
                                        RHDMES
                                        RHDINT

                        ;*************************************************************************
                        ;*ROUTINE TO MOVE ASCII STRINGS
                        ;*USES REGISTERS R1 - WHERE STRING IS BEING BUILT
                        ;*
                        ;*      CALL    JSR     R5,FIX
                        ;*              .WORD           ;ADDRESS OF STRING TO MOVE

                        FIX:    MOV     (R5)+,R0        ;GET ADDRESS AND MOVE RETURN
                        1$:     MOVB    (R0)+,(R1)+     ;GET BYTE AND UPDATE
                                BNE     1$              ;WATCH 0 BYTE TERMINATOR
                                TSTB    -(R1)           ;BACK UP OVER ZERO BYTE
                                RTS     R5              ;EXIT


                        ;LOAD REGISTERS BEFORE OPERATION
                        ;CALL:  JSR     R5,BEFORE

                        BEFORE: MOV     @RLCS,B.CS      ;READ CS
                                MOV     @RLBA,B.BA      ;READ BA
                                MOV     @RLDA,B.DA      ;READ DA
                                MOV     @RLMP,B.MP      ;READ MP
                                CMP     #2,T.CNTLR      ;IF THE CONTOLLER IS AN RLV12
                                BNE     1$              ;READ BE
                                MOV     @RLBE,B.BE

                        1$:     RTS     R5


                        ;LOAD REGISTERS AT ERROR
                        ;CALL:  JSR     R5,AFTER

                        AFTER:  MOV     @RLCS,E.CS      ;READ CS
                                MOV     @RLBA,E.BA      ;READ BA
                                MOV     @RLDA,E.DA      ;READ DA
                                MOV     @RLMP,E.MP      ;READ MP
                                MOV     @RLMP,E.MP1     ;READ MP SECOND WORD IN SILO
                                MOV     @RLMP,E.MP2     ;READ MP THIRD WORD IN SILO
                                CMP     #2,T.CNTLR      ;IF THE CONTROLLER IS AN RLV12
                                BNE     1$              ;READ BE
                                MOV     @RLBE,E.BE

                        1$:     RTS     R5


                        .SBTTL  ROUTINE TO CALCULATE 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)
                                        ;       ROUTINE USES R0,R1,R2
                                        ;
014032  010046                  SIMBCC: MOV     R0,-(SP)        ;SAVE R0
014034  010146                          MOV     R1,-(SP)        ;SAVE R1
014036  010246                          MOV     R2,-(SP)        ;SAVE R2
                                        ;
014040  012537  002346                  MOV     (R5)+,TEMP2     ;GET NUMBER OF BITS
014044  012537  002350                  MOV     (R5)+,TEMP3     ;GET DATA FOR CRC CALCULATION
014050  012537  002352                  MOV     (R5)+,TEMP4     ;GET STARTING CRC
                                        ;
014054  005037  002342          1$:     CLR     BCCFBK          ;
014060  013700  002352                  MOV     TEMP4,R0        ;GET PREVIOUS CRC
014064  006037  002350                  ROR     TEMP3           ;ROTATE NEW DATA
014070  005500                          ADC     R0              ;MERGE NEW WITH OLD
014072  032700  000001                  BIT     #1,R0           ;BIT 0 SET
014076  001402                          BEQ     2$              ;IF NOT CONTINUE
014100  005137  002342                  COM     BCCFBK          ;
014104  013700  002336          2$:     MOV     XPOLY,R0        ;GET CRC POLYNOMIAL (CRC-16)
014110  005100                          COM     R0              ;COMPLIMENT POLYNOMIAL
014112  040037  002342                  BIC     R0,BCCFBK
014116  000241                          CLC                     ;CLEAR CARRY
014120  006037  002352                  ROR     TEMP4
014124  013700  002342                  MOV     BCCFBK,R0
014130  013701  002352                  MOV     TEMP4,R1
014134  010102                          MOV     R1,R2
014136  040100                          BIC     R1,R0
014140  043702  002342                  BIC     BCCFBK,R2
014144  050200                          BIS     R2,R0
014146  043737  002336  002352          BIC     XPOLY,TEMP4
014154  050037  002352                  BIS     R0,TEMP4
014160  005337  002346                  DEC     TEMP2
014164  001333                          BNE     1$
014166  013737  002352  002344          MOV     TEMP4,CALBCC
                                        ;
014174  012602                          MOV     (SP)+,R2        ;RESTORE REGISTERS FROM STACK
014176  012601                          MOV     (SP)+,R1
014200  012600                          MOV     (SP)+,R0
                                        ;
014202  000205                          RTS     R5              ;RETURN
                                        ;
                                        ;
                                        ;ROUTINE TO SET FLAG IF TRAP OCCURRED
                                        ;"TRPHAN" IS IN LOCATION 4.
                                        ;
                                        ;
014204  005237  002326          TRPHAN: INC     TRPFLG          ;INDICATE TRAP
014210  000002                          RTI                     ;RETURN
                                        ;
014212                          BGNSRV
                                        ;
014212  005237  002330          INTSRV: INC     INTFLG          ;INDICATE INTERRUPT
                                        ;
014216                          ENDSRV
014216                          L10020:
014216  000002                          RTI
```

ROUTINE TO CALCULATE CRC

```
                                        ;ROUTINE TO WAIT FOR DRIVE READY
014220  010146                  WTDRDY: MOV     R1,-(SP)        ;SAVE R1
014222  012701  003720                  MOV     #2000.,R1       ;TIME OUT OF 200 MILLISECONDS
014226  032777  000001  166014  1$:     BIT     #DRDY,@RLCS     ;DRIVE READY?
014234  001022                          BNE     2$              ;YES, EXIT
014236                                  DELAY   1               ;WAIT A WHILE
014236  012727  000001                  MOV     #1,(PC)+
014242  000000                          .WORD   0
014244  013727  002116                  MOV     L$DLY,(PC)+
014250  000000                          .WORD   0
014252  005367  177772                  DEC     -6(PC)
014256  001375                          BNE     .-4
014260  005367  177756                  DEC     -22(PC)
014264  001367                          BNE     .-20
014266  005301                          DEC     R1              ;CHECK IF TIME UP
014270  001356                          BNE     1$              ;NO, GO CHECK DRIVE READY

014272                                  ERRDF   200.,DRTIM,ERR5 ;DRIVE READY DID NOT SET
014272  104455                          TRAP    C$ERDF
014274  000310                          .WORD   200
014276  004712                          .WORD   DRTIM
014300  010372                          .WORD   ERR5

014302  012601                  2$:     MOV     (SP)+,R1        ;RESTORE
014304  000205                          RTS     R5              ;EXIT

                                        ;ROUTINE TO WAIT FOR CONTROLLER READY
014306  010146                  WTCRDY: MOV     R1,-(SP)        ;SAVE R1
014310  012701  017500                  MOV     #8000.,R1       ;WAIT 800 MILLISECONDS
014314  032777  000200  165726  1$:     BIT     #CRDY,@RLCS     ;CONTROLLER READY
014322  001025                          BNE     2$              ;YES, EXIT
014324                                  DELAY   1               ;WAIT A WHILE
014324  012727  000001                  MOV     #1,(PC)+
014330  000000                          .WORD   0
014332  013727  002116                  MOV     L$DLY,(PC)+
014336  000000                          .WORD   0
014340  005367  177772                  DEC     -6(PC)
014344  001375                          BNE     .-4
014346  005367  177756                  DEC     -22(PC)
014352  001367                          BNE     .-20
014354  005301                          DEC     R1              ;CHECK IF TIME UP
014356  001356                          BNE     1$              ;NO GO BACK

014360  004537  013746                  JSR     R5,AFTER        ;GET REGISTERS

014364                                  ERRDF   100.,CRTIM,ERR6 ;CONTROLLER TIMED OUT
014364  104455                          TRAP    C$ERDF
014366  000144                          .WORD   100
014370  004665                          .WORD   CRTIM
014372  010404                          .WORD   ERR6

014374  000402                          BR      3$              ;EXIT

014376  004537  013746          2$:     JSR     R5,AFTER        ;GET REGISTERS
014402  012601                  3$:     MOV     (SP)+,R1
014404  000205                          RTS     R5              ;EXIT
```

ROUTINE TO CALCULATE CRC

```
    303
    304 014406                          ENDMOD
    305
    306
```

```
                                        .SBTTL  **TEST 1** - RLCS ADDRESSABILITY

                                        BGNTST                          ;****START OF TEST****
014406                                  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.
014406                                  STARS
                                        ;;**************************************************************************


014406  005037  002326          1$:     CLR     TRPFLG                  ;CLEAR TRAP OCCURANCE
014412                          2$:     SETVEC  ERRVEC,#TRPHAN,#340     ;SET TO CATCH TRAP
014412  012746  000340                  MOV     #340,-(SP)
014416  012746  014204                  MOV     #TRPHAN,-(SP)
014422  013746  002340                  MOV     ERRVEC,-(SP)
014426  012746  000003                  MOV     #3,-(SP)
014432  104437                          TRAP    C$SVEC
014434  062706  000010                  ADD     #10,SP

014440  005777  165604                  TST     @RLCS                   ;ADDRESS RLCS
014444                                  CLRVEC  ERRVEC                  ;RELEASE TRAP VECTOR
014444  013700  002340                  MOV     ERRVEC,R0
014450  104436                          TRAP    C$CVEC
014452  005737  002326                  TST     TRPFLG                  ;TRAP OCCURRED???
014456  001407                          BEQ     3$                      ;NO, IKAY PROCEED
014460  013737  002250  002362          MOV     RLCS,GDDAT              ;SET UP ERROR DATA

014466                                  ERRSF   0.,EM1,ERR1             ;BUS TIMEOUT IN ADDRESSING RLCS
014466  104454                          TRAP    C$ERSF
014470  000000                          .WORD   0
014472  004740                          .WORD   EM1
014474  010176                          .WORD   ERR1
014476                          3$:     CKLOOP                          ;CHECK IF /FL:LOE IS SET
014476  104406                          TRAP    C$CLP1
014500                          ENDTST                                  ;****END OF TEST****
014500                          L10021:
014500  104401                          TRAP    C$ETST


                                        .SBTTL  **TEST 2** - RLBA ADDRESSABILITY

014502                                  BGNTST                          ;****START OF TEST****


014502                                  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.
014502                                  STARS
                                        ;;**************************************************************************

014502  005037  002326          1$:     CLR     TRPFLG                  ;CLEAR TRAP OCCURANCE
```

```
**TEST 2** - RLBA ADDRESSABILITY

     39 014506                                  2$:     SETVEC  ERRVEC,#TRPHAN,#340  ;SET TO CATCH TRAP
        014506  012746  000340                         MOV     #340,-(SP)
        014512  012746  014204                         MOV     #TRPHAN,-(SP)
        014516  013746  002340                         MOV     ERRVEC,-(SP)
        014522  012746  000003                         MOV     #3,-(SP)
        014526  104437                                 TRAP    C$SVEC
        014530  062706  000010                         ADD     #10,SP
     40
     41 014534  005777  165512                         TST     @RLBA           ;ADDRESS RLBA
     42 014540                                         CLRVEC  ERRVEC          ;RELEASE TRAP VECTOR
        014540  013700  002340                         MOV     ERRVEC,R0
        014544  104436                                 TRAP    C$CVEC
     43 014546  005737  002326                         TST     TRPFLG          ;TRAP OCCURRED???
     44 014552  001407                                 BEQ     3$              ;NO, CONTINUE
     45 014554  013737  002252  002362                 MOV     RLBA,GDDAT      ;SETUP ERROR DATA
     46
     47 014562                                         ERRSF   1.,EM2,ERR1     ;BUS TIMEOUT IN ADDRESSING RLBA
        014562  104454                                 TRAP    C$ERSF
        014564  000001                                 .WORD   1
        014566  004765                                 .WORD   EM2
        014570  010176                                 .WORD   ERR1
     48 014572                                  3$:     CKLOOP                  ;CHECK IF /FL:LOE IS SET
        014572  104406                                 TRAP    C$CLP1
     49 014574                                  ENDTST                          ;****END OF TEST****
        014574                                  L10022:
        014574  104401                                 TRAP    C$ETST
     50
     51
     52                                         .SBTTL  **TEST 3** - RLDA ADDRESSABILITY
     53
     54 014576                                  BGNTST                          ;****START OF TEST****
     55 014576                                  STARS
                                                ;;**************************************************************
     56                                         ;TEST TO SEE IF WE CAN ADDRESS THE DISK ADDRESS
     57                                         ;REGISTER IF WE TRAP WE WILL REPORT THE ERROR
     58                                         ;AND ABORT.  AFTER THIS TEST WE ONLY KNOW THAT
     59                                         ;WE CAN ADDRESS THE REGISTER.
     60 014576                                  STARS
                                                ;;**************************************************************
     61
     62
     63 014576  005037  002326                  1$:     CLR     TRPFLG          ;CLEAR TRAP OCCURANCE
     64 014602                                  2$:     SETVEC  ERRVEC,#TRPHAN,#340  ;SET TO CATCH TRAP
        014602  012746  000340                         MOV     #340,-(SP)
        014606  012746  014204                         MOV     #TRPHAN,-(SP)
        014612  013746  002340                         MOV     ERRVEC,-(SP)
        014616  012746  000003                         MOV     #3,-(SP)
        014622  104437                                 TRAP    C$SVEC
        014624  062706  000010                         ADD     #10,SP
     65
     66 014630  005777  165420                         TST     @RLDA           ;ADDRESS RLDA
     67 014634                                         CLRVEC  ERRVEC          ;RELEASE TRAP VECTOR
        014634  013700  002340                         MOV     ERRVEC,R0
        014640  104436                                 TRAP    C$CVEC
     68 014642  005737  002326                         TST     TRPFLG          ;TRAP OCCURRED???
     69 014646  001407                                 BEQ     3$              ;NO, CONTINUE
     70
```

```
**TEST 3** - RLDA ADDRESSABILITY

     71 014650  013737  002254  002362          MOV     RLDA,GDDAT      ;SETUP ERROR INFO
     72 014656                                  ERRSF   2.,EM3,ERR1     ;BUS TIMEOUT IN ADDRESSING RLDA
        014656  104454                          TRAP    C$ERSF
        014660  000002                          .WORD   2
        014662  005012                          .WORD   EM3
        014664  010176                          .WORD   ERR1
     73 014666                          3$:     CKLOOP                  ;CHECK IF /FL:LOE IS SET
        014666  104406                          TRAP    C$CLP1
     74 014670                          ENDTST                          ;****END OF TEST****
        014670                          L10023:
        014670  104401                          TRAP    C$ETST
     75
     76
     77                                 .SBTTL  **TEST 4** - RLMP ADDRESSABILITY
     78
     79 014672                          BGNTST                          ;****START OF TEST****
     80 014672                          STARS
                                        ;;**************************************************************
     81                                 ;TEST TO SEE IF WE CAN ADDRESS THE MULTIPURPOSE
     82                                 ;REGISTER.  IF WE TRAP WE WILL REPORT THE ERROR AND
     83                                 ;ABORT.  AFTER THIS TEST WE ONLY KNOW THAT WE CAN
     84                                 ;ADDRESS THE REGISTER.
     85 014672                          STARS
                                        ;;**************************************************************
     86
     87
     88 014672  005037  002326          1$:     CLR     TRPFLG          ;CLEAR TRAP OCCURANCE
     89 014676                          2$:     SETVEC  ERRVEC,#TRPHAN,#340  ;SET UP TO CATCH TRAP
        014676  012746  000340                  MOV     #340,-(SP)
        014702  012746  014204                  MOV     #TRPHAN,-(SP)
        014706  013746  002340                  MOV     ERRVEC,-(SP)
        014712  012746  000003                  MOV     #3,-(SP)
        014716  104437                          TRAP    C$SVEC
        014720  062706  000010                  ADD     #10,SP
     90
     91 014724  005777  165326                  TST     @RLMP           ;ADDRESS RLMP
     92 014730                                  CLRVEC  ERRVEC          ;RELEASE TRAP VECTOR
        014730  013700  002340                  MOV     ERRVEC,R0
        014734  104436                          TRAP    C$CVEC
     93 014736  005737  002326                  TST     TRPFLG          ;TRAP OCCURRED???
     94 014742  001407                          BEQ     3$              ;NO, CONTINUE
     95 014744  013737  002256  002362          MOV     RLMP,GDDAT      ;SET UP ERROR INFO
     96
     97 014752                                  ERRSF   3.,EM4,ERR1     ;BUS TIMEOUT IN ADDRESSING RLMP
        014752  104454                          TRAP    C$ERSF
        014754  000003                          .WORD   3
        014756  005037                          .WORD   EM4
        014760  010176                          .WORD   ERR1
     98 014762                          3$:     CKLOOP                  ;CHECK IF /FL:LOE IS SET
        014762  104406                          TRAP    C$CLP1
     99 014764                          ENDTST                          ;****END OF TEST****
        014764                          L10024:
        014764  104401                          TRAP    C$ETST
    100
    101
    102                                 .SBTTL  **TEST 5** - READ WRITE OF RLCS
    103
```

```
**TEST 5** - READ WRITE OF RLCS

                                BGNTST                          ;****START OF TEST****


                                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
                                ;;*****************************************************************


015766  012703  002772                MOV     #CSPAT,R3       ;SET UP TABLE POINTER OF PATTERNS

015772                          BGNSEG                          ;****START OF SEGMENT****
015772  104404                        TRAP    C$BSEG

015774                          CSTEST:
015774  011337  002362                MOV     (R3),GDDAT      ;GET PATTERN INTO GDDAT
015000  052737  000200  002362        BIS     #200,GDDAT      ;INSURE GO IS SET
015006  013777  002362  165234        MOV     GDDAT,@RLCS     ;LOAD RLCS (CONTROL AND STATUS)
015014  032777  040000  165226        BIT     #DERR,@RLCS     ;IF DRIVE ERROR PRESENT
015022  001403                        BEQ     99$             ;THEN EXPECT DRIVE AND
015024  052737  140000  002362        BIS     #ERR!DERR,GDDAT ;COMPOSITE ERROR
015032  017737  165212  002364  99$:  MOV     @RLCS,BDDAT     ;READ RLCS BACK
015040  042737  000001  002364        BIC     #DRDY,BDDAT     ;IGNORE DRIVE READY
015046  023737  002362  002364        CMP     GDDAT,BDDAT     ;DID WE READ WHAT WE LOADED
015054  001404                        BEQ     1$              ;YES, THEN BRANCH

015056                                ERRDF   4.,EM5,ERR2     ;WRONG DATA IN RLCS
015056  104455                        TRAP    C$ERDF
015060  000004                        .WORD   4
015062  005064                        .WORD   EM5
015064  010210                        .WORD   ERR2
015066                          1$:   ESCAPE  SEG             ;IF /FL:LOE SET LOOP, ELSE EXIT SEG
015066  104410                        TRAP    C$ESCAPE
015070  000012                        .WORD   10000$-.

015072  005723                        TST     (R3)+           ;BUMP FOR NEXT PATTERN
015074  020327  003070                CMP     R3,#CSEND       ;CHECK FOR END
015100  001335                        BNE     CSTEST          ;NOT END, LOAD NEXT PATTERN

015102                          ENDSEG                          ;****END OF SEGMENT****
015102                          10000$:
015102  104405                        TRAP    C$ESEG
015104                          ENDTST                          ;****END OF TEST****
015104                          L10025:
015104  104401                        TRAP    C$ETST


                                .SBTTL  **TEST 6** - READ WRITE OF RLBA


015106                          BGNTST                          ;****START OF TEST****
```

TEST 6 - READ WRITE OF RLBA

```
                                        STARS
                                        ;;*****************************************************************
                                        ;TEST THAT WE CAN WRITE/READ BITS 15-1 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
                                        ;;*****************************************************************

                                                MOV     #BEGPAT,R3      ;GET START OF PATTERN LIST
                                BGNSEG                                  ;****START OF SEGMENT****
                                                TRAP    C$BSEG
                                BATEST:
                                                MOV     (R3),GDDAT      ;GET PATTERN TO SEND
                                                CMP     #1,T.CNTLR              ;RL11??
                                                BLT     2$              ;NO,
                                                BIC     #BIT0,GDDAT     ;KEEP RLBA EVEN (UNIBUS)
                                2$:             MOV     GDDAT,@RLBA     ;LOAD PATTERN TO BUS ADDRESS
                                                MOV     @RLBA,BDDAT     ;READ IT BACK
                                                CMP     GDDAT,BDDAT     ;IS IT CORRECT?
                                                BEQ     1$              ;IF SO, BRANCH

                                                ERRDF   5.,EM6,ERR2     ;DATA WRONG IN RLBA
                                                TRAP    C$ERDF
                                                .WORD   5
                                                .WORD   EM6
                                                .WORD   ERR2
                                1$:             ESCAPE  SEG             ;IF /FL:LOE SET LOOP, ELSE EXIT SEG
                                                TRAP    C$ESCAPE
                                                .WORD   10000$-.
```

```
**TEST 6** - READ WRITE OF RLBA

                                                TST     (R3)+           ;BUMP FOR NEXT PATTERN
                                                CMP     R3,#ENDPAT      ;CHECK FOR END
                                                BNE     BATEST          ;NOT END, BRANCH FOR NEXT

                                        ENDSEG                          ;****END OF SEGMENT****
                                        10000$:
                                                TRAP    C$ESEG
                                        ENDTST                          ;****END OF TEST****
                                        L10026:
                                                TRAP    C$ETST


                                        .SBTTL  **TEST 7** - READ WRITE OF RLDA

                                        BGNTST                          ;****START OF TEST****

                                        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
                                        ;;*****************************************************************


                                                MOV     #BEGPAT,R3      ;SET UP POINTER TO PATTERN LIST
                                        BGNSEG                          ;****START OF SEGMENT****
                                                TRAP    C$BSEG
                                        DATEST:
                                                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     1$              ;BRANCH IF CORRECT

                                                ERRDF   6.,EM7,ERR2     ;WRONG DATA IN RLDA
                                                TRAP    C$ERDF
                                                .WORD   6
                                                .WORD   EM7
                                                .WORD   ERR2
                                        1$:     ESCAPE  SEG             ;IF /FL:LOE SET LOOP, ELSE EXIT SEG
                                                TRAP    C$ESCAPE
                                                .WORD   10000$-.


                                                TST     (R3)+           ;BUMP POINTER
                                                CMP     R3,#ENDPAT      ;AT END OF PATTERNS?
                                                BNE     DATEST          ;NO, BRANCH BACK

                                        ENDSEG                          ;****END OF SEGMENT****
                                        10000$:
                                                TRAP    C$ESEG
                                        ENDTST                          ;****END OF TEST****
                                        L10027:
```

```
**TEST ?** - READ WRITE OF RLDA

    015276  104401                          TRAP    C$ETST

                                .SBTTL  **TEST 8** - BIS OF RLCS

015300                          BGNTST                          ;****START OF TEST****
015300                          STARS
                                ;;**************************************************************
                                ;TEST THAT WE CAN USE THE "BIS" INSTRUCTION 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
015300                          STARS
                                ;;**************************************************************

015300  012703  002772                  MOV     #CSPAT,R3       ;GET BEGINNING OF LIST
015304                          BGNSEG                          ;****START OF SEGMENT****
    015304  104404                      TRAP    C$BSEG
015306                          1$:
015306  012777  000200  164734          MOV     #CRDY,@RLCS     ;INSURE GO IS THERE
015314  011337  002362                  MOV     (R3),GDDAT      ;SET UP EXPECTED RLCS
015320  052737  000200  002362          BIS     #CRDY,GDDAT     ;IN GDDAT
015326  051377  164716                  BIS     (R3),@RLCS      ;BIT SET PATTERN IN RLCS
015332  032777  040000  164710          BIT     #DERR,@RLCS     ;IF ERROR BIT SET THEN
015340  001403                          BEQ     99$             ;EXPECT IT ON THE READ
015342  052737  140000  002362          BIS     #ERR!DERR,GDDAT ;BACK
015350  017737  164674  002364  99$:    MOV     @RLCS,BDDAT     ;READ RLCS TO CHECK "BIS"
015356  042737  000001  002364          BIC     #DRDY,BDDAT     ;CLEAR OUT DRIVE READY
015364  023737  002364  002362          CMP     BDDAT,GDDAT     ;DID BIS WORK?
015372  001404                          BEQ     2$              ;BRANCH IF OKAY

015374                                  ERRDF   7.,EM61,ERR2    ;WRONG DATA IN RLCS
    015374  104455                      TRAP    C$ERDF
    015376  000007                      .WORD   7
    015400  006660                      .WORD   EM61
    015402  010210                      .WORD   ERR2
015404                          2$:     ESCAPE  SEG             ;IF /FL:LOE SET LOOP, ELSE EXIT SEG
    015404  104410                      TRAP    C$ESCAPE
    015406  000012                      .WORD   10000$-.
                                                                ;BIT OR CLEARED OTHER BIT

015410  005723                          TST     (R3)+           ;GET NEXT PATTERN
015412  022703  003070                  CMP     #CSEND,R3       ;AT END OF LIST
015416  001333                          BNE     1$              ;NO GO BACK FOR TEST OF
                                                                ;NEXT PATTERN
015420                          ENDSEG                          ;****END OF SEGMENT****
015420                          10000$:
    015420  104405                      TRAP    C$ESEG
015422                          ENDTST                          ;****END OF TEST****
015422                          L10030:
    015422  104401                      TRAP    C$ETST


                                .SBTTL  **TEST 9** - BIC OF RLCS

015424                          BGNTST                          ;****START OF TEST****
```

```
**TEST 9** - BIC OF RLCS

                                        STARS
                                        ;;*****************************************************************
                                        ;TEST THAT THE 'BIC'' INSTRUCTION WILL WORK ON THE
                                        ;CONTROL AND STATUS REGISTER.  BITS 8-9 AND 6-1 ARE
                                        ;TESTED.
                                        STARS
                                        ;;*****************************************************************

015424  012703  002772                  MOV     #CSPAT,R3       ;GET BEGINNING OF PATTERNS
015430                                  BGNSEG                  ;****START OF SEGMENT****
015430  104404                          TRAP    C$BSEG
015432                                  1$:
015432  012777  001776  164610          MOV     #1776,@RLCS     ;SET ALL SETTABLE BITS
015440  012737  001776  002362          MOV     #1776,GDDAT     ;SET UP EXPECT DATA IN
015446  041337  002362                  BIC     (R3),GDDAT      ;GDDAT
015452  041377  164572                  BIC     (R3),@RLCS      ;CLEAR BITS IN RLCS VIA 'BIC''
015456  032777  040000  164564          BIT     #DERR,@RLCS     ;IF DRIVE ERROR BIT SET
015464  001403                          BEQ     99$             ;EXPECT IT SET WHEN WE
015466  052737  140000  002362          BIS     #ERR!DERR,GDDAT ;READ IT BACK
015474  017737  164550  002364  99$:    MOV     @RLCS,BDDAT     ;MOVE RLCS TO BDDAT FOR COMPARE
015502  042737  000001  002364          BIC     #DRDY,BDDAT     ;CLEAR DRIVE READY
015510  023737  002364  002362          CMP     BDDAT,GDDAT     ;DID 'BIC'' WORK PROPERLY
015516  001404                          BEQ     2$              ;BRANCH IF OKAY

015520                                  ERRDF   8.,EM62,ERR2    ;WRONG DATA IN RLCS
015520  104455                          TRAP    C$ERDF
015522  000010                          .WORD   8
015524  006741                          .WORD   EM62
015526  010210                          .WORD   ERR2
015530                          2$:     ESCAPE  SEG             ;IF /FL:LOE SET LOOP, ELSE EXIT SEG
015530  104410                          TRAP    C$ESCAPE
015532  000012                          .WORD   10000$-.

015534  005723                          TST     (R3)+           ;GET NEXT PATTERN
015536  020327  003070                  CMP     R3,#CSEND       ;AT END OF LIST
015542  001333                          BNE     1$              ;NO, GO BACK WITH NEXT PATTERN
015544                                  ENDSEG                  ;****END OF SEGMENT****
015544                                  10000$:
015544  104405                          TRAP    C$ESEG
015546                                  ENDTST                  ;****END OF TEST****
015546                                  L10031:
015546  104401                          TRAP    C$ETST


                                        .SBTTL  **TEST 10** - BIS OF RLBA

                                        BGNTST                  ;****START OF TEST****

015550                                  STARS
                                        ;;*****************************************************************
                                        ;TEST THAT THE 'BIS'' INSTRUCTION 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.
015550                                  STARS
```

```
**TEST 10** - BIS OF RLBA

                                        ;;*****************************************************************
  128
  129
  130 015550  012703  002416                    MOV     #BEGPAT,R3      ;GET START OF LIST
  131 015554                            BGNSEG                          ;****START OF SEGMENT****
      015554  104404                            TRAP    C$BSEG
  132 015556                            1$:
  133 015556  005077  164470                    CLR     @RLBA           ;CLEAR 'BA'
  134 015562  011337  002362                    MOV     (R3),GDDAT      ;SET EXPECTED
  135 015566  022737  000001  002410            CMP     #1,T.CNTLR              ;RL11
  136 015574  002403                            BLT     3$              ;NO
  137 015576  042737  000001  002362            BIC     #1,GDDAT        ;BIT 0 CAN'T SET IN RLBA (UNIBUS)
  138 015604  051377  164442            3$:     BIS     (R3),@RLBA      ;BIS RLBA WITH PATTERN
  139 015610  017737  164436  002364            MOV     @RLBA,BDDAT     ;READ 'BA'
  140 015616  023737  002364  002362            CMP     BDDAT,GDDAT     ;DID RLBA LOAD PROPERLY?
  141 015624  001404                            BEQ     2$              ;BRANCH IF YES
  142
  143 015626                                    ERRDF   9.,EM63,ERR2    ;WRONG DATA IN RLBA
      015626  104455                            TRAP    C$ERDF
      015630  000011                            .WORD   9
      015632  007024                            .WORD   EM63
      015634  010210                            .WORD   ERR2
  144 015636                            2$:     ESCAPE  SEG             ;IF /FL:LOE SET LOOP, ELSE EXIT SEG
      015636  104410                            TRAP    C$ESCAPE
      015640  000012                            .WORD   10000$-.
  145
  146 015642  005723                            TST     (R3)+           ;GET NEXT PATTERN
  147 015644  020327  002624                    CMP     R3,#ENDPAT      ;DID WE COMPLETE LIST
  148 015650  001342                            BNE     1$              ;NO, GO BACK FOR NEXT.
  149 015652                            ENDSEG                          ;****END OF SEGMENT****
      015652                            10000$:
      015652  104405                            TRAP    C$ESEG
  150 015654                            ENDTST                          ;****END OF TEST****
      015654                            L10032:
      015654  104401                            TRAP    C$ETST
  151
  152
  153                                   .SBTTL  **TEST 11** - BIC OF RLBA
  154
  155 015656                            BGNTST                          ;****START OF TEST****
  156
  157 015656                            STARS
                                        ;;*****************************************************************
  158                                   ;TEST THAT THE 'BIC' INSTRUCTION WILL WORK ON THE BUS
  159                                   ;ADDRESS REGISTER.  BITS 15-1 ARE TESTED WITH 4 PATTERNS
  160                                   ;GROWING 1, SHIFTING 1, GROWING 0 AND SHIFTING 0.
  161 015656                            STARS
                                        ;;*****************************************************************
  162
  163
  164 015656  012703  002416                    MOV     #BEGPAT,R3      ;GET START OF LIST
  165 015662                            BGNSEG                          ;****START OF SEGMENT****
      015662  104404                            TRAP    C$BSEG
  166 015664                            1$:
  167 015664  012777  177776  164360            MOV     #-2,@RLBA       ;SET RLBA TO ALL 1'S (BIT 0=0)
  168 015672  012737  177776  002362            MOV     #-2,GDDAT       ;SET UP EXPECTED RESULTS
  169 015700  041337  002362                    BIC     (R3),GDDAT      ;IN GDDAT
```

```
**TEST 11** - BIC OF RLBA

    170 015704  041377  164342              BIC     (R3),@RLBA      ;BIC RLBA
    171 015710  017737  164336  002364      MOV     @RLBA,BDDAT     ;READ RLBA
    172 015716  023737  002364  002362      CMP     BDDAT,GDDAT     ;BIC WORK OKAY?
    173 015724  001404                      BEQ     2$              ;IF YES BRANCH
    174
    175 015726                              ERRDF   10.,EM64,ERR2   ;WRONG DATA IN RLBA
        015726  104455                      TRAP    C$ERDF
        015730  000012                      .WORD   10
        015732  007105                      .WORD   EM64
        015734  010210                      .WORD   ERR2
    176 015736                      2$:     ESCAPE  SEG             ;IF /FL:LOE SET LOOP, ELSE EXIT SEG
        015736  104410                      TRAP    C$ESCAPE
        015740  000012                      .WORD   10000$-.
    177
    178 015742  005723                      TST     (R3)+           ;GET NEXT PATTERN
    179 015744  020327  002624              CMP     R3,#ENDPAT      ;HAVE WE COMPLETED LIST
    180 015750  001345                      BNE     1$              ;NO, GO BACK FOR NEXT
    181 015752                      ENDSEG                          ;****END OF SEGMENT****
        015752                      10000$:
        015752  104405                      TRAP    C$ESEG
    182 015754                      ENDTST                          ;****END OF TEST****
        015754                      L10033:
        015754  104401                      TRAP    C$ETST
    183
    184
    185                             .SBTTL  **TEST 12** - BIS OF RLDA
    186
    187 015756                      BGNTST                          ;****START OF TEST****
    188
    189 015756                      STARS
                                    ;;*****************************************************************
                                    ;TEST THAT THE 'BIS" INSTRUCTION WILL WORK ON THE DISK ADDRESS
    190                             ;REGISTER.  BITS 15-0 ARE TESTED WITH 4 PATTERNS, GROWING 1,
    191                             ;SHIFTING 1, GROWING 0, AND SHIFTING 0.
    192
    193 015756                      STARS
                                    ;;*****************************************************************
    194
    195
    196 015756  012703  002416              MOV     #BEGPAT,R3      ;GET START OF LIST
    197 015762                      BGNSEG                          ;****START OF SEGMENT****
        015762  104404                      TRAP    C$BSEG
    198 015764                      1$:
    199 015764  005077  164264              CLR     @RLDA           ;CLEAR "DA"
    200 015770  011337  002362              MOV     (R3),GDDAT      ;SET EXPECTED
    201 015774  051377  164254              BIS     (R3),@RLDA      ;BIS RLDA
    202 016000  017737  164250  002364      MOV     @RLDA,BDDAT     ;READ RLDA
    203 016006  023737  002364  002362      CMP     BDDAT,GDDAT     ;IS RLDA CORRECT
    204 016014  001404                      BEQ     2$              ;IF OKAY BRANCH
    205
    206 016016                              ERRDF   11.,EM65,ERR2   ;WRONG DATA IN RLDA
        016016  104455                      TRAP    C$ERDF
        016020  000013                      .WORD   11
        016022  007170                      .WORD   EM65
        016024  010210                      .WORD   ERR2
    207 016026                      2$:     ESCAPE  SEG             ;IF /FL:LOE SET LOOP, ELSE EXIT SEG
        016026  104410                      TRAP    C$ESCAPE
        016030  000012                      .WORD   10000$-.
```

```
**TEST 12** - BIS OF RLDA

                                                TST     (R3)+           ;GET NEXT PATTERN
                                                CMP     R3,#ENDPAT      ;HAVE WE FINISHED?
                                                BNE     1$              ;NO GO BACK
                                        ENDSEG                          ;****END OF SEGMENT****
                                        10000$:
                                                TRAP    C$ESEG
                                        ENDTST                          ;****END OF TEST****
                                        L10034:
                                                TRAP    C$ETST


                                        .SBTTL  **TEST 13** - BIC OF RLDA

                                        BGNTST                          ;****START OF TEST****

                                        STARS
                                        ;;**************************************************************
                                        ;TEST THAT THE "BIC" INSTRUCTION WORKS ON THE DISK
                                        ;ADDRESS REGISTER.  ALL BITS ARE TESTED WITH FOUR
                                        ;PATTERNS: GROWING 1, SHIFTING 1, GROWING 0 AND SHIFTING 0
                                        STARS
                                        ;;**************************************************************


                                                MOV     #BEGPAT,R3      ;GET START OF LIST
                                        BGNSEG                          ;****START OF SEGMENT****
                                                TRAP    C$BSEG
                                        1$:
                                                MOV     #-1,@RLDA       ;SET RLDA TO ALL 1'S
                                                MOV     #-1,GDDAT       ;SET EXPECTED DATA
                                                BIC     (R3),GDDAT      ;SET EXPECTED DATA
                                                BIC     (R3),@RLDA      ;"BIC" RLDA
                                                MOV     @RLDA,BDDAT     ;READ RLDA
                                                CMP     GDDAT,BDDAT     ;DID "BIC" WORK?
                                                BEQ     2$              ;IF IT DID BRANCH

                                                ERRDF   12.,EM66,ERR2   ;WRONG DATA IN RLDA
                                                TRAP    C$ERDF
                                                .WORD   12
                                                .WORD   EM66
                                                .WORD   ERR2
                                        2$:     ESCAPE  SEG             ;IF /FL:LOE SET LOOP, ELSE EXIT SEG
                                                TRAP    C$ESCAPE
                                                .WORD   10000$-.

                                                TST     (R3)+           ;GET NEXT PATTERN
                                                CMP     R3,#ENDPAT      ;DONE?
                                                BNE     1$              ;NO GO BACK
                                        ENDSEG                          ;****END OF SEGMENT****
                                        10000$:
                                                TRAP    C$ESEG
                                        ENDTST                          ;****END OF TEST****
                                        L10035:
                                                TRAP    C$ETST
```

TEST 14 - BUS RESET OF RLCS

```
                                .SBTTL  **TEST 14** - BUS RESET OF RLCS

                                BGNTST                          ;****START OF TEST****

                                STARS
                                ;;*****************************************************************
                                ;TEST THAT A BUS RESET WILL CLEAR THE PROPER BITS
                                ;OF THE CONTROL AND STATUS REGISTER.  THOSE BITS ARE
                                ;BITS 6-1,8,9,10,11,12,13,15.  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.
                                STARS
                                ;;*****************************************************************

016146                                  SETPRI  #PRI07          ;PRIORITY TO SEVEN
016146  012700  000340                  MOV     #PRI07,R0
016152  104441                          TRAP    C$SPRI
016154  012777  000377  164066          MOV     #377,@RLCS      ;LOAD ALL RLCS LOADABLE BITS
016162  012737  000200  002362          MOV     #CRDY,GDDAT     ;SETUP EXPECTED
016170  032777  040000  164052          BIT     #DERR,@RLCS     ;DRIVE ERR SET?
016176  001403                          BEQ     1$              ;IF NOT DON'T EXPECT IT
016200  052737  140000  002362          BIS     #DERR!ERR,GDDAT  ;IT'S SET, INIT BETTER NOT CLR
016206  012700  000100          1$:     MOV     #100,R0         ;SET UP A WAIT LOOP
016212                                  BRESET                  ;BUS RESET
016212  104433                          TRAP    C$RESET
016214  005300                  2$:     DEC     R0              ;WAIT IN CASE OF DRIVE ERROR
016216  001376                          BNE     2$              ;
016220  017737  164024  002364          MOV     @RLCS,BDDAT     ;READ RLCS
016226  042737  000001  002364          BIC     #DRDY,BDDAT     ;CLEAR OUT DRDY - DON'T CARE
016234  023737  002364  002362          CMP     BDDAT,GDDAT     ;DID INIT WORK
016242  001404                          BEQ     3$              ;YES, BRANCH

016244                                  ERRDF   13.,EM67,ERR2   ;WRONG DATA IN RLCS
016244  104455                          TRAP    C$ERDF
016246  000015                          .WORD   13
016250  007334                          .WORD   EM67
016252  010210                          .WORD   ERR2
                                3$:
                                ENDTST                          ;****END OF TEST****
016254                          L10036:
016254  104401                          TRAP    C$ETST


                                .SBTTL  **TEST 15** - BUS RESET OF RLBA

                                BGNTST                          ;****START OF TEST****

                                STARS
                                ;;*****************************************************************
                                ;TEST THAT A BUS RESET WILL CLEAR THE ENTIRE
                                ;BUS ADDRESS REGISTER.  THE BUS ADDRESS IS LOADED WITH 177776
                                ;AND IS EXPECTED TO BE ZERO AFTER THE RESET
                                STARS
```

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

    016256  012777  177776  163766              MOV     #-2,@RLBA          ;SET BA TO ALL 1'S
    016264  022737  000001  002410              CMP     #1,T.CNTLR                 ;RL11??
    016272  002403                              BLT     2$                 ;NO
    016274  052777  000001  163750              BIS     #1,@RLBA
    016302  005037  002362          2$:         CLR     GDDAT              ;CLEAR EXPECTED DATA
    016306                                      BRESET                     ;ISSUE BUS INIT
    016306  104433                              TRAP    C$RESET
    016310  017737  163736  002364              MOV     @RLBA,BDDAT        ;READ RLBA
    016316  001404                              BEQ     1$                 ;IF CLEAR BRANCH

    016320                                      ERRDF   14.,EM70,ERR2      ;WRONG DATA IN RLBA
    016320  104455                              TRAP    C$ERDF
    016322  000016                              .WORD   14
    016324  007371                              .WORD   EM70
    016326  010210                              .WORD   ERR2
    016330                          1$:

    016330                          ENDTST                                 ;****END OF TEST****
    016330                          L10037:
    016330  104401                              TRAP    C$ETST


                                    .SBTTL  **TEST 16** - BUS RESET OF RLDA

    016332                          BGNTST                                 ;****START OF TEST****

    016332                          STARS
                                    ;;*****************************************************************
                                    ;TEST THAT A BUS RESET WILL CLEAR THE ENTIRE
                                    ;DISK ADDRESS REGISTER.  THE DISK ADDRESS IS LOADED WITH 177777
                                    ;AND IS EXPECTED TO BE ZERO AFTER THE RESET.
    016332                          STARS
                                    ;;*****************************************************************


    016332  012777  177777  163714              MOV     #-1,@RLDA          ;SET DA TO ALL 1'S
    016340  005037  002362                      CLR     GDDAT              ;CLEAR EXPECTED
    016344                                      BRESET                     ;ISSUE BUS INIT
    016344  104433                              TRAP    C$RESET
    016346  017737  163702  002364              MOV     @RLDA,BDDAT        ;READ RLDA
    016354  001404                              BEQ     1$                 ;IF CLEAR BRANCH

    016356                                      ERRDF   15.,EM71,ERR2      ;WRONG DATA IN RLDA
    016356  104455                              TRAP    C$ERDF
    016360  000017                              .WORD   15
    016362  007426                              .WORD   EM71
    016364  010210                              .WORD   ERR2
    016366                          1$:

    016366                          ENDTST                                 ;****END OF TEST****
    016366                          L10040:
    016366  104401                              TRAP    C$ETST
```

```
                                .SBTTL  **TEST 17** - UNIQUENESS OF RLCS

016370                          BGNTST                          ;****START OF TEST****

016370                          STARS
                                ;;*****************************************************************
                                ;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.
016370                          STARS
                                ;;*****************************************************************

016370  012737  000201  002332          MOV     #DRDY!CRDY,LDCSR        ;SET DRIVE AND CONTROLLER READY
016376  012777  177776  163646          MOV     #-2,@RLBA               ;SET RLBA TO ALL 1'S
016404  012777  177777  163642          MOV     #-1,@RLDA               ;SET RLDA TO ALL 1'S
016412  013777  002332  163630          MOV     LDCSR,@RLCS             ;WRITE RLCS

                                ;CHECK THAT RLBA REMAINS UNAFFECTED

016420  022777  177776  163624          CMP     #-2,@RLBA               ;RLBA OKAY?
016426  001412                        BEQ     1$                      ;YES, GO CHECK DA

016430  012737  177776  002362          MOV     #-2,GDDAT               ;SET UP EXPECTED
016436  017737  163610  002364          MOV     @RLBA,BDDAT             ;READ RLBA

016444                                  ERRDF   16.,EM72,ERR2           ;CS MODIFIED BA
016444  104455                        TRAP    C$ERDF
016446  000020                        .WORD   16
016450  007463                        .WORD   EM72
016452  010210                        .WORD   ERR2
016454                          1$:     CKLOOP                          ;CHECK IF /FL:LOE IS SET
016454  104406                        TRAP    C$CLP1

016456  022777  177777  163570          CMP     #-1,@RLDA               ;RLDA OKAY?
016464  001412                        BEQ     2$                      ;YES, CONTINUE

016466  012737  177777  002362          MOV     #-1,GDDAT               ;SET UP EXPECTED
016474  017737  163554  002364          MOV     @RLDA,BDDAT             ;READ DA

016502                                  ERRDF   17.,EM73,ERR2           ;CS MODIFIED DA
016502  104455                        TRAP    C$ERDF
016504  000021                        .WORD   17
016506  007516                        .WORD   EM73
016510  010210                        .WORD   ERR2
016512                          2$:

                                ENDTST                                  ;****END OF TEST****
016512                          L10041:
016512  104401                        TRAP    C$ETST

                                .SBTTL  **TEST 18** - UNIQUENESS OF RLBA
```

TEST 18 - UNIQUENESS OF RLBA

```
                                BGNTST                          ;****START OF TEST****
                                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
                                ;BY WRITING THE RLBA.
                                STARS
                                ;;*************************************************************************

016514  012737  000200  002362          MOV     #CRDY,GDDAT     ;CONTROLLER READY
016522  032777  040000  163520          BIT     #DERR,@RLCS     ;IF DRIVE ERROR IS
016530  001403                          BEQ     99$             ;SET THEN EXPECT IT
016532  052737  140000  002362          BIS     #ERR!DERR,GDDAT ;SET WHEN WE READ IT.
016540  013737  002362  163502  99$:    MOV     GDDAT,@RLCS     ;LOAD RLCS
016546  012777  177777  163500          MOV     #-1,@RLDA       ;LOAD RLDA
016554  005077  163472                  CLR     @RLBA           ;CLEAR RLBA

                                ;CHECK IF RLCS IS OKAY

016560  017737  163464  002364          MOV     @RLCS,BDDAT     ;READ RLCS
016566  042737  000001  002364          BIC     #DRDY,BDDAT     ;IGNORE DRIVE READY
016574  023737  002364  002362          CMP     BDDAT,GDDAT     ;CS OK?
016602  001404                          BEQ     1$              ;YES, GO CHECK DA

016604                                  ERRDF   18.,EM74,ERR2   ;BA MODIFIED CS
016604  104455                          TRAP    C$ERDF
016606  000022                          .WORD   18
016610  007551                          .WORD   EM74
016612  010210                          .WORD   ERR2
016614                          1$:     CKLOOP                  ;CHECK IF /FL:LOE IS SET
016614  104406                          TRAP    C$CLP1

016616  022777  177777  163430          CMP     #-1,@RLDA       ;IS RLDA OKAY?

016624  001412                          BEQ     2$              ;IF OKAY BRANCH

016626  012737  177777  002362          MOV     #-1,GDDAT       ;SET UP EXPECTED
016634  017737  163414  002364          MOV     @RLDA,BDDAT     ;READ RLDA

016642                                  ERRDF   19.,EM75,ERR2   ;BA MODIFIED DA
016642  104455                          TRAP    C$ERDF
016644  000023                          .WORD   19
016646  007603                          .WORD   EM75
016650  010210                          .WORD   ERR2
016652                          2$:
016652                          ENDTST                          ;****END OF TEST****
016652                          L10042:
016652  104401                          TRAP    C$ETST


                                .SBTTL  **TEST 19** - UNIQUENESS OF RLDA

016654                          BGNTST                          ;****START OF TEST****
```

TEST 19 - 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
                                        ;BY WRITING THE RLDA.
                                        STARS
                                        ;;*****************************************************************

016654  012737  000200  002362          MOV     #CRDY.GDDAT     ;CONTROLLER READY
016662  032777  040000  163360          BIT     #DERR,@RLCS     ;IF DRIVE ERROR SET
016670  001403                          BEQ     99$             ;THEN EXPECT IT LATER
016672  052737  140000  002362          BIS     #ERR!DERR,GDDAT
016700  013777  002362  163342  99$:    MOV     GDDAT,@RLCS     ;LOAD CS
016706  012777  177776  163336          MOV     #-2,@RLBA       ;LOAD BA WITH ALL 1'S
016714  005077  163334                  CLR     @RLDA           ;CLEAR RLDA

                                        ;CHECK IF RLCS IS OKAY

016720  017737  163324  002364          MOV     @RLCS,BDDAT     ;READ RLCS
016726  042737  000001  002364          BIC     #DRDY,BDDAT     ;IGNORE DRIVE READY
016734  023737  002362  002364          CMP     GDDAT,BDDAT     ;RLCS OKAY?
016742  00140?                          BEQ     1$              ;YES, THEN BRANCH

016744                                  ERRDF   20.,EM76,ERR2   ;DA MODIFIED CS
016744  104455                          TRAP    C$ERDF
016746  000024                          .WORD   20
016750  007635                          .WORD   EM76
016752  010210                          .WORD   ERR2
016754                          1$:     CKLOOP                  ;CHECK IF /FL:LOE IS SET
016754  104406                          TRAP    C$CLP1

016756  022777  177776  163266          CMP     #-2,@RLBA       ;IS RLBA OKAY?
016764  001412                          BEQ     2$              ;BRANCH IF OKAY

016766  012737  177776  002362          MOV     #-2,GDDAT       ;SET UP EXPECTED
016774  017737  163252  002364          MOV     @RLBA,BDDAT     ;READ RLBA

017002                                  ERRDF   21.,EM77,ERR2   ;DA MODIFIED BA
017002  104455                          TRAP    C$ERDF
017004  000025                          .WORD   21
017006  007670                          .WORD   EM77
017010  010210                          .WORD   ERR2
017012                          2$:


017012                          ENDTST                          ;****END OF TEST****
017012                          L10043:
017012  104401                          TRAP    C$ETST

                                        .SBTTL  **TEST 20** - UNIQUENESS OF RLMP

017014                          BGNTST                          ;****START OF TEST****
```

TEST 20 - 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.
                                        STARS
                                        ;;*****************************************************************

017014  012737  000200  002362          MOV     #CRDY,GDDAT     ;CONTROLLER READY
017022  032777  040000  163220          BIT     #DERR,@RLCS     ;IF DRIVE ERROR SET
017030  001403                          BEQ     99$             ;THE EXPECT IT LATER
017032  052737  140000  002362          BIS     #ERR!DERR,GDDAT
017040  013777  002362  163202  99$:    MOV     GDDAT,@RLCS     ;LOAD CS
017046  012777  177776  163176          MOV     #-2,@RLBA       ;LOAD BA WITH ALL 1'S
017054  012777  177777  163172          MOV     #-1,@RLDA       ;LOAD RLDA
017062  005077  163170                  CLR     @RLMP           ;WRITE RLMP

                                        ;CHECK IF RLCS IS OKAY

017066  017737  163156  002364          MOV     @RLCS,BDDAT     ;READ RLCS
017074  042737  000001  002364          BIC     #DRDY,BDDAT     ;IGNORE DRIVE READY
017102  023737  002362  002364          CMP     GDDAT,BDDAT     ;RLCS OKAY?
017110  001404                          BEQ     1$              ;YES, THEN BRANCH

017112                                  ERRDF   201.,EM44,ERR2  ;MP MODIFIED CS
017112  104455                          TRAP    C$ERDF
017114  000311                          .WORD   201
017116  006204                          .WORD   EM44
017120  010210                          .WORD   ERR2
017122                          1$:     CKLOOP                  ;CHECK IF /FL:LOE IS SET
017122  104406                          TRAP    C$CLP1

017124  022777  177776  163120          CMP     #-2,@RLBA       ;IS RLBA OKAY?
017132  001412                          BEQ     2$              ;BRANCH IF OKAY

017134  012737  177776  002362          MOV     #-2,GDDAT       ;SET UP EXPECTED
017142  017737  163104  002364          MOV     @RLBA,BDDAT     ;READ RLBA

017150                                  ERRDF   211.,EM45,ERR2  ;MP MODIFIED BA
017150  104455                          TRAP    C$ERDF
017152  000323                          .WORD   211
017154  006237                          .WORD   EM45
017156  010210                          .WORD   ERR2
017160                          2$:     CKLOOP                  ;CHECK IF /FL:LOE IS SET
017160  104406                          TRAP    C$CLP1
017162  022777  177777  163064          CMP     #-1,@RLDA       ;DISK ADDRESS OKAY
017170  001412                          BEQ     3$              ;YES, CONTINUE

017172  017737  163056  002364          MOV     @RLDA,BDDAT     ;SET UP BAD
017200  012737  177777  002362          MOV     #-1,GDDAT       ;SET UP EXPECTED

017206                                  ERRDF   212.,EM46,ERR2  ;MP MODIFIED DA
017206  104455                          TRAP    C$ERDF
017210  000324                          .WORD   212
```

```
**TEST 20** - UNIQUENESS OF RLMP

        017212  006272                          .WORD   EM46
        017214  010210                          .WORD   ERR2
    508
    509 017216                          3$:
    510
    511
    512 017216                          ENDTST                          ;****END OF TEST****
        017216                          L10044:
        017216  104401                          TRAP    C$ETST
    513
    514                                 .SBTTL  **TEST 21** - NOOP FUNCTION(RL11 ONLY)
    515
    516 017220                          BGNTST                          ;****START OF TEST****
    517
    518
    519
    520 017220                          STARS
                                        ;;**********************************************************************
    521                                 ;TEST THAT NOOP WILL FUNCTION.  WE WILL ISSUE THE
    522                                 ;NOOP AND WAIT FOR CONTROLLER READY TO SET.  A
    523                                 ;TIMEOUT OF 200 MILLISECS IS ALLOWED.  DRIVE 0 IS ALWAYS
    524                                 ;SELECTED SINCE THE DRIVE IS NOT NECESSARY.
    525 017220                          STARS
                                        ;;**********************************************************************
    526
    527
    528 017220  022737  000001  002410          CMP     #1,T.CNTLR      ;RLV11, OR RLV12?
    529 017226  001010                          BNE     99$             ;YES SKIP TEST
    530
    531
    532 017230  004537  013420                  JSR     R5,LDFUNC       ;ISSUE FUNCTION OF FOLLOWING WORD
    533 017234  000000                          NOOP0                   ;NOOP(0) FUNCTION
    534 017236  004537  014306                  JSR     R5,WTCRDY       ;WAIT FOR CONTROLLER READY HIGH
    535 017242                          2$:     CKLOOP                  ;CHECK IF /FL:LOE IS SET
        017242  104406                          TRAP    C$CLP1
    536
    537 017244  004537  013120                  JSR     R5,CHERR        ;CHECK CONTROLLER FOR ERRORS
    538
    539 017250                          99$:
    540 017250                          ENDTST                          ;****END OF TEST****
        017250                          L10045:
        017250  104401                          TRAP    C$ETST
    541
    542
    543                                 .SBTTL  **TEST 22** - TEST NOOP DOES NOTHING (RL11 ONLY)
    544
    545 017252                          BGNTST                          ;****START OF TEST****
    546
    547 017252                          STARS
                                        ;;**********************************************************************
    548                                 ;TEST THAT ISSUING A NOOP FUNCTION DOES NOTHING.  THIS IS DONE BY WRITING
    549                                 ;THE RLBA, AND RLDA, READING THE RLMP AND MAKING SURE NOTHING CHANGES.
    550 017252                          STARS
                                        ;;**********************************************************************
    551
    552 017252  022737  000001  002410          CMP     #1,T.CNTLR      ;RLV11, OR RLV12?
    553 017260  001076                          BNE     3$              ;YES SKIP TEST.
```

```
017262  012777  000001  162764          MOV     #1,@RLDA        ;LOAD DISK ADDRESS
017270  012777  000002  162754          MOV     #2,@RLBA        ;LOAD BUS ADDRESS
017276  005077  162754                  CLR     @RLMP
017302  017737  162750  002362          MOV     @RLMP,GDDAT     ;READ RLMP

017310  004537  013420                  JSR     R5,LDFUNC       ;ISSUE FUNCTION OF FOLLOWING WORD
017314  000000                          NOOPO
017316  004537  014306                  JSR     R5,WTCRDY       ;WAIT FOR CONTROLLER READY HIGH
017322                                  CKLOOP                  ;CHECK IF /FL:LOE IS SET
017322  104406                          TRAP    C$CLP1

017324  004537  013120                  JSR     R5,CHERR        ;CHECK CONTROLLER FOR ERRORS
017330                                  ESCAPE  TST             ;IF /FL:LOE SET LOOP, ELSE EXIT TST
017330  104410                          TRAP    C$ESCAPE
017332  000124                          .WORD   L10046-.

017334  017737  162716  002364          MOV     @RLMP,BDDAT     ;READ RLMP
017342  023737  002362  002364          CMP     GDDAT,BDDAT     ;RLMP OK?
017350  001404                          BEQ     1$

017352                                  ERRDF   202.,EM14,ERR2
017352  104455                          TRAP    C$ERDF
017354  000312                          .WORD   202
017356  005304                          .WORD   EM14
017360  010210                          .WORD   ERR2

017362                          1$:     CKLOOP                  ;CHECK IF /FL:LOE IS SET
017362  104406                          TRAP    C$CLP1

017364  012737  000002  002362          MOV     #2,GDDAT        ;SET UP EXP'D BA
017372  017737  162654  002364          MOV     @RLBA,BDDAT     ;READ BA
017400  023737  002362  002364          CMP     GDDAT,BDDAT     ;BA OK?
017406  001404                          BEQ     2$              ;YES

017410                                  ERRDF   203.,EM15,ERR2
017410  104455                          TRAP    C$ERDF
017412  000313                          .WORD   203
017414  005332                          .WORD   EM15
017416  010210                          .WORD   ERR2

017420                          2$:     CKLOOP                  ;CHECK IF /FL:LOE IS SET
017420  104406                          TRAP    C$CLP1

017422  012737  000001  002362          MOV     #1,GDDAT        ;SET UP EXP'D DA
017430  017737  162620  002364          MOV     @RLDA,BDDAT     ;READ DA
017436  023737  002362  002364          CMP     GDDAT,BDDAT     ;DA OKAY
017444  001404                          BEQ     3$

017446                                  ERRDF   204.,EM16,ERR2
017446  104455                          TRAP    C$ERDF
017450  000314                          .WORD   204
017452  005360                          .WORD   EM16
017454  010210                          .WORD   ERR2

017456                          3$:
```

```
                                ENDTST                          ;****END OF TEST****
                                L10046:
017456  104401                          TRAP    C$ETST

                                .SBTTL  **TEST 23** - TEST OF INTERRUPT (RL11 ONLY)

                                BGNTST                          ;****START OF TEST****

                                STARS
                                ;;*****************************************************************
                                ;CHECK THE INTERRUPT WITH A NOOP.  WE WILL SET UP THE
                                ;INTERRUPT VECTOR, LOWER THE PSW TO ZERO AND ISSUE
                                ;A NOOP.  THE INTERRUPT SERVICE ROUTINE WILL SET A
                                ;FLAG UPON INTERRUPT AND RETURN IN LINE.  WE WAIT 200 MILLISECONDS
                                ;LOOKING FOR THAT FLAG TO BE SET BEFORE CALLING IT
                                ;AN ERROR.  IF THE INTERRUPT SENDS US TO ANOTHER
                                ;VECTOR ADDRESS THEN THE ERROR HANDLER WILL REPORT
                                ;"TRAP TO XXXX FROM YYYY" AND RETURN  TO DIAG SUP MONITOR.  IF THE
                                ;INTERRUPT GOES TO ABOVE 1000 WHO KNOWS WHAT WILL HAPPEN.
                                STARS
                                ;;*****************************************************************

017460  022737  000001  002410          CMP     #1,T.CNTLR      ;RLV11 OR RLV12?
017466  001026                          BNE     99$             ;YES SKIP TEST.

017470  005037  002330                  CLR     INTFLG          ;CLEAR INTERRUPT OCCURRENCE FLAG
017474                                  SETPRI  #PRI00          ;SET PSW TO 0
017474  012700  000000                  MOV     #PRI00,R0
017500  104441                          TRAP    C$SPRI
017502  004537  013420                  JSR     R5,LDFUNC       ;ISSUE FUNCTION OF FOLLOWING WORD
017506  000100                          NOOP0!INTEN             ;NOOP AND INTERRUPT ENABLE
017510  004537  014306                  JSR     R5,WTCRDY       ;WAIT FOR CONTROLLER READY HIGH
017514  005737  002330                  TST     INTFLG          ;DID INTERRUPT OCCUR
017520  001004                          BNE     2$              ;IF SO BRANCH
017522                                  ERRDF   22.,EM13,ERR0
017522  104455                          TRAP    C$ERDF
017524  000026                          .WORD   22
017526  005252                          .WORD   EM13
017530  010160                          .WORD   ERR0
017532  005037  002330          2$:     CLR     INTFLG
017536                                  CKLOOP                  ;CHECK IF /FL:LOE IS SET
017536  104406                          TRAP    C$CLP1
017540  004537  013120                  JSR     R5,CHERR        ;CHECK CONTROLLER FOR ERRORS

                                99$:
                                ENDTST                          ;****END OF TEST****
                                L10047:
017544  104401                          TRAP    C$ETST

                                .SBTTL  **TEST 24** - TEST PRIORITY BR LEVEL

                                BGNTST                          ;****START OF TEST****
```

```
                                        STARS
                                        ;;*****************************************************************
                                        ;TEST THAT PRIORITY GIVEN IS ACTUAL PRIORITY OF CONTROLLER.  WE KNOW
                                        ;THE BOARD WILL INTERRUPT.  WE WILL START TRYING TO INTERRUPT AT 7
                                        ;AND WORK DOWN TIL IT DOES INTERRUPT.
                                        STARS
                                        ;;*****************************************************************

017546  022737  000001  002410          CMP     #1,T.CNTLR              ;RLV11??
017554  002456                          BLT     6$                      ;YES, SKIP TEST

017556  012737  000340  002364          MOV     #340,BDDAT              ;SET UP INITIAL OF 7
017564  013737  002264  002362          MOV     BPRIOR,GDDAT            ;GET GIVEN PRIORITY

017572                          BGNSEG                                  ;****START OF SEGMENT****
017572  104404                          TRAP    C$BSEG

017574  005037  002330          5$:     CLR     INTFLG                  ;CLEAR INTERRUPT OCCURRENCE
017600                                  SETPRI  BDDAT                   ;SET PRIORITY
017600  013700  002364                  MOV     BDDAT,R0
017604  104441                          TRAP    C$SPRI

017606  004537  013420                  JSR     R5,LDFUNC               ;ISSUE FUNCTION OF FOLLOWING WORD
017612  000100                          NOOP0!INTEN

017614  004537  014306                  JSR     R5,WTCRDY               ;WAIT FOR CONTROLLER READY HIGH
017620                                  ESCAPE  TST                     ;IF /FL:LOE SET LOOP, ELSE EXIT TST
017620  104410                          TRAP    C$ESCAPE
017622  000070                          .WORD   L10050-.

017624  004537  013120                  JSR     R5,CHERR                ;CHECK CONTROLLER FOR ERRORS
017630                                  ESCAPE  TST                     ;IF /FL:LOE SET LOOP, ELSE EXIT TST
017630  104410                          TRAP    C$ESCAPE
017632  000060                          .WORD   L10050-.

017634  023737  002364  002362          CMP     BDDAT,GDDAT             ;SHOULD IT INTERRUPT
017642  002012                          BGE     1$                      ;NO, BRANCH

017644  005737  002330                  TST     INTFLG                  ;DID INTERRUPT OCCUR
017650  001004                          BNE     2$                      ;YES, OK

017652                          3$:     ERRDF   204,EM17,ERR7
017652  104455                          TRAP    C$ERDF
017654  000314                          .WORD   204
017656  005406                          .WORD   EM17
017660  010446                          .WORD   ERR7

017662                          2$:     ESCAPE  SEG                     ;IF /FL:LOE SET LOOP, ELSE EXIT SEG
017662  104410                          TRAP    C$ESCAPE
017664  000014                          .WORD   10000$-.
017666  000405                          BR      4$
017670  005737  002330          1$:     TST     INTFLG                  ;DID INTERRUPT OCCUR
017674  001772                          BEQ     2$                      ;NO, OK
017676  000765                          BR      3$                      ;YES, ERROR

017700                          ENDSEG                                  ;****END OF SEGMENT****
017700                          10000$:
```

```
**TEST 24** - TEST PRIORITY BR LEVEL

     017700  104405                          TRAP    C$ESEG
679  017702  162737  000040  002364  4$:     SUB     #40,BDDAT       ;NEXT LEVEL
680  017710  100331                          BPL     5$
681
682  017712                          6$:
683  017712                          ENDTST                          ;****END OF TEST****
     017712                          L10050:
     017712  104401                          TRAP    C$ETST
684
685                                  .SBTTL  **TEST 25** - GET STATUS FUNCTION
686
687  017714                          BGNTST                          ;****START OF TEST****
688
689
690  017714                          STARS
                                     ;;*****************************************************************
691                                  ;TEST GET STATUS FUNCTION.  THE GET STATUS FUNCTION WILL
692                                  ;WORK IF DRIVE IS LOADED AND READY OR NOT.  THE RLDA
693                                  ;IS LOADED WITH THE GET STATUS AND MARKER BITS (BITS 1,0)
694                                  ;AND THE FUNCTION IS ISSUED.  WE WAIT 200 MILLISECONDS
695                                  ;FOR CONTROLLER READY.  VERIFY THAT NO ERRORS OCCUR.
696  017714                          STARS
                                     ;;*****************************************************************
697
698
699  017714  012777  000013  162332          MOV     #GSBIT!MK!DRST,@RLDA    ;SET GET STATUS AND MARKER BIT
700  017722  004537  013420                  JSR     R5,LDFUNC       ;ISSUE FUNCTION OF FOLLOWING WORD
701  017726  000004                          GSTAT                   ;GET STATUS
702  017730  004537  014306                  JSR     R5,WTCRDY       ;WAIT FOR CONTROLLER READY HIGH
703  017734                          2$:     CKLOOP                  ;CHECK IF /FL:LOE IS SET
     017734  104406                          TRAP    C$CLP1
704
705  017736  004537  013120                  JSR     R5,CHERR        ;CHECK CONTROLLER FOR ERRORS
706
707  017742                          ENDTST                          ;****END OF TEST****
     017742                          L10051:
     017742  104401                          TRAP    C$ETST
708
709
710                                  .SBTTL  **TEST 26** - GET STATUS FUNCTION INTERRUPT
711
712  017744                          BGNTST                          ;****START OF TEST****
713
714                                  ;CHECK GET STATUS UNDER INTERRUPT
715
716  017744  005037  002330                  CLR     INTFLG          ;CLEAR INTERRUPT OCCURANCE
717  017750                          SETPRI  #PRI00                  ;PSW TO LEVEL 0
     017750  012700  000000                  MOV     #PRI00,R0
     017754  104441                          TRAP    C$SPRI
718  017756  012777  000003  162270          MOV     #GSBIT!MK,@RLDA ;SET UP DA
719  017764  004537  013420                  JSR     R5,LDFUNC       ;ISSUE FUNCTION OF FOLLOWING WORD
720  017770  000104                          GSTAT!INTEN             ;GET STATUS, INT ENABLE
721  017772  004537  014306                  JSR     R5,WTCRDY       ;WAIT FOR CONTROLLER READY HIGH
722  017776                          SETPRI  #PRI07
     017776  012700  000340                  MOV     #PRI07,R0
     020002  104441                          TRAP    C$SPRI
723  020004  005737  002330                  TST     INTFLG          ;DID INTERRUPT OCCUR
```

```
**TEST 26** - GET STATUS FUNCTION INTERRUPT

724 020010  001004                        BNE     2$                ;YES-BRANCH
725 020012                                 ERRDF   28.,EM30,ERR0
    020012  104455                         TRAP    C$ERDF
    020014  000034                         .WORD   28
    020016  005441                         .WORD   EM30
    020020  010160                         .WORD   ERR0
726 020022                          2$:    CKLOOP                    ;CHECK IF /FL:LOE IS SET
    020022  104406                         TRAP    C$CLP1
727 020024  004537  013120                 JSR     R5,CHERR          ;CHECK CONTROLLER FOR ERRORS
728 020030  005037  002330                 CLR     INTFLG            ;CLEAR INTERRUPT OCCURANCE
729 020034                                 SETPRI  #PRI00            ;PSW TO LEVEL 0
    020034  012700  000000                 MOV     #PRI00,R0
    020040  104441                         TRAP    C$SPRI
730 020042  012777  000003  162204         MOV     #GSBIT!MK,@RLDA   ;SET UP DA FOR GET STATUS CMD
731 020050  004537  013420                 JSR     R5,LDFUNC         ;ISSUE FUNCTION OF FOLLOWING WORD
732 020054  000004                         GSTAT                     ;GET STATUS - SHOULD NOT CAUSE AN INTERRUPT
733 020056  004537  014306                 JSR     R5,WTCRDY         ;WAIT FOR CONTROLLER READY HIGH
734 020062                                 SETPRI  #PRI07
    020062  012700  000340                 MOV     #PRI07,R0 ----------------------------------------------------------------------
    020066  104441                         TRAP    C$SPRI
735 020070  005737  002330                 TST     INTFLG            ;DID INTERRUPT OCCUR (SHOULD NOT)
736 020074  001404                         BEQ     3$                ;NO - BRANCH (OK)
737 020076                                 ERRDF   281.,EM30A,ERR0
    020076  104455                         TRAP    C$ERDF
    020100  000431                         .WORD   281
    020102  005500                         .WORD   EM30A
    020104  010160                         .WORD   ERR0
738 020106                          3$:    CKLOOP                    ;CHECK IF /FL:LOE IS SET
    020106  104406                         TRAP    C$CLP1
739 020110  004537  013120                 JSR     R5,CHERR          ;CHECK CONTROLLER FOR ERRORS
740 020114                          ENDTST                           ;****END OF TEST****
    020114                          L10052:
    020114  104401                         TRAP    C$ETST
741
742
743                                        .SBTTL  **TEST 27** - GET STATUS FUNCTION GENERATES OPI W/O GS BIT
744
745 020116                                 BGNTST                           ;****START OF TEST****
746
747 020116                                 STARS
                                           ;;************************ ****************************************
748                                        ;VERIFY THAT GET STATUS FUNCTION WILL NOT COMPLETE
749                                        ;WITHOUT SENDING OUT THE GET STATUS BIT IN THE RLDA.
750                                        ;WE SET MARKER BUT NO GET STATUS BIT IN THE RLDA AND
751                                        ;ISSUE A GET STATUS WE SHOULD RECIEVE AN OPI ERROR.
752                                        ;VERIFY THAT CONTROLLER READY SETS AND OPI SETS
753 020116                                 STARS
                                           ;;**********************************************************************
754
755
756 020116  012777  000001  162130         MOV     #MK,@RLDA         ;SET ONLY MARKER BIT!!
757 020124  004537  013420                 JSR     R5,LDFUNC         ;ISSUE FUNCTION OF FOLLOWING WORD
758 020130  000004                         GSTAT                     ;GET STATUS
759 020132  004537  014306                 JSR     R5,WTCRDY         ;WAIT FOR CONTROLLER READY HIGH
760 020136  032737  074000  002306         BIT #74000,E.CS
761 020144  001405                         BEQ     1$
762 020146  012737  004053  013402         MOV     #OPIERR,RESTMS
```

```
**TEST 27** - GET STATUS FUNCTION GENERATES OPI W/O GS BIT

    763 020154  004537  013120                 JSR     R5,CHERR
    764 020160                          1$:     CKLOOP
        020160  104406                         TRAP    C$CLP1
    765 020162  032737  002000  002306         BIT     #OPI,E.CS       ;IS OPI SET?
    766 020170  001004                         BNE     2$              ;YES-BRANCH NO-CHECK TIMEOUT
    767 020172                                 ERRDF   29.,EM33,ERR0
        020172  104455                         TRAP    C$ERDF
        020174  000035                         .WORD   29
        020176  005574                         .WORD   EM33
        020200  010160                         .WORD   ERR0
    768 020202                          2$:
    769
    770 020202                          ENDTST                          ;****END OF TEST****
        020202                          L10053:
        020202  104401                         TRAP    C$ETST
    771
    772
    773                                 .SBTTL  **TEST 28** - OPI UNDER INTERRUPT
    774
    775 020204                          BGNTST                          ;****START OF TEST****
    776 020204                          STARS
                                        ;;**************************************************************************
    777                                 ;FORCE AN OPI ERROR UNDER INTERRUPT TO VERIFY THAT
    778                                 ;AN INTERRUPT WILL OCCUR FROM OPI.  THE OPI IS FORCED
    779                                 ;USING A GET STATUS WITHOUT THE GET STATUS BIT SET
    780                                 ;IN RLDA.
    781 020204                          STARS
                                        ;;**************************************************************************
    782
    783
    784 020204                                 SETPRI  #PRI00
        020204  012700  000000                 MOV     #PRI00,R0
        020210  104441                         TRAP    C$SPRI
    785 020212  005037  002330                 CLR     INTFLG
    786 020216  012777  000001  162030         MOV     #MK,@RLDA       ;SET ONLY MARKER BIT!!
    787 020224  004537  013420                 JSR     R5,LDFUNC       ;ISSUE FUNCTION OF FOLLOWING WORD
    788 020230  000104                         GSTAT!INTEN             ;GET STATUS
    789 020232  004537  014306                 JSR     R5,WTCRDY       ;WAIT FOR CONTROLLER READY HIGH
    790 020236                                 SETPRI  #PRI07
        020236  012700  000340                 MOV     #PRI07,R0
        020242  104441                         TRAP    C$SPRI
    791 020244  005737  002330                 TST     INTFLG          ;INTERRUPT OCCUR
    792 020250  001004                         BNE     2$
    793 020252                                 ERRDF   30.,EM11,ERR0
        020252  104455                         TRAP    C$ERDF
        020254  000036                         .WORD   30
        020256  005211                         .WORD   EM11
        020260  010160                         .WORD   ERR0
    794 020262                          2$:    CKLOOP                  ;CHECK IF /FL:LOE IS SET
        020262  104406                         TRAP    C$CLP1
    795 020264  032737  074000  002306         BIT     #74000,E.CS
    796 020272  001405                         BEQ     1$
    797 020274  012737  004053  013402         MOV     #OPIERR,RESTMS
    798 020302  004537  013120                 JSR     R5,CHERR
    799 020306                          1$:    CKLOOP
        020306  104406                         TRAP    C$CLP1
    800 020310  032737  002000  002306         BIT     #OPI,E.CS       ;IS OPI SET?
```

```
**TEST 28** - OPI UNDER INTERRUPT

                                        BNE     3$              ;YES-BRANCH NO-CHECK TIMEOUT
                                        ERRDF   31.,EM33,ERR0
                                        TRAP    C$ERDF
                                        .WORD   31
                                        .WORD   EM33
                                        .WORD   ERR0
                                3$:

                                ENDTST                          ;****END OF TEST****
                                L10054:
                                        TRAP    C$ETST

                                .SBTTL  **TEST 29** - READ HEADER FUNCTION


                                BGNTST                          ;****START OF TEST****
                                STARS
                                ;;**************************************************************************
                                ;CHECK THAT READ HEADER WORKS, THAT WE CAN ISSUE
                                ;IT, GET READY BACK WITHOUT ANY ERRORS SETTING.
                                STARS
                                ;;**************************************************************************

020332  004537  013420                JSR     R5,LDFUNC       ;ISSUE FUNCTION OF FOLLOWING WORD
020336  000010                        RDHDR                   ;READ HEADER
020340  004537  014306                JSR     R5,WTCRDY       ;WAIT FOR CONTROLLER READY HIGH READY
020344                          2$:   CKLOOP                  ;CHECK IF /FL:LOE IS SET
020344  104406                        TRAP    C$CLP1
020346  004537  013120                JSR     R5,CHERR        ;CHECK CONTROLLER FOR ERRORS

                                ENDTST                          ;****END OF TEST****
                                L10055:
                                        TRAP    C$ETST

                                .SBTTL  **TEST 30** - READ HEADER FUNCTION INTERRUPT


                                BGNTST                          ;****START OF TEST****

                                STARS
                                ;;**************************************************************************
                                ;CHECK THAT READ HEADER WILL GENERATE AN INTERRRUPT
                                ;UPON COMPLETION WITHOUT ANY ERRORS SETTING
                                STARS
                                ;;**************************************************************************


020354                                  SETPRI  #PRI00          ;PSW TO 0
020354  012700  000000                  MOV     #PRI00,R0
020360  104441                          TRAP    C$SPRI
020362  005037  002330                  CLR     INTFLG          ;CLEAR INTERRUPT OCCURENCE
020366  004537  013420                  JSR     R5,LDFUNC       ;ISSUE FUNCTION OF FOLLOWING WORD
020372  000111                          RDHDR!INTEN             ;READ HEADER, INTR. ENA
020374  004537  014306                  JSR     R5,WTCRDY       ;WAIT FOR CONTROLLER READY HIGH
020400                                  SETPRI  #PRI07
020400  012700  000340                  MOV     #PRI07,R0
020404  104441                          TRAP    C$SPRI
020406  005737  002330                  TST     INTFLG          ;INTERRUPT HAPPEN
020412  001004                          BNE     2$              ;YES-CONTINUE
```

```
**TEST 30** - READ HEADER FUNCTION INTERRUPT

    841 020414                                      ERRDF   35.,EM37,ERR0
        020414  104455                              TRAP    C$ERDF
        020416  000043                              .WORD   35
        020420  005716                              .WORD   EM37
        020422  010160                              .WORD   ERR0
    842 020424                          2$:         CKLOOP                  ;CHECK IF /FL:LOE IS SET
        020424  104406                              TRAP    C$CLP1
    843
    844 020426  004537  013120                      JSR     R5,CHERR        ;CHECK CONTROLLER FOR ERRORS
    845
    846 020432                          ENDTST                              ;****END OF      .***
        020432                          L10056:
        020432  104401                              TRAP    C$ETST
    847
    848
    849                                 .SBTTL  **TEST 31** - REPEATED RD HDRS YIELD SAME CYL AND HD
    850
    851 020434                          BGNTST                              ;****START OF TEST****
    852
    853
    854 020434                          STARS
                                        ;;*****************************************************************
    855                                 ;CHECK THAT READ HEADERS WILL RELIABLY READ THE SAME
    856                                 ;CYLINDER AND HEAD SELECT.  WE WILL READ HEADERS VERIFYING
    857                                 ;THAT WE ALWAYS READ THE SAME CYLINDER AND HEAD SELECT.
    858 020434                          STARS
                                        ;;*****************************************************************
    859
    860
    861 020434  012701  000144                      MOV     #100.,R1        ;SET UP TO DO 100 RD HDR'S
    862 020440  004537  013420                      JSR     R5,LDFUNC       ;ISSUE FUNCTION OF FOLLOWING WORD
    863 020444  000010                              RDHDR                   ;READ HEADER
    864 020446  004537  014306                      JSR     R5,WTCRDY       ;WAIT FOR CONTROLLER READY HIGH
    865 020452                          99$:        ESCAPE  TST             ;IF /FL:LOE SET LOOP, ELSE EXIT TST
        020452  104410                              TRAP    C$ESCAPE
        020454  000122                              .WORD   L10057-.
    866
    867 020456  004537  013120                      JSR     R5,CHERR        ;CHECK CONTROLLER FOR ERRORS
    868 020462                                      ESCAPE  TST             ;IF /FL:LOE SET LOOP, ELSE EXIT TST
        020462  104410                              TRAP    C$ESCAPE
        020464  000112                              .WORD   L10057-.
    869
    870 020466  013737  002314  002362              MOV     E.MP,GDDAT      ;READ FIRST HEADER (ASSUME GOOD)
    871 020474  043737  002334  002362              BIC     SECMSK,GDDAT    ;MASK AWAY SECTOR BITS
    872 020502                          BGNSEG                              ;****START OF SEGMENT****
        020502  104404                              TRAP    C$BSEG
    873 020504                          2$:
    874 020504  004537  013420                      JSR     R5,LDFUNC       ;ISSUE FUNCTION OF FOLLOWING WORD
    875 020510  000010                              RDHDR
    876 020512  004537  014306                      JSR     R5,WTCRDY       ;WAIT FOR CONTROLLER READY HIGH
    877 020516                          97$:        ESCAPE  SEG             ;IF /FL:LOE SET LOOP, ELSE EXIT SEG
        020516  104410                              TRAP    C$ESCAPE
        020520  000054                              .WORD   10000$-.
    878
    879 020522  004537  013120                      JSR     R5,CHERR        ;CHECK CONTROLLER FOR ERRORS
    880 020526                                      ESCAPE  SEG             ;IF /FL:LOE SET LOOP, ELSE EXIT SEG
        020526  104410                              TRAP    C$ESCAPE
```

```
020530  000044                              .WORD   10000$-.

020532  013737  002314  002364              MOV     E.MP,BDDAT      ;READ HEADER
020540  043737  002334  002364              BIC     SECMSK,BDDAT    ;MASK AWAY SECTOR BITS
020546  023737  002362  002364              CMP     GDDAT,BDDAT     ;IS HEADER CORRECT
020554  001404                              BEQ     4$

020556                                      ERRDF   36.,EM41,ERR4
020556  104455                              TRAP    C$ERDF
020560  000044                              .WORD   36
020562  005756                              .WORD   EM41
020564  010324                              .WORD   ERR4
                                                                    ;CONSTANT CYL & HS
020566                              4$:     CKLOOP                  ;CHECK IF /FL:LOE IS SET
020566  104406                              TRAP    C$CLP1

020570  005301                              DEC     R1              ;PERFORM ALL READ HDR'S
020572  001344                              BNE     2$              ;IF NOT GO BACK AND DO ANOTHER
020574                              ENDSEG                          ;****END OF SEGMENT****
020574                              10000$:
020574  104405                              TRAP    C$ESEG
020576                              ENDTST                          ;****END OF TEST****
020576                              L10057:
020576  104401                              TRAP    C$ETST



                                    .SBTTL  **TEST 32** - CHECK OF HEADER CRC

020600                              BGNTST                          ;****START OF TEST****

020600                              STARS
                                    ;;*****************************************************************
                                    ;CHECK THAT WE CAN READ THE HDCRC AFTER A
                                    ;READ HEADER AND THAT IT IS THE CORRECT CRC
                                    ;FOR THE HEADER.
020600                              STARS
                                    ;;*****************************************************************


020600  005037  020650                      CLR     3$
020604  004537  013420                      JSR     R5,LDFUNC       ;ISSUE FUNCTION OF FOLLOWING WORD
020610  000010                              RDHDR                   ;READ HEADER
020612  004537  014306                      JSR     R5,WTCRDY       ;WAIT FOR CONTROLLER READY HIGH
020616                                      ESCAPE  TST             ;IF /FL:LOE SET LOOP, ELSE EXIT TST
020616  104410                              TRAP    C$ESCAPE
020620  000114                              .WORD   L10060-.

020622  004537  013120                      JSR     R5,CHERR        ;CHECK CONTROLLER FOR ERRORS
020626                                      ESCAPE  TST             ;IF /FL:LOE SET LOOP, ELSE EXIT TST
020626  104410                              TRAP    C$ESCAPE
020630  000104                              .WORD   L10060-.

020632  013737  002314  020646              MOV     E.MP,2$         ;READ HEADER WORD CONTAINS SEC, HD, CYL

020640  004537  014032                      JSR     R5,SIMBCC       ;GO CALCULATE CRC
020644  000020                              16.                     ;16 BITS
020646  000000                      2$:     .WORD   0               ;HEADER GOES HERE
```

TEST 32 - CHECK OF HEADER CRC

```
                                3$:     .WORD   0                       ;START WITH 0 CRC
020650  000000
020652  013737  002344  020676        MOV     CALBCC,5$
020660  013737  002316  020674        MOV     E.MP1,4$                ;GET SECOND WORD IN SILO, CONTAINS 0'S
020666  004537  014032                JSR     R5,SIMBCC
020672  000020                        16.
020674  000000                4$:     .WORD   0
020676  000000                5$:     .WORD   0
020700  013737  002344  002362        MOV     CALBCC,GDDAT            ;STORE CALCULATED CRC AS GOOD
020706  013737  002320  002364        MOV     E.MP2,BDDAT             ;THIRD READ OF MP SILO GETS CRC
020714  023737  002362  002364        CMP     GDDAT,BDDAT             ;IS CRC CORRECT?
020722  001404                        BEQ     6$                      ;IF SO CONTINUE

020724                                ERRDF   37.,EM42,ERR4
020724  104455                        TRAP    C$ERDF
020726  000045                        .WORD   37
020730  006047                        .WORD   EM42
020732  010324                        .WORD   ERR4
020734                          6$:

020734                          ENDTST                                  ;****END OF TEST****
020734                          L10060:
020734  104401                        TRAP    C$ETST


                                .SBTTL  **TEST 33** - CHECK CONSECUTIVE HEADERS

020736                          BGNTST                                  ;****START OF TEST****


020736                          STARS
                                ;;**********************************************************************
                                ;CHECK THAT THE HEADERS ARE CONSECUTIVE.  WE WILL DO
                                ;40 (FORTY) READ HEADERS AND STORE EACH.  AFTER WE HAVE
                                ;READ THE FORTIETH HEADER WE WILL VERIFY THAT
                                ;THEY CAME IN SEQUENTIAL, THAT 0 FOLLOWS 39,
                                ;THAT THERE WERE NO ERRORS.
020736                          STARS
                                ;;**********************************************************************


020736  005037  002366                CLR     FIRST                   ;CLEAR FIRST READ DONE FLAG
020742  012703  003274                MOV     #HDRBUF,R3              ;STORE HEADERS
020746  012701  000050                MOV     #40.,R1                 ;FORTY HEADERS
020752  012737  000210  002272        MOV     #RDHDR!CRDY,B.CS
020760  053737  002270  002272        BIS     DRIVE,B.CS
020766  013777  002272  161254        MOV     B.CS,@RLCS
020774  042777  000200  161246  2$:   BIC     #200,@RLCS
021002  032777  000200  161240  1$:   BIT     #200,@RLCS              ;DONE?
021010  001774                        BEQ     1$
021012  017723  161232                MOV     @RLCS,(R3)+
021016  017723  161234                MOV     @RLMP,(R3)+
021022  017723  161230                MOV     @RLMP,(R3)+
021026  017723  161224                MOV     @RLMP,(R3)+
021032  005301                        DEC     R1                      ;HAVE WE READ FORTY HEADERS
021034  001357                        BNE     2$                      ;GO BACK UNTIL FOURTY DONE
021036  012703  003274                MOV     #HDRBUF,R3              ;GET LIST OF HEADERS
021042  012701  000050                MOV     #40.,R1                 ;CHECK FORTY OF THEM
```

TEST 33 - CHECK CONSECUTIVE HEADERS

```
                                                MOV     (R3),E.CS
                                                TST     E.CS
                                                BPL     99$
                                                MOV     #RHDMES,RESTMS
                                                TST     (R3)+
                                                MOV     (R3)+,E.MP
                                                MOV     (R3)+,E.MP1
                                                MOV     (R3)+,E.MP2
                                                JSR     R5,CHERR        ;CHECK CONTROLLER FOR ERRORS
                                                JMP     7$
                                        99$:    TST     (R3)+
                                                MOV     (R3),BDDAT      ;GET HEADER
                                                TST     FIRST           ;IS THIS FIRST READ?
                                                BNE     4$              ;NO, BRANCH
                                                MOV     #1,FIRST        ;SET FIRST READ DONE FLAG
                                        3$:     MOV     BDDAT,GDDAT     ;SET UP NEXT READ EXPECTED
                                                BR      6$              ;GO SEE IF TEST IS DONE
                                        4$:     INC     GDDAT           ;INCREMENT EXP'D HEADER
                                                CMP     BDDAT,GDDAT     ;IS NEW HEADER SEQUENTIAL?
                                                BEQ     3$              ;YES THEN BRANCH
                                                BIT     SECMSK,BDDAT    ;IS NEW HEADER ZERO?
                                                BNE     5$              ;NO, THEN ERROR GO REPORT IT
                                                MOV     GDDAT,TEMP2     ;YES, CHECK IF LAST HEADER WAS
                                                BIC     CYLMSK,TEMP2    ;MAX ADDRESS, IF SO BRANCH
                                                CMP     MXSEC1,TEMP2    ;STORE NEW DATA AS OLD
                                                BEQ     3$              ;AND PERFORM NEW RD HDR
                                                BIC     SECMSK,GDDAT    ;EXPECTING ZERO SECTOR

                                        5$:

                                                CLR     FIRST           ;ERROR WILL MAKE US MISS
                                                                        ;NEXT SECTOR SEQUENTIALLY
                                                                        ;START OVER; CLEAR FIRST FLAG
                                                ERRDF   38.,EM43,ERR2
                                                TRAP    C$ERDF
                                                .WORD   38
                                                .WORD   EM43
                                                .WORD   ERR2
                                        6$:     CKLOOP                  ;CHECK IF /FL:LOE IS SET
                                                TRAP    C$CLP1

                                                ADD     #6,R3
                                                DEC     R1              ;HAVE WE DONE THIS ENOUGH
                                                BNE     99$             ;NO, GO BACK DO IT AGAIN
                                        7$:
                                        ENDTST                          ;****END OF TEST****
                                        L10061:
                                                TRAP    C$ETST


                                        .SBTTL  **TEST 34** - SEEK FUNCTION

                                        BGNTST                          ;****START OF TEST****
                                        STARS
                                        ;;*****************************************************************
                                        ;CHECK THE SEEK FUNCTION RETURNS CONTROLLER READY
                                        ;WITH NO ERRORS.  WE ISSUE A ONE TRACK IN WORD SEEK.
```

```
**TEST 34** - SEEK FUNCTION

                                        ;WE DO NOT CHECK THE RESULT FOR POSITION
021254                                  STARS
                                        ;;*****************************************************************

021254  012777  000205  160772          MOV     #BIT7!MK!SIGN,@RLDA  ;SET UP DA-DIFF=1,MARKER,TOWARDS
021262  004537  013420                  JSR     R5,LDFUNC       ;ISSUE FUNCTION OF FOLLOWING WORD
021266  000006                          SEEK                    ;SEEK
021270  004537  014306                  JSR     R5,WTCRDY       ;WAIT FOR CONTROLLER READY HIGH
021274  012737  000010  002414          MOV     #8.,DLYCNT      ;INITIALIZE DELAY COUNT
021302                                  DELAY   250.            ;IMPLEMENT TIME DELAY
021302  012727  000372                  MOV     #250.,(PC)+
021306  000000                          .WORD   0
021310  013727  002116                  MOV     L$DLY,(PC)+
021314  000000                          .WORD   0
021316  005367  177772                  DEC     -6(PC)
021322  001375                          BNE     .-4
021324  005367  177756                  DEC     -22(PC)
021330  001367                          BNE     .-20
021332  005337  002414                  DEC     DLYCNT          ;DECREMENT DELAY COUNT
021336  001361                          BNE     WAIT1           ;BRANCH IF DELAY NOT EXPIRED
021340                                  CKLOOP                  ;CHECK IF /FL:LOE IS SET
021340  104406                          TRAP    C$CLP1
021342  004537  013120                  JSR     R5,CHERR        ;CHECK CONTROLLER FOR ERRORS

021346                                  ENDTST                  ;****END OF TEST****
021346                                  L10062:
021346  104401                          TRAP    C$ETST


                                        .SBTTL  **TEST 35** - CHECK DRIVE READY ON SEEK

021350                                  BGNTST                          ;****START OF TEST****


021350                                  STARS
                                        ;;*****************************************************************
                                        ;CHECK THE SEEK FUNCTION RETURNS DRIVE READY WITH
                                        ;NO ERRORS.  WE ISSUE A ONE TRACK INWARD SEEK.  WE DO
                                        ;NOT CHECK THE RESULT FOR POSITION
021350                                  STARS
                                        ;;*****************************************************************


021350  012777  000201  160676          MOV     #BIT7!MK,@RLDA  ;SET DA, MARKER, DIFF=1.
021356  004537  013420                  JSR     R5,LDFUNC       ;ISSUE FUNCTION OF FOLLOWING WORD
021362  000006                          SEEK                    ;SEEK
021364  004537  014306                  JSR     R5,WTCRDY       ;WAIT FOR CONTROLLER READY HIGH
021370                                  CKLOOP                  ;CHECK IF /FL:LOE IS SET
021370  104406                          TRAP    C$CLP1

021372  004537  013120                  JSR     R5,CHERR        ;CHECK CONTROLLER FOR ERRORS
021376                                  CKLOOP                  ;CHECK IF /FL:LOE IS SET
021376  104406                          TRAP    C$CLP1

021400  004537  014220                  JSR     R5,WTDRDY       ;WAIT FOR DRIVE READY
```

```
**TEST 35** - CHECK DRIVE READY ON SEEK

1061 021404                                     CKLOOP                  ;CHECK IF /FL:LOE IS SET
     021404  104406                             TRAP    C$CLP1
1062
1063 021406  004537  013120                     JSR     R5,CHERR        ;CHECK CONTROLLER FOR ERRORS
1064
1065 021412                             ENDTST                          ;****END OF TEST****
     021412                             L10063:
     021412  104401                             TRAP    C$ETST
1066
1067
1068                                    .SBTTL  **TEST 36** - SEEK FUNCTION INTERRUPT
1069
1070 021414                             BGNTST                          ;****START OF TEST****
1071
1072
1073 021414                             STARS
                                        ;;**************************************************************************
1074                                    ;CHECK THAT CONTROLLER READY RESETTING WHEN THE SEEK IS
1075                                    ;INITIATED CAUSES AN INTERRUPT BUT DRIVE READY WILL
1076                                    ;NOT.  WE ALSO MONITOR FOR ANY ERROR BITS SETTING.
1077 021414                             STARS
                                        ;;**************************************************************************
1078
1079
1080
1081
1082 021414  005037  002330                     CLR     INTFLG
1083 021420                                     SETPRI  #PRI00          ;SET PSW TO 0
     021420  012700  000000                     MOV     #PRI00,R0
     021424  104441                             TRAP    C$SPRI
1084 021426  012777  000205  160620             MOV     #BIT7!MK!SIGN,@RLDA  ;SET UP RLDA
1085 021434  004537  013420                     JSR     R5,LDFUNC       ;ISSUE FUNCTION OF FOLLOWING WORD
1086 021440  000106                             SEEK!INTEN              ;SEEK AND INTR. ENA.
1087 021442  004537  014306                     JSR     R5,WTCRDY       ;WAIT FOR CONTROLLER READY HIGH
1088 021446  000240                             NOP                     ;
1089 021450  005737  002330             1$:     TST     INTFLG          ;DID INTERRUPT OCCUR
1090 021454  001004                             BNE     2$              ;YES, GO CHECK DRDY
1091 021456                                     ERRDF   40.,EM47,ERR0
     021456  104455                             TRAP    C$ERDF
     021460  000050                             .WORD   40
     021462  006325                             .WORD   EM47
     021464  010160                             .WORD   ERR0
1092 021466                             2$:     CKLOOP                  ;CHECK IF /FL:LOE IS SET
     021466  104406                             TRAP    C$CLP1
1093
1094
1095 021470  004537  013120                     JSR     R5,CHERR        ;CHECK CONTROLLER FOR ERRORS
1096 021474                                     CKLOOP                  ;CHECK IF /FL:LOE IS SET
     021474  104406                             TRAP    C$CLP1
1097
1098 021476  005037  002330                     CLR     INTFLG          ;CLEAR INTERRUPT OCCURANCE
1099
1100
1101 021502  004537  014220                     JSR     R5,WTDRDY       ;WAIT FOR DRIVE READY
1102 021506                             5$:     CKLOOP                  ;CHECK IF /FL:LOE IS SET
     021506  104406                             TRAP    C$CLP1
1103
```

TEST 36 - SEEK FUNCTION INTERRUPT

```
1104 021510                                    SETPRI  #PRI07
     021510  012700  000340                    MOV     #PRI07,R0
     021514  104441                            TRAP    C$SPRI
1105 021516  005737  002330                    TST     INTFLG          ;DID DRIVE READY CAUSE INTERRUPT
1106 021522  001404                            BEQ     6$              ;NO, CONTINUE
1107
1108 021524                                    ERRDF   42.,EM52,ERR0
     021524  104455                            TRAP    C$ERDF
     021526  000052                            .WORD   42
     021530  006356                            .WORD   EM52
     021532  010160                            .WORD   ERR0
1109 021534                            6$:     CKLOOP                  ;CHECK IF /FL:LOE IS SET
     021534  104406                            TRAP    C$CLP1
1110
1111 021536                            ENDTST                          ;****END OF TEST****
     021536                            L10064:
     021536  104401                            TRAP    C$ETST
1112
1113
1114                                   .SBTTL  **TEST 37** - TEST DIFFERENCE WORD TRANSMISSION
1115
1116 021540                            BGNTST                          ;****START OF TEST****
1117
1118
1119
1120
1121 021540                            STARS
                                       ;;*************************************************************************
1122                                   ;VERIFY THAT THE DIFFERENCE WORD LOADS AND IS
1123                                   ;TRANSMITTED CORRECTLY.  WE WILL ISSUE SEEKS WITH THE
1124                                   ;DIFFERENCE WORD CONTAINING ALL OF THE BIT PATTERNS FLOATING 1,
1125                                   ;GROWING 1, GROWING 0 AND SHITING 0.  THE SEEK WILL
1126                                   ;START FROM TRACK 0 EACH TIME AND WILL RETURN THERE
1127                                   ;EACH, THUS BOTH DIRECTIONS FOR PATTERNS WILL BE CHECKED.
1128                                   ;READ HEADERS ARE USED TO VERIFY THE SEEK CORRECTNESS.
1129                                   ;ERRORS ARE MONITORED AND REPORTED.
1130 021540                            STARS
                                       ;;*************************************************************************
1131
1132
1133 021540  012703  002626                        MOV     #SKLST,R3       ;GET LIST OF DIFFERENCE WORDS
1134 021544                            BGNSEG                          ;****START OF SEGMENT****
     021544  104404                            TRAP    C$BSEG
1135 021546                            1$:
1136 021546  004537  013420                        JSR     R5,LDFUNC       ;ISSUE FUNCTION OF FOLLOWING WORD
1137 021552  000010                            RDHDR                   ;READ HEADER
1138 021554  004537  014306                        JSR     R5,WTCRDY       ;WAIT FOR CONTROLLER READY HIGH
1139 021560                            98$:    CKLOOP                  ;CHECK IF /FL:LOE IS SET
     021560  104406                            TRAP    C$CLP1
1140
1141 021562  004537  013120                        JSR     R5,CHERR        ;CHECK CONTROLLER FOR ERRORS
1142 021566                                    CKLOOP                  ;CHECK IF /FL:LOE IS SET
     021566  104406                            TRAP    C$CLP1
1143
1144 021570  013737  002314  002364            MOV     E.MP,BDDAT      ;READ HEADER
1145 021576  043737  002334  002364            BIC     SECMSK,BDDAT    ;CLEAR OUT SECTOR
1146 021604  001462                            BEQ     99$             ;IF ON TRACK ZERO, H.S. ZERO, OK
```

```
1147
1148                                        ;NOT ON TRACK ZERO CALCULATE DIFFERENCE WORD AND PUT IT BACK
1149                                        ;ON ZERO.
1150
1151 021606  042737  000100  002364        BIC     #RHHS,BDDAT     ;CLEAR OUT HEAD SELECT
1152 021614  013777  002364  160432        MOV     BDDAT,@RLDA     ;PUT CYLINDER AS DIFFERENCE WORD
1153 021622  052777  000001  160424        BIS     #MK,@RLDA       ;SET MARKER BIT
1154 021630  004537  013420                JSR     R5,LDFUNC       ;ISSUE FUNCTION OF FOLLOWING WORD
1155 021634  000006                        SEEK                    ;SEEK
1156 021636  004537  014306                JSR     R5,WTCRDY       ;WAIT FOR CONTROLLER READY HIGH
1157 021642                                CKLOOP                  ;CHECK IF /FL:LOE IS SET
     021642  104406                        TRAP    C$CLP1
1158
1159 021644  004537  013120                JSR     R5,CHERR        ;CHECK CONTROLLER FOR ERRORS
1160 021650                                CKLOOP                  ;CHECK IF /FL:LOE IS SET
     021650  104406                        TRAP    C$CLP1
1161
1162 021652  004537  014220                JSR     R5,WTDRDY       ;WAIT FOR DRIVE READY
1163 021656                        89$:    CKLOOP                  ;CHECK IF /FL:LOE IS SET
     021656  104406                        TRAP    C$CLP1
1164
1165 021660  004537  013120                JSR     R5,CHERR        ;CHECK CONTROLLER FOR ERRORS
1166 021664                                CKLOOP                  ;CHECK IF /FL:LOE IS SET
     021664  104406                        TRAP    C$CLP1
1167
1168 021666  004537  013420                JSR     R5,LDFUNC       ;ISSUE FUNCTION OF FOLLOWING WORD
1169 021672  000010                        RDHDR                   ;READ HEADER
1170 021674  004537  014306                JSR     R5,WTCRDY       ;WAIT FOR CONTROLLER READY HIGH
1171 021700                        96$:    CKLOOP                  ;CHECK IF /FL:LOE IS SET
     021700  104406                        TRAP    C$CLP1
1172
1173 021702  004537  013120                JSR     R5,CHERR        ;CHECK CONTROLLER FOR ERRORS
1174 021706                                CKLOOP                  ;CHECK IF /FL:LOE IS SET
     021706  104406                        TRAP    C$CLP1
1175
1176 021710  005037  002362                CLR     GDDAT           ;CLEAR EXPECTED
1177 021714  013737  002364  002376        MOV     BDDAT,DWORD     ;SAVE DIFFERENCE WORD
1178 021722  013737  002314  002364        MOV     E.MP,BDDAT      ;READ HEADER
1179 021730  043737  002334  002364        BIC     SECMSK,BDDAT    ;MASK OUT SECTOR BITS
1180 021736  001404                        BEQ     5$              ;BRANCH IF ON ZERO TRACK
1181
1182 021740                                ERRDF   43.,EM54,ERR3
     021740  104455                        TRAP    C$ERDF
     021742  000053                        .WORD   43
     021744  006426                        .WORD   EM54
     021746  010252                        .WORD   ERR3
1183 021750                        5$:     CKLOOP                  ;CHECK IF /FL:LOE IS SET
     021750  104406                        TRAP    C$CLP1
1184
1185 021752  011377  160276        99$:    MOV     (R3),@RLDA      ;GET DIFFERENCE WORD
1186 021756  052777  000005  160270        BIS     #SIGN!MK,@RLDA  ;SET SIGN (TOWARDS SPINDLE) AND MARKER
1187 021764  004537  013420                JSR     R5,LDFUNC       ;ISSUE FUNCTION OF FOLLOWING WORD
1188 021770  000006                        SEEK                    ;SEEK
1189 021772  004537  014306                JSR     R5,WTCRDY       ;WAIT FOR CONTROLLER READY HIGH
1190 021776                                CKLOOP                  ;CHECK IF /FL:LOE IS SET
     021776  104406                        TRAP    C$CLP1
1191
```

TEST 37 - TEST DIFFERENCE WORD TRANSMISSION

```
1192 022000  004537  013120                 JSR     R5,CHERR        ;CHECK CONTROLLER FOR ERRORS
1193 022004                                 CKLOOP                  ;CHECK IF /FL:LOE IS SET
     022004  104406                         TRAP    C$CLP1
1194
1195 022006  004537  014220                 JSR     R5,WTDRDY       ;WAIT FOR DRIVE READY
1196 022012                          87$:   CKLOOP                  ;CHECK IF /FL:LOE IS SET
     022012  104406                         TRAP    C$CLP1
1197
1198 022014  004537  013120                 JSR     R5,CHERR        ;CHECK CONTROLLER FOR ERRORS
1199 022020                                 CKLOOP                  ;CHECK IF /FL:LOE IS SET
     022020  104406                         TRAP    C$CLP1
1200
1201 022022  004537  013420                 JSR     R5,LDFUNC       ;ISSUE FUNCTION OF FOLLOWING WORD
1202 022026  000010                         RDHDR                   ;READ HEADER
1203
1204 022030  004537  014306                 JSR     R5,WTCRDY       ;WAIT FOR CONTROLLER READY HIGH
1205 022034                                 CKLOOP                  ;CHECK IF /FL:LOE IS SET
     022034  104406                         TRAP    C$CLP1
1206
1207 022036  004537  013120                 JSR     R5,CHERR        ;CHECK CONTROLLER FOR ERRORS
1208 022042                                 ESCAPE  SEG             ;IF /FL:LOE SET LOOP, ELSE EXIT SEG
     022042  104410                         TRAP    C$ESCAPE
     022044  000106                         .WORD   10000$-.
1209
1210 022046  011337  002362                 MOV     (R3),GDDAT      ;GET EXPECTED CYLINDER
1211 022052  011337  002376          8$:    MOV     (R3),DWORD      ;SET UP DIFFERENCE FOR SEEK
1212 022056  013737  002314  002364         MOV     E.MP,BDDAT      ;READ HEADER FROM RLMP
1213 022064  043737  002334  002364         BIC     SECMSK,BDDAT    ;CLEAR OUT SECTOR BITS
1214 022072  023737  002362  002364         CMP     GDDAT,BDDAT     ;DID SEEK GO TO THE RIGHT
1215 022100  001404                         BEQ     9$              ;TRACK, IF SO, GO GET NEXT
1216
1217 022102                                 ERRDF   44.,EM54,ERR3
     022102  104455                         TRAP    C$ERDF
     022104  000054                         .WORD   44
     022106  006426                         .WORD   EM54
     022110  010252                         .WORD   ERR3
1218 022112                          9$:    CKLOOP                  ;CHECK IF /FL:LOE IS SET
     022112  104406                         TRAP    C$CLP1
1219
1220 022114  005723                         TST     (R3)+           ;BUMP PATTERN
1221 022116  023727  002406  000001         CMP     T.DRIVE,#1
1222 022124  001005                         BNE     2$
1223 022126  020327  002726                 CMP     R3,#SKEND
1224 022132  001407                         BEQ     10$
1225 022134  000137  021546                 JMP     1$
1226
1227 022140  020327  002770          2$:    CMP     R3,#SKEEND
1228 022144  001402                         BEQ     10$
1229 022146  000137  021546                 JMP     1$
1230
1231 022152                          10$:
1232
1233 022152                                 ENDSEG                  ;****END OF SEGMENT****
     022152                         10000$:
     022152  104405                         TRAP    C$ESEG
1234 022154                                 ENDTST                  ;****END OF TEST****
     022154                         L10065:
```

TEST 37 - TEST DIFFERENCE WORD TRANSMISSION

```
022154  104401                          TRAP    C$ETST
1235
1236
1237                                    .SBTTL  **TEST 38** - VERIFY HEAD SELECT 0 VIA RD HDR
1238
1239 022156                             BGNTST                          ;****START OF TEST****
1240
1241                                    ;
1242
1243 022156                             STARS
                                        ;;**************************************************************************
1244                                    ;CHECK THAT WE CAN SELECT HEAD SELECT ZERO.  ISSUE
1245                                    ;SEEK TO HEAD SELECT 0 AND VERIFY WITH READ HEADER.
1246 022156                             STARS
                                        ;;**************************************************************************
1247
1248 022156  012777  000001  160070    99$:    MOV     #MK,@RLDA       ;SET MARKER IN RLDA
1249 022164  005037  002362                    CLR     GDDAT           ;SET EXPECTED
1250                                                                    ;LOAD HS=0 INTO RLDA
1251 022170                             2$:
1252 022170  004537  013420                    JSR     R5,LDFUNC       ;ISSUE FUNCTION OF FOLLOWING WORD
1253 022174  000006                            SEEK                    ;SEEK
1254 022176  004537  014306                    JSR     R5,WTCRDY       ;WAIT FOR CONTROLLER READY HIGH
1255 022202                                    CKLOOP                  ;CHECK IF /FL:LOE IS SET
     022202  104406                            TRAP    C$CLP1
1256
1257 022204  004537  013120                    JSR     R5,CHERR        ;CHECK CONTROLLER FOR ERRORS
1258 022210                                    CKLOOP                  ;CHECK IF /FL:LOE IS SET
     022210  104406                            TRAP    C$CLP1
1259
1260 022212  004537  014220                    JSR     R5,WTDRDY       ;WAIT FOR DRIVE READY
1261 022216                             89$:   CKLOOP                  ;CHECK IF /FL:LOE IS SET
     022216  104406                            TRAP    C$CLP1
1262
1263 022220  004537  013120                    JSR     R5,CHERR        ;CHECK CONTROLLER FOR ERRORS
1264 022224                                    CKLOOP                  ;CHECK IF /FL:LOE IS SET
     022224  104406                            TRAP    C$CLP1
1265
1266 022226  004537  013420                    JSR     R5,LDFUNC       ;ISSUE FUNCTION OF FOLLOWING WORD
1267 022232  000010                            RDHDR                   ;READ HEADER
1268 022234  004537  014306                    JSR     R5,WTCRDY       ;WAIT FOR CONTROLLER READY HIGH
1269 022240                             96$:   CKLOOP                  ;CHECK IF /FL:LOE IS SET
     022240  104406                            TRAP    C$CLP1
1270
1271 022242  004537  013120                    JSR     R5,CHERR        ;CHECK CONTROLLER FOR ERRORS
1272 022246                                    ESCAPE  TST             ;IF /FL:LOE SET LOOP, ELSE EXIT TST
     022246  104410                            TRAP    C$ESCAPE
     022250  000036                            .WORD   L10066-.
1273
1274 022252  013737  002314  002364            MOV     E.MP,BDDAT      ;READ HEADER FOR HEAD SELECT
1275 022260  042737  177677  002364            BIC     #177677,BDDAT   ;MASK ONLY HEAD SELECT
1276 022266  023737  002362  002364            CMP     GDDAT,BDDAT     ;COMPARE HEAD SELECTS
1277 022274  001404                            BEQ     5$              ;IF EQUAL CONTINUE
1278
1279 022276                                    ERRDF   45.,EM55,ERR4
     022276  104455                            TRAP    C$ERDF
     022300  000055                            .WORD   45
```

```
**TEST 38** - VERIFY HEAD SELECT 0 VIA RD HDR

     022302  006465                          .WORD   EM55
     022304  010324                          .WORD   ERR4
1280 022306                          5$:
1281
1282 022306                          ENDTST                          ;****END OF TEST****
     022306                          L10066:
     022306  104401                          TRAP    C$ETST
1283
1284
1285                                 .SBTTL  **TEST 39** - VERIFY HEAD SELECT 1 VIA RD HDR
1286
1287 022310                          BGNTST                          ;****START OF TEST****
1288
1289
1290 022310                          STARS
                                     ;;*************************************************************************
1291                                 ;CHECK THAT WE CAN SELECT HEAD SELECT ONE.  ISSUE
1292                                 ;SEEK TO HEAD SELECT 1 AND VERIFY WITH READ HEADER.
1293 022310                          STARS
                                     ;;*************************************************************************
1294
1295
1296 022310  012777  000001  157736 99$:    MOV     #MK,@RLDA       ;SET MARKER IN RLDA
1297 022316  052777  000020  157730         BIS     #DAHS,@RLDA     ;LOAD HS=1 INTO RLDA
1298 022324  004537  013420          2$:    JSR     R5,LDFUNC       ;ISSUE FUNCTION OF FOLLOWING WORD
1299 022330  000006                         SEEK                    ;SEEK
1300 022332  004537  014306                 JSR     R5,WTCRDY       ;WAIT FOR CONTROLLER READY HIGH
1301 022336                                  CKLOOP                  ;CHECK IF /FL:LOE IS SET
     022336  104406                         TRAP    C$CLP1
1302
1303 022340  004537  013120                 JSR     R5,CHERR        ;CHECK CONTROLLER FOR ERRORS
1304 022344                                  CKLOOP                  ;CHECK IF /FL:LOE IS SET
     022344  104406                         TRAP    C$CLP1
1305
1306 022346  004537  014220                 JSR     R5,WTDRDY       ;WAIT FOR DRIVE CLEAR
1307 022352                          89$:    CKLOOP                  ;CHECK IF /FL:LOE IS SET
     022352  104406                         TRAP    C$CLP1
1308
1309 022354  004537  013120                 JSR     R5,CHERR        ;CHECK CONTROLLER FOR ERRORS
1310 022360                                  CKLOOP                  ;CHECK IF /FL:LOE IS SET
     022360  104406                         TRAP    C$CLP1
1311
1312 022362  004537  013420                 JSR     R5,LDFUNC       ;ISSUE FUNCTION OF FOLLOWING WORD
1313 022366  000010                         RDHDR                   ;READ HEADER
1314 022370  004537  014306                 JSR     R5,WTCRDY       ;WAIT FOR CONTROLLER READY HIGH
1315 022374                                  CKLOOP                  ;CHECK IF /FL:LOE IS SET
     022374  104406                         TRAP    C$CLP1
1316
1317 022376  004537  013120                 JSR     R5,CHERR        ;CHECK CONTROLLER FOR ERRORS
1318 022402                                  ESCAPE  TST             ;IF /FL:LOE SET LOOP, ELSE EXIT TST
     022402  104410                         TRAP    C$ESCAPE
     022404  000044                         .WORD   L10067-.
1319
1320 022406  013737  002314  002364         MOV     E.MP,BDDAT      ;READ HEADER
1321 022414  042737  177677  002364         BIC     #177677,BDDAT   ;MASK FOR H.S.
1322 022422  012737  000100  002362         MOV     #RHHS,GDDAT     ;SET EXPECTED
1323 022430  023737  002362  002364         CMP     GDDAT,BDDAT     ;CORRECT HEAD
```

```
**TEST 39** - VERIFY HEAD SELECT 1 VIA RD HDR

1324 022436  001404                          BEQ     5$              ;YES, CONTINUE
1325
1326 022440                                   ERRDF   46.,EM55,ERR4
     022440  104455                          TRAP    C$ERDF
     022442  000056                          .WORD   46
     022444  006465                          .WORD   EM55
     022446  010324                          .WORD   ERR4
1327 022450                            5$:
1328
1329 022450                            ENDTST                          ;****END OF TEST****
     022450                            L10067:
     022450  104401                          TRAP    C$ETST
1330
1331
1332                                   .SBTTL  **TEST 40** - VERIFY HEAD SELECT 0 VIA GET STATUS
1333
1334 022452                            BGNTST                          ;****START OF TEST****
1335
1336 022452                            STARS
                                       ;;*************************************************************************
1337                                   ;CHECK THAT WE CAN READ BACK HEAD SELECT 0 WITH
1338                                   ;A GET STATUS FUNCTION.  SELECT H.S. 0 WITH A SEEK
1339                                   ;VERIFY WITH GET STATUS
1340 022452                            STARS
                                       ;;*************************************************************************
1341
1342 022452  012777  000001  157574          MOV     #MK,@RLDA       ;SET MARKER IN RLDA
1343                                                                  ;LOAD HS=0 INTO RLDA
1344 022460  005037  002362            2$:   CLR     GDDAT           ;SET UP EXP'D
1345 022464  004537  013420            3$:   JSR     R5,LDFUNC       ;ISSUE FUNCTION OF FOLLOWING WORD
1346 022470  000006                          SEEK                    ;SEEK
1347 022472  004537  014306                  JSR     R5,WTCRDY       ;WAIT FOR CONTROLLER READY HIGH
1348 022476                                   CKLOOP                  ;CHECK IF /FL:LOE IS SET
     022476  104406                          TRAP    C$CLP1
1349
1350 022500  004537  013120                  JSR     R5,CHERR        ;CHECK CONTROLLER FOR ERRORS
1351 022504                                   CKLOOP                  ;CHECK IF /FL:LOE IS SET
     022504  104406                          TRAP    C$CLP1
1352
1353 022506  004537  014220                  JSR     R5,WTDRDY       ;WAIT FOR DRIVE READY
1354 022512                                   CKLOOP                  ;CHECK IF /FL:LOE IS SET
     022512  104406                          TRAP    C$CLP1
1355
1356 022514  004537  013120                  JSR     R5,CHERR        ;CHECK CONTROLLER FOR ERRORS
1357 022520                                   CKLOOP                  ;CHECK IF /FL:LOE IS SET
     022520  104406                          TRAP    C$CLP1
1358
1359 022522  012777  000003  157524          MOV     #GSBIT!MK,@RLDA ;SET UP FOR GET STATUS IN DA
1360 022530  004537  013420                  JSR     R5,LDFUNC       ;ISSUE FUNCTION OF FOLLOWING WORD
1361 022534  000004                          GSTAT                   ;GET STATUS
1362 022536  004537  014306                  JSR     R5,WTCRDY       ;WAIT FOR CONTROLLER READY HIGH
1363 022542                                   CKLOOP                  ;CHECK IF /FL:LOE IS SET
     022542  104406                          TRAP    C$CLP1
1364
1365 022544  004537  013120                  JSR     R5,CHERR        ;CHECK CONTROLLER FOR ERRORS
1366 022550                                   ESCAPE  TST             ;IF /FL:LOE SET LOOP, ELSE EXIT TST
     022550  104410                          TRAP    C$ESCAPE
```

```
**TEST 40** - VERIFY HEAD SELECT 0 VIA GET STATUS

022552  000036                          .WORD   L10070-.
1367
1368 022554  013737  002314  002364      MOV     E.MP,BDDAT      ;READ STATUS FOR HEAD SELECT BIT
1369 022562  042737  177677  002364      BIC     #177677,BDDAT   ;LEAVE ONLY H.S. BIT
1370 022570  023737  002362  002364      CMP     GDDAT,BDDAT     ;IS HEAD SELECT CORRECT?
1371 022576  001404                      BEQ     6$              ;YES, CONTINUE
1372
1373 022600                              ERRDF   47.,EM56,ERR4
     022600  104455                      TRAP    C$ERDF
     022602  000057                      .WORD   47
     022604  006520                      .WORD   EM56
     022606  010324                      .WORD   ERR4
1374 022610                          6$:
1375
1376 022610                          ENDTST                          ;****END OF TEST****
     022610                          L10070:
     022610  104401                      TRAP    C$ETST
1377
1378
1379                                 .SBTTL  **TEST 41** - VERIFY HEAD SELECT 1 VIA GET STATUS
1380
1381 022612                          BGNTST                          ;****START OF TEST****
1382
1383 022612                          STARS
                                     ;;**************************************************************************
1384                                 ;CHECK THAT WE CAN READ BACK HEAD SELECT 1 WITH A GET
1385                                 ;STATUS FUNCTION.  SELECT H.S. 1 WITH A SEEK AND VERIFIY WITH
1386                                 ;GET STATUS
1387 022612                          STARS
                                     ;;**************************************************************************
1388
1389
1390 022612  012777  000001  157434      MOV     #MK,@RLDA       ;SET MARKER IN RLDA
1391 022620  052777  000020  157426      BIS     #DAHS,@RLDA     ;LOAD HS=1 INTO RLDA
1392 022626  012737  000100  002362  2$: MOV     #STHS,GDDAT     ;SET UP EXP'D
1393 022634  004537  013420          3$: JSR     R5,LDFUNC       ;ISSUE FUNCTION OF FOLLOWING WORD
1394 022640  000006                      SEEK                    ;SEEK
1395 022642  004537  014306              JSR     R5,WTCRDY       ;WAIT FOR CONTROLLER READY HIGH
1396 022646                              CKLOOP                  ;CHECK IF /FL:LOE IS SET
     022646  104406                      TRAP    C$CLP1
1397
1398 022650  004537  013120              JSR     R5,CHERR        ;CHECK CONTROLLER FOR ERRORS
1399 022654                              CKLOOP                  ;CHECK IF /FL:LOE IS SET
     022654  104406                      TRAP    C$CLP1
1400
1401 022656  004537  014220              JSR     R5,WTDRDY       ;WAIT FOR DRIVE READY
1402 022662                              CKLOOP                  ;CHECK IF /FL:LOE IS SET
     022662  104406                      TRAP    C$CLP1
1403
1404 022664  004537  013120              JSR     R5,CHERR        ;CHECK CONTROLLER FOR ERRORS
1405 022670                              CKLOOP                  ;CHECK IF /FL:LOE IS SET
     022670  104406                      TRAP    C$CLP1
1406
1407 022672  012777  000003  157354      MOV     #GSBIT!MK,@RLDA ;SET UP FOR GET STATUS IN DA
1408 022700  004537  013420              JSR     R5,LDFUNC       ;ISSUE FUNCTION OF FOLLOWING WORD
1409 022704  000004                      GSTAT                   ;GET STATUS
1410 022706  004537  014306              JSR     R5,WTCRDY       ;WAIT FOR CONTROLLER READY HIGH
```

```
**TEST 41** - VERIFY HEAD SELECT 1 VIA GET STATUS

1411 022712                                    ESCAPE  TST             ;IF /FL:LOE SET LOOP, ELSE EXIT TST
     022712  104410                            TRAP    C$ESCAPE
     022714  000046                            .WORD   L10071-.
1412
1413 022716  004537  013120                    JSR     R5,CHERR        ;CHECK CONTROLLER FOR ERRORS
1414 022722                                    ESCAPE  TST             ;IF /FL:LOE SET LOOP, ELSE EXIT TST
     022722  104410                            TRAP    C$ESCAPE
     022724  000036                            .WORD   L10071-.
1415
1416 022726  013737  002314  002364            MOV     E.MP,BDDAT      ;READ STATUS FOR HEAD SELECT BIT
1417 022734  042737  177677  002364            BIC     #177677,BDDAT   ;LEAVE ONLY H.S. BIT
1418 022742  023737  002362  002364            CMP     GDDAT,BDDAT     ;IS HEAD SELECT CORRECT?
1419 022750  001404                            BEQ     6$              ;YES, CONTINUE
1420
1421 022752                                    ERRDF   48.,EM56,ERR4
     022752  104455                            TRAP    C$ERDF
     022754  000060                            .WORD   48
     022756  006520                            .WORD   EM56
     022760  010324                            .WORD   ERR4
1422 022762                            6$:
1423
1424 022762                            ENDTST                          ;****END OF TEST****
     022762                            L10071:
     022762  104401                            TRAP    C$ETST
1425
1426
1427                                   .SBTTL  **TEST 42** - TEST TIME AT WHICH DIF WD GETS TRANSMITTED
1428
1429 022764                            BGNTST                          ;****START OF TEST****
1430
1431
1432 022764                            STARS
                                       ;;*****************************************************************
1433                                   ;VERIFY THAT THE DIFFERENCE WORD ON A SEEK IS
1434                                   ;TRANSMITTED PRIOR TO CONTROLLER READY SETTING.  THIS
1435                                   ;IS DONE BY SETTING A KNOWN DIFFERENCE WORD IN
1436                                   ;THE RLDA ISSUING A A SEEK, WAITING FOR CONTROLLER READY
1437                                   ;(BUT NOT DRIVE READY), WRITING A DIFFERENT RLDA AND WAITING
1438                                   ;FOR DRIVE READY.  THE RESULTANT POSITION SHOULD BE THAT
1439                                   ;OF THE FIRST RLDA ONLY.
1440 022764                            STARS
                                       ;;*****************************************************************
1441
1442
1443 022764  004537  013420                    JSR     R5,LDFUNC       ;ISSUE FUNCTION OF FOLLOWING WORD
1444 022770  000010                            RDHDR                   ;READ HEADER
1445 022772  004537  014306                    JSR     R5,WTCRDY       ;WAIT FOR CONTROLLER READY HIGH
1446 022776                            99$:    CKLOOP                  ;CHECK IF /FL:LOE IS SET
     022776  104406                            TRAP    C$CLP1
1447
1448 023000  004537  013120                    JSR     R5,CHERR        ;CHECK CONTROLLER FOR ERRORS
1449 023004                                    CKLOOP                  ;CHECK IF /FL:LOE IS SET
     023004  104406                            TRAP    C$CLP1
1450
1451 023006  013737  002314  002362            MOV     E.MP,GDDAT      ;READ HEADER
1452 023014  043737  002334  002362            BIC     SECMSK,GDDAT    ;CLEAR SECTOR BITS
1453 023022  012777  000001  157224            MOV     #MK,@RLDA       ;SET MARKER IN RLDA
```

TEST 42 - TEST TIME AT WHICH DIF WD GETS TRANSMITTED

```
1454 023030  032737  000100  002362          BIT     #RHHS,GDDAT     ;TEST H.S.
1455 023036  001403                          BEQ     2$              ;IF ZERO, CONTINUE
1456 023040  052777  000020  157206          BIS     #DAHS,@RLDA     ;ONE, SET SO WE WILL REMAIN THERE
1457 023046  013737  002362  002354  2$:     MOV     GDDAT,TMP0      ;STORE HEADER
1458 023054  042737  000100  002354          BIC     #RHHS,TMP0      ;CLEAR H.S. FROM STORED WORD
1459 023062  023727  002406  000001          CMP     T.DRIVE,#1
1460 023070  001034                          BNE     12$
1461 023072  023737  002354  002704          CMP     TMP0,HALMAX
1462 023100  101007                          BHI     3$
1463 023102  052777  000004  157144          BIS     #SIGN,@RLDA
1464 023110  063737  002702  002362          ADD     QUAMAX,GDDAT
1465 023116  000403                          BR      4$
1466 023120  163737  002702  002362  3$:     SUB     QUAMAX,GDDAT
1467 023126  053777  002702  157120  4$:     BIS     QUAMAX,@RLDA
1468 023134  012737  000001  002356          MOV     #MK,TMP1
1469 023142  032777  000020  157104          BIT     #DAHS,@RLDA
1470 023150  001037                          BNE     5$
1471 023152  052737  000020  002356          BIS     #DAHS,TMP1
1472 023160  000433                          BR      5$
1473 023162  023737  002354  002734  12$:    CMP     TMP0,HMAX
1474 023170  101007                          BHI     13$
1475 023172  052777  000004  157054          BIS     #SIGN,@RLDA
1476 023200  063737  002732  002362          ADD     QMAX,GDDAT
1477 023206  000403                          BR      14$
1478 023210  163737  002732  002362  13$:    SUB     QMAX,GDDAT
1479 023216  053777  002732  157030  14$:    BIS     QMAX,@RLDA
1480 023224  012737  000001  002356          MOV     #MK,TMP1
1481 023232  032777  000020  157014          BIT     #DAHS,@RLDA
1482 023240  001003                          BNE     5$
1483 023242  052737  000020  002356          BIS     #DAHS,TMP1
1484 023250  004537  013420          5$:     JSR     R5,LDFUNC       ;ISSUE FUNCTION OF FOLLOWING WORD
1485 023254  000006                          SEEK                    ;SEEK
1486 023256  004537  014306                  JSR     R5,WTCRDY       ;WAIT FOR CONTROLLER READY HIGH
1487 023262                                  CKLOOP                  ;CHECK IF /FL:LOE IS SET
     023262  104406                          TRAP    C$CLP1
1488
1489
1490 023264  004537  013120                  JSR     R5,CHERR        ;CHECK CONTROLLER FOR ERRORS
1491 023270                                  CKLOOP                  ;CHECK IF /FL:LOE IS SET
     023270  104406                          TRAP    C$CLP1
1492
1493 023272  013777  002356  156754          MOV     TMP1,@RLDA      ;SEND IN NEW DIFFERENCE WORD
1494 023300  004537  014306                  JSR     R5,WTCRDY       ;WAIT FOR CONTROLLER READY HIGH
1495 023304                                  CKLOOP                  ;CHECK IF /FL:LOE IS SET
     023304  104406                          TRAP    C$CLP1
1496
1497 023306  004537  013120                  JSR     R5,CHERR        ;CHECK CONTROLLER FOR ERRORS
1498 023312                                  CKLOOP                  ;CHECK IF /FL:LOE IS SET
     023312  104406                          TRAP    C$CLP1
1499
1500 023314  004537  014220                  JSR     R5,WTDRDY       ;WAIT FOR DRIVE READY
1501 023320                          8$:     CKLOOP                  ;CHECK IF /FL:LOE IS SET
     023320  104406                          TRAP    C$CLP1
1502
1503
1504 023322  004537  013120                  JSR     R5,CHERR        ;CHECK CONTROLLER FOR ERRORS
1505 023326                                  CKLOOP                  ;CHECK IF /FL:LOE IS SET
```

TEST 42 - TEST TIME AT WHICH DIF WD GETS TRANSMITTED

```
                023326  104406                          TRAP    C$CLP1
1506
1507            023330  004537  013420                  JSR     R5,LDFUNC       ;ISSUE FUNCTION OF FOLLOWING WORD
1508            023334  000010                          RDHDR                   ;READ HEADER
1509            023336  004537  014306                  JSR     R5,WTCRDY       ;WAIT FOR CONTROLLER READY HIGH
1510            023342                                  CKLOOP                  ;CHECK IF /FL:LOE IS SET
                023342  104406                          TRAP    C$CLP1
1511
1512            023344  004537  013120                  JSR     R5,CHERR        ;CHECK CONTROLLER FOR ERRORS
1513            023350                                  ESCAPE  TST             ;IF /FL:LOE SET LOOP, ELSE EXIT TST
                023350  104410                          TRAP    C$ESCAPE
                023352  000036                          .WORD   L10072-.
1514
1515            023354  013737  002314  002364          MOV     E.MP,BDDAT      ;READ HEADER
1516            023362  043737  002334  002364          BIC     SECMSK,BDDAT    ;CLEAR SECTOR ADDRESS
1517            023370  023737  002362  002364          CMP     GDDAT,BDDAT     ;IS HEADER CORRECT?
1518            023376  001404                          BEQ     10$             ;IF SO BRANCH
1519
1520            023400                                  ERRDF   50.,EM57,ERR4
                023400  104455                          TRAP    C$ERDF
                023402  000062                          .WORD   50
                023404  006557                          .WORD   EM57
                023406  010324                          .WORD   ERR4
1521            023410                          10$:
1522
1523            023410                          ENDTST                          ;****END OF TEST****
                023410                          L10072:
                023410  104401                          TRAP    C$ETST
1524
1525
1526                                            .SBTTL  **TEST 43** - EXTENSIVE CHECK OF HEADER CRC
1527
1528            023412                          BGNTST                          ;****START OF TEST****
1529            023412                          STARS
                                                ;;**************************************************************
1530                                            ;MORE EXTENSIVE CHECK OF HEADER CRC.  WE WILL SEEK
1531                                            ;AND READ HEADERS VERIFYING HDR CRC ACROSS THE
1532                                            ;PLATTER USING THE GROWING 0, GROWING 1, SHIFTING 0 AND
1533                                            ;GROWING 0 PATTERNS FOR TRACK ADDRESSES.
1534            023412                          STARS
                                                ;;**************************************************************
1535
1536
1537            023412  012703  002626                  MOV     #SKLST,R3       ;GET LIST OF DIFFERENCE WORDS
1538            023416                          BGNSEG                          ;****START OF SEGMENT****
                023416  104404                          TRAP    C$BSEG
1539            023420                          1$:
1540            023420  004537  013420                  JSR     R5,LDFUNC       ;ISSUE FUNCTION OF FOLLOWING WORD
1541            023424  000010                          RDHDR                   ;READ HEADER
1542            023426  004537  014306                  JSR     R5,WTCRDY       ;WAIT FOR CONTROLLER READY HIGH
1543            023432                          98$:    CKLOOP                  ;CHECK IF /FL:LOE IS SET
                023432  104406                          TRAP    C$CLP1
1544
1545            023434  004537  013120                  JSR     R5,CHERR        ;CHECK CONTROLLER FOR ERRORS
1546            023440                                  CKLOOP                  ;CHECK IF /FL:LOE IS SET
                023440  104406                          TRAP    C$CLP1
1547
```

```
1548 023442  013737  002314  002364          MOV     E.MP,BDDAT      ;READ HEADER
1549 023450  043737  002334  002364          BIC     SECMSK,BDDAT    ;CLEAR OUT SECTOR
1550 023456  001461                          BEQ     5$              ;IF ON TRACK ZERO, H.S. ZERO, OK
1551
1552                                 ;NOT ON TRACK ZERO CALCULATE DIFFERENCE WORD AND PUT IT BACK
1553                                 ;ON ZERO.
1554
1555 023460  042737  000100  002364          BIC     #RHHS,BDDAT     ;CLEAR OUT HEAD SELECT
1556 023466  013777  002364  156560          MOV     BDDAT,@RLDA     ;PUT CYLINDER AS DIFFERENCE WORD
1557 023474  052777  000001  156552          BIS     #MK,@RLDA       ;SET MARKER BIT
1558 023502  004537  013420                  JSR     R5,LDFUNC       ;ISSUE FUNCTION OF FOLLOWING WORD
1559 023506  000006                          SEEK                    ;SEEK
1560 023510  004537  014306                  JSR     R5,WTCRDY       ;WAIT FOR CONTROLLER READY HIGH
1561 023514                                  CKLOOP                  ;CHECK IF /FL:LOE IS SET
     023514  104406                          TRAP    C$CLP1
1562
1563 023516  004537  013120                  JSR     R5,CHERR        ;CHECK CONTROLLER FOR ERRORS
1564 023522                                  CKLOOP                  ;CHECK IF /FL:LOE IS SET
     023522  104406                          TRAP    C$CLP1
1565
1566 023524  004537  014220                  JSR     R5,WTDRDY       ;WAIT FOR DRIVE READY
1567 023530                          89$:    CKLOOP                  ;CHECK IF /FL:LOE IS SET
     023530  104406                          TRAP    C$CLP1
1568
1569 023532  004537  013120                  JSR     R5,CHERR        ;CHECK CONTROLLER FOR ERRORS
1570 023536                                  CKLOOP                  ;CHECK IF /FL:LOE IS SET
     023536  104406                          TRAP    C$CLP1
1571
1572
1573 023540  004537  013420                  JSR     R5,LDFUNC       ;ISSUE FUNCTION OF FOLLOWING WORD
1574 023544  000010                          RDHDR                   ;READ HEADER
1575 023546  004537  014306                  JSR     R5,WTCRDY       ;WAIT FOR CONTROLLER READY HIGH
1576 023552                          96$:    CKLOOP                  ;CHECK IF /FL:LOE IS SET
     023552  104406                          TRAP    C$CLP1
1577
1578 023554  004537  013120                  JSR     R5,CHERR        ;CHECK CONTROLLER FOR ERRORS
1579 023560                                  CKLOOP                  ;CHECK IF /FL:LOE IS SET
     023560  104406                          TRAP    C$CLP1
1580
1581 023562  005037  002362                  CLR     GDDAT           ;CLEAR EXPECTED
1582 023566  013737  002364  002376          MOV     BDDAT,DWORD     ;SAVE DIFFERENCE WORD
1583 023574  013737  002314  002364          MOV     E.MP,BDDAT      ;READ HEADER
1584 023602  043737  002334  002364          BIC     SECMSK,BDDAT    ;MASK OUT SECTOR BITS
1585 023610  001404                          BEQ     5$              ;BRANCH IF ON ZERO TRACK
1586
1587 023612                                  ERRDF   51.,EM54,ERR3
     023612  104455                          TRAP    C$ERDF
     023614  000063                          .WORD   51
     023616  006426                          .WORD   EM54
     023620  010252                          .WORD   ERR3
1588 023622                          5$:     CKLOOP                  ;CHECK IF /FL:LOE IS SET
     023622  104406                          TRAP    C$CLP1
1589
1590 023624  011377  156424                  MOV     (R3),@RLDA      ;GET DIFFERENCE WORD
1591 023630  052777  000005  156416          BIS     #SIGN!MK,@RLDA  ;SET SIGN (TOWARDS SPINDLE) AND MARKER
1592 023636  004537  013420                  JSR     R5,LDFUNC       ;ISSUE FUNCTION OF FOLLOWING WORD
1593 023642  000006                          SEEK                    ;SEEK
```

```
1594 023644  004537  014306                JSR     R5,WTCRDY       ;WAIT FOR CONTROLLER READY HIGH
1595 023650                                CKLOOP                  ;CHECK IF /FL:LOE IS SET
     023650  104406                        TRAP    C$CLP1
1596
1597 023652  004537  013120                JSR     R5,CHERR        ;CHECK CONTROLLER FOR ERRORS
1598 023656                                CKLOOP                  ;CHECK IF /FL:LOE IS SET
     023656  104406                        TRAP    C$CLP1
1599
1600 023660  004537  014220                JSR     R5,WTDRDY       ;WAIT FOR DRIVE READY
1601 023664                                CKLOOP                  ;CHECK IF /FL:LOE IS SET
     023664  104406                        TRAP    C$CLP1
1602
1603
1604 023666  004537  013120                JSR     R5,CHERR        ;CHECK CONTROLLER FOR ERRORS
1605 023672                                CKLOOP                  ;CHECK IF /FL:LOE IS SET
     023672  104406                        TRAP    C$CLP1
1606
1607 023674  004537  013420                JSR     R5,LDFUNC       ;ISSUE FUNCTION OF FOLLOWING WORD
1608 023700  000010                        RDHDR                   ;READ HEADER
1609 023702  004537  014306                JSR     R5,WTCRDY       ;WAIT FOR CONTROLLER READY HIGH
1610 023706                                CKLOOP                  ;CHECK IF /FL:LOE IS SET
     023706  104406                        TRAP    C$CLP1
1611
1612
1613 023710  004537  013120                JSR     R5,CHERR        ;CHECK CONTROLLER FOR ERRORS
1614 023714                                CKLOOP                  ;CHECK IF /FL:LOE IS SET
     023714  104406                        TRAP    C$CLP1
1615
1616 023716  011337  002362                MOV     (R3),GDDAT      ;GET EXPECTED CYLINDER
1617 023722  011337  002376        8$:     MOV     (R3),DWORD      ;SET UP DIFFERENCE FOR SEEK
1618 023726  013737  002314  002364        MOV     E.MP,BDDAT      ;READ HEADER FROM RLMP
1619 023734  043737  002334  002364        BIC     SECMSK,BDDAT    ;CLEAR OUT SECTOR BITS
1620 023742  023737  002362  002364        CMP     GDDAT,BDDAT     ;DID SEEK GO TO THE RIGHT
1621 023750  001404                        BEQ     9$              ;TRACK, IF SO, GO GET NEXT
1622
1623 023752                                ERRDF   52.,EM54,ERR3
     023752  104455                        TRAP    C$ERDF
     023754  000064                        .WORD   52
     023756  006426                        .WORD   EM54
     023760  010252                        .WORD   ERR3
1624 023762                        9$:     CKLOOP                  ;CHECK IF /FL:LOE IS SET
     023762  104406                        TRAP    C$CLP1
1625
1626 023764  013737  002314  024000        MOV     E.MP,10$        ;GET HEADER WORD
1627 023772  004537  014032                JSR     R5,SIMBCC       ;GO CALCULATE HEADER CRC
1628 023776  000020                        16.                     ;16 BITS
1629 024000  000000                10$:    .WORD   0               ;HEADER GOES HERE
1630 024002  000000                        .WORD   0               ;START WITH ZERO CRC
1631 024004  013737  002344  024030        MOV     CALBCC,20$
1632 024012  013737  002316  024026        MOV     E.MP1,21$
1633 024020  004537  014032                JSR     R5,SIMBCC
1634 024024  000020                        16.
1635 024026  000000                21$:    .WORD   0
1636 024030  000000                20$:    .WORD   0
1637 024032  013737  002344  002362        MOV     CALBCC,GDDAT    ;MOVE CALCULATED CRC TO GDDAT
1638 024040  013737  002320  002364        MOV     E.MP2,BDDAT     ;GET HEADER CRC FROM RLMP
1639 024046  023737  002362  002364        CMP     GDDAT,BDDAT     ;IS CRC CORRECT?
```

```
**TEST 43** - EXTENSIVE CHECK OF HEADER CRC

1640 024054  001404                          BEQ     11$             ;IF SO CONTINUE
1641
1642 024056                                  ERRDF   53.,EM42,ERR4
     024056  104455                          TRAP    C$ERDF
     024060  000065                          .WORD   53
     024062  006047                          .WORD   EM42
     024064  010324                          .WORD   ERR4
1643 024066                          11$:    CKLOOP                  ;CHECK IF /FL:LOE IS SET
     024066  104406                          TRAP    C$CLP1
1644
1645
1646 024070  005723                          TST     (R3)+           ;BUMP PATTERN
1647 024072  023727  002406  000001          CMP     T.DRIVE,#1
1648 024100  001005                          BNE     2$
1649 024102  020327  002726                  CMP     R3,#SKEND
1650 024106  001407                          BEQ     12$
1651 024110  000137  023420                  JMP     1$
1652 024114  020327  002770          2$:     CMP     R3,#SKEEND
1653 024120  001402                          BEQ     12$
1654 024122  000137  023420                  JMP     1$
1655 024126                          12$:
1656
1657 024126                          ENDSEG                          ;****END OF SEGMENT****
     024126                          10000$:
     024126  104405                          TRAP    C$ESEG
1658 024130                          ENDTSI                          ;****END OF TEST****
     024130                          L10073:
     024130  104401                          TRAP    C$ETST
1659
1660
1661                                 .SBTTL  **TEST 44** - VERIFY GET STATUS WHILE DRDY IS LOW
1662
1663 024132                          BGNTST                          ;****START OF TEST****
1664
1665 024132                          STARS
                                     ;;**************************************************************************
1666                                 ;VERIFY THAT WE CAN ISSUE GET STATUS AND RECIEVE
1667                                 ;THE STATUS WORD WHILE THE DRIVE IS IN NOTION SEEKING
1668 024132                          STARS
                                     ;;**************************************************************************
1669
1670
1671 024132                          1$:
1672 024132  004537  013420                  JSR     R5,LDFUNC       ;ISSUE FUNCTION OF FOLLOWING WORD
1673 024136  000010                          RDHDR                   ;READ HEADER
1674 024140  004537  014306                  JSR     R5,WTCRDY       ;WAIT FOR CONTROLLER READY HIGH
1675 024144                                  CKLOOP                  ;CHECK IF /FL:LOE IS SET
     024144  104406                          TRAP    C$CLP1
1676
1677 024146  004537  013120                  JSR     R5,CHERR        ;CHECK CONTROLLER FOR ERRORS
1678 024152                                  CKLOOP                  ;CHECK IF /FL:LOE IS SET
     024152  104406                          TRAP    C$CLP1
1679
1680 024154  013737  002314  002364          MOV     E.MP,BDDAT      ;READ HEADER
1681 024162  043737  002334  002364          BIC     SECMSK,BDDAT    ;CLEAR OUT SECTOR
1682 024170  001461                          BEQ     5$              ;IF ON TRACK ZERO, H.S. ZERO, OK
1683
```

```
1684                                    ;NOT ON TRACK ZERO CALCULATE DIFFERENCE WORD AND PUT IT BACK
1685                                    ;ON ZERO.
1686
1687 024172  042737  000100  002364          BIC     #RHHS,BDDAT     ;CLEAR OUT HEAD SELECT
1688 024200  013777  002364  156046          MOV     BDDAT,@RLDA     ;PUT CYLINDER AS DIFFERENCE WORD
1689 024206  052777  000001  156040          BIS     #MK,@RLDA       ;SET MARKER BIT
1690 024214  004537  013420                  JSR     R5,LDFUNC       ;ISSUE FUNCTION OF FOLLOWING WORD
1691 024220  000006                          SEEK                    ;SEEK
1692 024222  004537  014306                  JSR     R5,WTCRDY       ;WAIT FOR CONTROLLER READY HIGH
1693 024226                                  CKLOOP                  ;CHECK IF /FL:LOE IS SET
     024226  104406                          TRAP    C$CLP1
1694
1695 024230  004537  013120                  JSR     R5,CHERR        ;CHECK CONTROLLER FOR ERRORS
1696 024234                                  CKLOOP                  ;CHECK IF /FL:LOE IS SET
     024234  104406                          TRAP    C$CLP1
1697
1698 024236  004537  014220                  JSR     R5,WTDRDY       ;WAIT FOR DRIVE READY
1699 024242                                  CKLOOP                  ;CHECK IF /FL:LOE IS SET
     024242  104406                          TRAP    C$CLP1
1700
1701 024244  004537  013120                  JSR     R5,CHERR        ;CHECK CONTROLLER FOR ERRORS
1702 024250                                  CKLOOP                  ;CHECK IF /FL:LOE IS SET
     024250  104406                          TRAP    C$CLP1
1703
1704
1705 024252  004537  013420                  JSR     R5,LDFUNC       ;ISSUE FUNCTION OF FOLLOWING WORD
1706 024256  000010                          RDHDR                   ;READ HEADER
1707 024260  004537  014306                  JSR     R5,WTCRDY       ;WAIT FOR CONTROLLER READY HIGH
1708 024264                                  CKLOOP                  ;CHECK IF /FL:LOE IS SET
     024264  104406                          TRAP    C$CLP1
1709
1710 024266  004537  013120                  JSR     R5,CHERR        ;CHECK CONTROLLER FOR ERRORS
1711 024272                                  CKLOOP                  ;CHECK IF /FL:LOE IS SET
     024272  104406                          TRAP    C$CLP1
1712
1713 024274  005037  002362                  CLR     GDDAT           ;CLEAR EXPECTED
1714 024300  013737  002364  002376          MOV     BDDAT,DWORD     ;SAVE DIFFERENCE WORD
1715 024306  013737  002314  002364          MOV     E.MP,BDDAT      ;READ HEADER
1716 024314  043737  002334  002364          BIC     SECMSK,BDDAT    ;MASK OUT SECTOR BITS
1717 024322  001404                          BEQ     5$              ;BRANCH IF ON ZERO TRACK
1718
1719 024324                                  ERRDF   54.,EM54,ERR3
     024324  104455                          TRAP    C$ERDF
     024326  000066                          .WORD   54
     024330  006426                          .WORD   EM54
     024332  010252                          .WORD   ERR3
1720 024334                          5$:     CKLOOP                  ;CHECK IF /FL:LOE IS SET
     024334  104406                          TRAP    C$CLP1
1721
1722 024336  012777  077601  155710          MOV     #77601,@RLDA    ;GET DIFFERENCE WORD
1723 024344  052777  000005  155702          BIS     #SIGN!MK,@RLDA  ;SET SIGN (TOWARDS SPINDLE) AND MARKER
1724 024352  004537  013420                  JSR     R5,LDFUNC       ;ISSUE FUNCTION OF FOLLOWING WORD
1725 024356  000006                          SEEK                    ;SEEK
1726 024360  004537  014306                  JSR     R5,WTCRDY       ;WAIT FOR CONTROLLER READY HIGH
1727 024364                                  CKLOOP                  ;CHECK IF /FL:LOE IS SET
     024364  104406                          TRAP    C$CLP1
1728
```

```
1729
1730 024366  004537  013120                  JSR     R5,CHERR        ;CHECK CONTROLLER FOR ERRORS
1731 024372                                  CKLOOP                  ;CHECK IF /FL:LOE IS SET
     024372  104406                          TRAP    C$CLP1
1732 024374  012777  000003  155652          MOV     #MK!GSBIT,@RLDA
1733 024402  004537  013420                  JSR     R5,LDFUNC       ;ISSUE FUNCTION OF FOLLOWING WORD
1734 024406  000004                          GSTAT
1735 024410  004537  014306                  JSR     R5,WTCRDY       ;WAIT FOR CONTROLLER READY HIGH
1736 024414                                  CKLOOP                  ;CHECK IF /FL:LOE IS SET
     024414  104406                          TRAP    C$CLP1
1737 024416  004537  013120                  JSR     R5,CHERR        ;CHECK CONTROLLER FOR ERRORS
1738
1739 024422                          ENDTST                          ;****END OF TEST****
     024422                          L10074:
     024422  104401                          TRAP    C$ETST
1740
1741 024424                          BGNMOD  HRDPRM
1742
1743 024424                                  BGNHRD
     024424  000032                          .WORD L10075-L$HARD/2
                                                                     ;WHAT TYPE OF CONTROLLER
1744                                                                 ;RL11=1, RLV11=2, RLV12=3
1745
1746 024426                                  GPRMD   CNTMSG,CNT,0,3,1,3,YES
     024426  005032                          .WORD   T$CODE
     024430  024526                          .WORD   CNTMSG
     024432  000003                          .WORD   3
     024434  000001                          .WORD   T$LOLIM
     024436  000003                          .WORD   T$HILIM
                                                                     ;CONTOLLER BUS ADDRESS
1747
1748 024440                                  GPRMA   CSRMSG,CSR,0,160000,177776,YES
     024440  000031                          .WORD   T$CODE
     024442  024512                          .WORD   CSRMSG
     024444  160000                          .WORD   T$LOLIM
     024446  177776                          .WORD   T$HILIM
                                                                     ;INTERRUPT VECTOR
1749
1750 024450                                  GPRMA   VECMSG,VECT,0,0,776,YES
     024450  001031                          .WORD   T$CODE
     024452  024544                          .WORD   VECMSG
     024454  000000                          .WORD   T$LOLIM
     024456  000776                          .WORD   T$HILIM
                                                                     ;DRIVE NUMBER
1751
1752 024460                                  GPRMD   DRMSG,DRET,0,03400,0,7,YES
     024460  004032                          .WORD   T$CODE
     024462  024575                          .WORD   DRMSG
     024464  003400                          .WORD   03400
     024466  000000                          .WORD   T$LOLIM
     024470  000007                          .WORD   T$HILIM
                                                                     ;DRIVE TYPE
1753
1754 024472                                  GPRML   DRTYPE,TYPDR,1,YES
     024472  003130                          .WORD   T$CODE
     024474  024553                          .WORD   DRTYPE
     024476  000001                          .WORD   1
                                                                     ;BREAK LEVEL
1755
1756 024500                                  GPRMD   BRMSG,PRIOR,0,340,0,7,YES
     024500  002032                          .WORD   T$CODE
     024502  024533                          .WORD   BRMSG
     024504  000340                          .WORD   340
```

TEST 44 - VERIFY GET STATUS WHILE DRDY IS LOW

```
                024506  000000                          .WORD   T$LOLIM
                024510  000007                          .WORD   T$HILIM
          1757
          1758  024512                                  ENDHRD
                                                        .EVEN
                024512                          L10075:
          1759
          1760  024512      102     125     123 CSRMSG: .ASCIZ  /BUS ADDRESS/
                024515      040     101     104
                024520      104     122     105
                024523      123     123     000
          1761  024526      122     114     061 CNTMSG: .ASCIZ  /RL11/
                024531      061     000
          1762  024533      102     122     040 BRMSG:  .ASCIZ  /BR LEVEL/
                024536      114     105     126
                024541      105     114     000
          1763  024544      126     105     103 VECMSG: .ASCIZ  /VECTOR/
                024547      124     117     122
                024552      000
          1764  024553      104     122     111 DRTYPE: .ASCIZ  /DRIVE TYPE = RL01/
                024556      126     105     040
                024561      124     131     120
                024564      105     040     075
                024567      040     122     114
                024572      060     061     000
          1765  024575      104     122     111 DRMSG:  .ASCIZ  /DRIVE/
                024600      126     105     000
          1766                                  .EVEN
          1767
          1768  024604                                  ENDMOD
          1769
          1770
          1771
          1772  024604                          BGNMOD  SFTPRM
          1773
          1774  024604                                  BGNSFT
                024604  000011                          .WORD L10076-L$SOFT/2
          1775  024606                                  GPRML   DMSG,DLT,1,YES
                024606  000130                          .WORD   T$CODE
                024610  024630                          .WORD   DMSG
                024612  000001                          .WORD   1
          1776  024614                                  XFERF   1$
                024614  006044                          .WORD   T$CODE
          1777  024616                                  GPRMD   EMSG,ELT,0,177777,0,177777,YES
                024616  001032                          .WORD   T$CODE
                024620  024654                          .WORD   EMSG
                024622  177777                          .WORD   177777
                024624  000000                          .WORD   T$LOLIM
                024626  177777                          .WORD   T$HILIM
          1778  024630                          1$:     ENDSFT
                                                        .EVEN
                024630                          L10076:
          1779
          1783
          1784  024630      104     122     117 DMSG:   .ASCIZ  /DROP ON ERROR LIMIT/
          1785  024654      105     122     122 EMSG:   .ASCIZ  /ERROR LIMIT/
          1786
```

TEST 44 - VERIFY GET STATUS WHILE DRDY IS LOW

```
                                        .EVEN

                                                ENDMOD
024670                                  LASTAD
                                                .EVEN
024670  000000                                  .WORD   0
024672  000000                                  .WORD   0
024674                                  L$LAST::

000001                                  .END
```

SYMBOL TABLE

```
ADDCOD  013030 G        CLNCOD  012756 G        C$RDBU= 000007          EM32    005540          E.MP1   002316
ADR    = 000020 G       CNT    = 000012         C$REFG= 000047          EM33    005574          E.MP2   002320
AFREG   004644          CNTMSG  024526          C$RESE= 000033          EM34    005641          FIRST   002366
AFTER   013746          COMP    004045          C$REVI= 000003          EM37    005716          FIX     013664
ARLBA   004601          CONT    012206          C$RFLA= 000021          EM4     005037          FNDFNC  013636
ARLCS   004574          CONTIN  012054          C$RPT = 000025          EM41    005756          FRMT1   011024
ARLDA   004607          CRDY   = 000200         C$SEFG= 000046          EM42    006047          FRMT11  011303
ARLMP   004615          CRTIM   004665          C$SPRI= 000041          EM43    006105          FRMT12  011344
ASSEMB= 000010          CSEND   003070          C$SVEC= 000037          EM44    006204          FRMT13  011423
BATEST  015114          CSPAT   002772          C$TPRI= 000013          EM45    006237          FRMT14  011454
BA16   = 000020         CSR    = 000000         DAHS   = 000020         EM46    006272          FRMT15  011520
BA17   = 000040         CSRMSG  024512          DATEST  015220          EM47    006325          FRMT2   011064
BCCFBK  002342          CSTEST  014774          DCKMES  004026          EM5     005064          FRMT2A  011103
BCSR    002262          CYLMSK  002370          DEMES   003774          EM52    006356          FRMT2B  011116
BDDAT   002364          C$AU   = 000052         DERFLG  002304          EM54    006426          FRMT3   011132
BEFORE  013676          C$AUTO= 000061          DERR   = 040000         EM55    006465          FRMT4   011137
BEGPAT  002416          C$BRK  = 000022         DIAGMC= 000000          EM56    006520          FRMT5   011175
BEREG   004623          C$BSEG= 000004          DLT    = 000000         EM57    006557          FRMT6   011246
BGNTST  012430          C$BSUB= 000002          DLTMES  004033          EM6     005135          FRMT99  011172
BIT0   = 000001 G       C$CEFG= 000045          DLYCNT  002414          EM61    006660          F$AU   = 000015
BIT00  = 000001 G       C$CLCK= 000062          DMSG    024630          EM62    006741          F$AUTO= 000020
BIT01  = 000002 G       C$CLEA= 000012          DRBT   = 000010         EM63    007024          F$BGN  = 000040
BIT02  = 000004 G       C$CLOS= 000035          DRDY   = 000001         EM64    007105          F$CLEA= 000007
BIT03  = 000010 G       C$CLP1= 000006          DRIVE   002270          EM65    007170          F$DU   = 000016
BIT04  = 000020 G       C$CVEC= 000036          DRMSG   024575          EM66    007251          F$END  = 000041
BIT05  = 000040 G       C$DCLN= 000044          DROP    011624          EM67    007334          F$HARD= 000004
BIT06  = 000100 G       C$DODU= 000051          DRPCOD  013024 G        EM7     005163          F$HW   = 000013
BIT07  = 000200 G       C$DRPT= 000024          DRST   = 000010         EM70    007371          F$INIT= 000006
BIT08  = 000400 G       C$DU   = 000053         DRTIM   004712          EM71    007426          F$JMP  = 000050
BIT09  = 001000 G       C$EDIT= 000003          DRTYPE  024553          EM72    007463          F$MOD  = 000000
BIT1   = 000002 G       C$ERDF= 000055          DRVRDY  012314          EM73    007516          F$MSG  = 000011
BIT10  = 002000 G       C$ERHR= 000056          DSPCOD  011632 G        EM74    007551          F$PROT= 000021
BIT11  = 004000 G       C$ERRO= 000060          DS0    = 000000         EM75    007603          F$PWR  = 000017
BIT12  = 010000 G       C$ERSF= 000054          DS1    = 000400         EM76    007635          F$RPT  = 000012
BIT13  = 020000 G       C$ERSO= 000057          DS2    = 001000         EM77    007670          F$SEG  = 000003
BIT14  = 040000 G       C$ESCA= 000010          DS3    = 001400         END     012470          F$SOFT= 000005
BIT15  = 100000 G       C$ESEG= 000005          DWORD   002376          ENDPAT  002624          F$SRV  = 000010
BIT2   = 000004 G       C$ESUB= 000003          EF.CON= 000036 G        ERCOUN  003074          F$SUB  = 000002
BIT3   = 000010 G       C$ETST= 000001          EF.NEW= 000035 G        ERPOIN  003072          F$SW   = 000014
BIT4   = 000020 G       C$EXIT= 000032          EF.PWR= 000034 G        ERR    = 100000         F$TEST= 000001
BIT5   = 000040 G       C$GETB= 000026          EF.RES= 000037 G        ERRVEC  002340          GDDAT   002362
BIT6   = 000100 G       C$GETW= 000027          EF.STA= 000040 G        ERR0    010160 G        GLBDAT  002242 G
BIT7   = 000200 G       C$GMAN= 000043          ELT    = 000002         ERR1    010176 G        GLBEQA  002242 G
BIT8   = 000400 G       C$GPHR= 000042          EMSG    024654          ERR2    010210 G        GLBERR  010160 G
BIT9   = 001000 G       C$GPLO= 000030          EM1     004740          ERR3    010252 G        GLBSUB  013034 G
BOE    = 000400 G       C$GPRI= 000040          EM101   007723          ERR4    010324 G        GLBTXT  003774 G
BPRIOR  002264          C$INIT= 000011          EM102   007770          ERR5    010372 G        GODRVR= 000202
BRMSG   024533          C$INLP= 000020          EM11    005211          ERR6    010404 G        GSBIT  = 000002
BVEC    002266          C$MANI= 000050          EM13    005252          ERR7    010446 G        GSTAT  = 000004
B.BA    002274          C$MEM  = 000031         EM14    005304          EVL    = 000004 G       GSTINT  004535
B.BE    002302          C$MSG  = 000023         EM15    005332          E$END  = 002100         GSTMES  004476
B.CS    002272          C$OPEN= 000034          EM16    005360          E$LOAD= 000035          G$CNTO= 000200
B.DA    002276          C$PNTB= 000014          EM17    005406          E.BA    002310          G$DELM= 000372
B.MP    002300          C$PNTF= 000017          EM2     004765          E.BE    002322          G$DISP= 000003
CALBCC  002344          C$PNTS= 000016          EM3     005012          E.CS    002306          G$EXCP= 000400
CHERR   013120          C$PNTX= 000015          EM30    005441          E.DA    002312          G$HILI= 000002
CKERLT  013034          C$QIO  = 000377         EM30A   005500          E.MP    002314          G$LOLI= 000001
```

SYMBOL TABLE

```
G$NO  = 000000          LOT   = 000010 G      L10004  010370      L10076  024630      SECMSK  002334
G$OFFS= 000400          L$ACP   002110 G      L10005  010402      MAXCYL  002400      SEEK  = 000006
G$OFSI= 000376          L$APT   002036 G      L10006  010444      MAXSEC  002374      SEKINT  004444
G$PRMA= 000001          L$AU    013030 G      L10007  010502      MDHEDR  002000 G    SEKMES  004413
G$PRMD= 000002          L$AUT   002070 G      L10010  011622      MERLMT  011626      SFTPRM  024604 G
G$PRML= 000000          L$AUTO  012534 G      L10011  011632      MK    = 000001      SIGN  = 000004
G$RADA= 000140          L$CCP   002106 G      L10013  012532      MSCRLF  004040      SIMBCC  014032
G$RADB= 000000          L$CLEA  012756 G      L10014  012754      MXSEC1  002372      SIZE  = 000004
G$RADD= 000040          L$CO    002032 G      L10015  013022      NOOP0 = 000000      SKEEND  002770
G$RADL= 000120          L$DEPO  002011 G      L10016  013026      NOOP7 = 000016      SKEND   002726
G$RADO= 000020          L$DESC  002122 G      L10017  013032      NOPINT  004157      SKLST   002626
G$XFER= 000004          L$DESP  002076 G      L10020  014216      NOPMES  004126      SPTCOD  011622 G
G$YES = 000010          L$DEVP  002060 G      L10021  014500      NOPWR   012014      START   012072
HALMAX  002704          L$DISP  011634 G      L10022  014574      NXM   = 020000      START1  012034
HCRCME  004013          L$DLY   002116 G      L10023  014670      NXMMES  004001      STHS  = 000100
HDRBUF  003274          L$DTP   002040 G      L10024  014764      NXT     012064      SVCGBL= 000000
HDRLST  013640          L$DTYP  002034 G      L10025  015104      OKHDR   013650      SVCINS= 000000
HMAX    002734          L$DU    013024 G      L10026  015210      OPI   = 002000      SVCSUB= 177777
HNFMES  004021          L$DUT   002072 G      L10027  015276      OPIERR  004053      SVCTAG= 000000
HOE   = 100000 G        L$DVTY  002230 G      L10030  015422      OPIMES  004006      SVCTST= 177777
HPTCOD  011604 G        L$EF    002052 G      L10031  015546      O$APTS= 000000      SVHD    002402
HRDPRM  024424 G        L$ENVI  002044 G      L10032  015654      O$AU  = 000001      S$LSYM= 010000
IBE   = 010000 G        L$ETP   002102 G      L10033  015754      O$BGNR= 000000      TEMP2   002346
IDU   = 000040 G        L$EXP1  002046 G      L10034  016044      O$BGNS= 000001      TEMP3   002350
IER   = 020000 G        L$EXP4  002064 G      L10035  016144      O$DU  = 000001      TEMP4   002352
INITCO  011772 G        L$EXP5  002066 G      L10036  016254      O$ERRT= 000000      TMPFNC  002412
INTEN = 000100          L$HARD  024426 G      L10037  016330      O$GNSW= 000001      TMP0    002354
INTFLG  002330          L$HIME  002120 G      L10040  016366      O$POIN= 000001      TMP1    002356
INTSRV  014212          L$HPCP  002016 G      L10041  016512      O$SETU= 000000      TMP2    002360
ISR   = 000100 G        L$HPTP  002022 G      L10042  016652      PFLG    002324      TRPFLG  002326
IXE   = 004000 G        L$HW    011606 G      L10043  017012      PNT   = 001000 G    TRPHAN  014204
I$AU  = 000041          L$ICP   002104 G      L10044  017216      PRI   = 002000 G    TYPDR = 000006
I$AUTO= 000041          L$INIT  011772 G      L10045  017250      PRIOR = 000004      T$ARGC= 000001
I$CLN = 000041          L$LADP  002026 G      L10046  017456      PRI00 = 000000 G    T$CODE= 001032
I$DU  = 000041          L$LAST  024674 G      L10047  017544      PRI01 = 000040 G    T$ERRN= 000066
I$HRD = 000041          L$LOAD  002100 G      L10050  017712      PRI02 = 000100 G    T$EXCP= 000000
I$INIT= 000041          L$LUN   002074 G      L10051  017742      PRI03 = 000140 G    T$FLAG= 000040
I$MOD = 000041          L$MREV  002050 G      L10052  020114      PRI04 = 000200 G    T$GMAN= 000000
I$MSG = 000041          L$NAME  002000 G      L10053  020202      PRI05 = 000240 G    T$HILI= 177777
I$PROT= 000040          L$PRIO  002042 G      L10054  020330      PRI06 = 000300 G    T$LAST= 000001
I$PTAB= 000041          L$PROT  011764 G      L10055  020352      PRI07 = 000340 G    T$LOLI= 000000
I$PWR = 000041          L$PRT   002112 G      L10056  020432      PWRFLG  002242      T$LSYM= 010000
I$RPT = 000041          L$REPP  002062 G      L10057  020576      QMAX    002732      T$LTNO= 000054
I$SEG = 000041          L$REV   002010 G      L10060  020734      QUAMAX  002702      T$NEST= 177777
I$SETU= 000041          L$SOFT  024606 G      L10061  021252      RDHDR = 000010      T$NS0 = 000000
I$SFT = 000041          L$SPC   002056 G      L10062  021346      READ  = 000014      T$NS1 = 000005
I$SRV = 000041          L$SPCP  002020 G      L10063  021412      REST    012132      T$PTNU= 000000
I$SUB = 000041          L$SPTP  002024 G      L10064  021536      RESTMS  013402      T$SAVL= 177777
I$TST = 000041          L$STA   002030 G      L10065  022154      RHDINT  004352      T$SEGL= 177777
J$JMP = 000167          L$SW    011624 G      L10066  022306      RHDMES  004312      T$SEK0= 010000
LDCSR   002332          L$TEST  002114 G      L10067  022450      RHHS  = 000100      T$SUBN= 000000
LDFUNC  013420          L$TIML  002014 G      L10070  022610      RLBA    002252      T$TAGL= 177777
LF      004043          L$UNIT  002012 G      L10071  022762      RLBE    002260      T$TAGN= 010077
LINE1   010504          L10000  010174        L10072  023410      RLCS    002250      T$TEMP= 000000
LINE2   010540          L10001  010206        L10073  024130      RLDA    002254      T$TEST= 000054
LINE3   010752          L10002  010250        L10074  024422      RLMP    002256      T$TSTM= 177777
LOE   = 040000 G        L10003  010322        L10075  024512      RL2     002730      T$TSTS= 000001
```

SYMBOL TABLE

```
T$$AU = 010017          T1      014406 G        T24     017546 G        T39     022310 G        VECT  = 000002
T$$AUT= 010014          T10     015550 G        T25     017714 G        T4      014672 G        WAIT0   012332
T$$CLE= 010015          T11     015656 G        T26     017744 G        T40     022452 G        WAIT1   021302
T$$DU = 010016          T12     015756 G        T27     020116 G        T41     022612 G        WCKINT  004251
T$$HAR= 010075          T13     016046 G        T28     020204 G        T42     022764 G        WCKMES  004211
T$$HW = 010010          T14     016146 G        T29     020332 G        T43     023412 G        WHY     002404
T$$INI= 010013          T15     016256 G        T3      014576 G        T44     024132 G        WRCHK = 000002
T$$MSG= 010007          T16     016332 G        T30     020354 G        T5      014766 G        WRITE = 000012
T$$PRO= 010012          T17     016370 G        T31     020434 G        T6      015106 G        WTCRDY  014306
T$$SEG= 010000          T18     016514 G        T32     020600 G        T7      015212 G        WTDRDY  014220
T$$SOF= 010076          T19     016654 G        T33     020736 G        T8      015300 G        XPOLY   002336
T$$SRV= 010020          T2      014502 G        T34     021254 G        T9      015424 G        XXX     012114
T$$SW = 010011          T20     017014 G        T35     021350 G        UAM   = 000200 G        X$ALWA= 000000
T$$TES= 010074          T21     017220 G        T36     021414 G        UNITST  002246          X$FALS= 000040
T.CNTL  002410          T22     017252 G        T37     021540 G        UUT     002244          X$OFFS= 000400
T.DRIV  002406          T23     017460 G        T38     022156 G        VECMSG  024544          X$TRUE= 000020
T.SIZE  011630

. ABS.  024674      000
        000000      001
ERRORS DETECTED:  0

VIRTUAL MEMORY USED:  29184 WORDS  ( 114 PAGES)
DYNAMIC MEMORY AVAILABLE FOR  70 PAGES
A:CZRLGC.BIN,CZRLGC/C=SVC33.SRC,A:CZRLGC.MAC
```

CROSS REFERENCE TABLE (CREF V04.00)

CROSS REFERENCE TABLE (CREF V04.00)

```
BIT9      2-26#   2-38    2-39    2-211   2-271
BOE       2-26#
BPRIOR    2-87#   5-51*   8-648
BRMSG     8-A56   8-A62#
BVEC      2-88#   5-50*   5-97    5-154
C$AU      2-7#    5-186
C$AUTO    2-7#    5-141
C$BRK     2-7#
C$BSEG    2-7#    7-118   7-157   8-23    8-56    8-94    8-131   8-165   8-197   8-228   8-650   8-872   8-;34   8-?38
C$BSUB    2-7#
C$CEFG    2-7#
C$CLCK    2-7#
C$CLEA    2-7#    5-164
C$CLOS    2-7#
C$CLP1    2-7#    7-22    7-48    7-73    7-98    8-360   8-403   8-447   8-491   8-500   8-535   8-563   8-574   8-583
          8-626   8-703   8-726   8-738   8-764   8-794   8-799   8-818   8-842   8-889   8-:05   8-:32   8-:55   8-:58
          8-:61   8-:92   8-:96   8-;02   8-;09   8-;39   8-;42   8-;57   8-;60   8-;63   8-;66   8-;71   8-;74   8-;83
          8-;90   8-;93   8-;96   8-;99   8-<05   8-<18   8-<55   8-<58   8-<61   8-<64   8-<69   8-=01   8-=04   8-=07
          8-=10   8-=15   8-=48   8-=51   8-=54   8-=57   8-=63   8-=96   8-=99   8->02   8->05   8->46   8->49   8->87
          8->91   8->95   8->98   8-?01   8-?05   8-?10   8-?43   8-?46   8-?61   8-?64   8-?67   8-?70   8-?76   8-?79
          8-?88   8-?95   8-?98   8-@01   8-@05   8-@10   8-@14   8-@24   8-@43   8-@75   8-@78   8-@93   8-@96   8-@99
          8-AG2   8-A08   8-A11   8-A20   8-A27   8-A31   8-A36
C$CVEC    2-7#    5-121   5-123   5-154   7-16    7-42    7-67    7-92
C$DCLN    2-7#    5-90    6-18
C$DODU    2-7#    5-89    5-128   5-139   6-17
C$DRPT    2-7#
C$DU      2-7#    5-176
C$EDIT    2-7#    2-17
C$ERDF    2-7#    6-100   6-280   6-296   7-132   7-168   8-32    8-70    8-108   8-143   8-175   8-206   8-238   8-279
          8-304   8-327   8-359   8-368   8-402   8-412   8-446   8-455   8-490   8-499   8-507   8-572   8-581   8-590
          8-624   8-670   8-725   8-737   8-767   8-793   8-802   8-841   8-887   8-934   8-:04   8-:91   8-;08   8-;82
          8-<17   8-<79   8-=26   8-=73   8->21   8-?20   8-?87   8-@23   8-@42   8-A19
C$ERHR    2-7#
C$ERRO    2-7#
C$ERSF    2-7#    7-21    7-47    7-72    7-97
C$ERSO    2-7#
C$ESCA    2-7#    7-133   7-169   8-33    8-71    8-109   8-144   8-176   8-207   8-239   8-566   8-659   8-662   8-672
          8-865   8-868   8-877   8-880   8-912   8-915   8-<08   8-<72   8-=18   8-=66   8->11   8->14   8-?13
C$ESEG    2-7#    7-140   8-7     8-40    8-78    8-114   8-149   8-181   8-212   8-244   8-678   8-893   8-<33   8-@57
C$ESUB    2-7#
C$ETST    2-7#    7-23    7-49    7-74    7-99    7-141   8-8     8-41    8-79    8-115   8-150   8-182   8-213   8-245
          8-281   8-307   8-330   8-372   8-414   8-459   8-512   8-540   8-594   8-631   8-683   8-707   8-740   8-770
          8-805   8-821   8-846   8-894   8-937   8-:11   8-:35   8-:65   8-;11   8-<34   8-<82   8-=29   8-=76   8->24
          8-?23   8-@58   8-A39
C$EXIT    2-7#
C$GETB    2-7#
C$GETW    2-7#
C$GMAN    2-7#
C$GPHR    2-7#    5-42
C$GPLO    2-7#
C$GPRI    2-7#
C$INIT    2-7#    5-103
C$INLP    2-7#    6-7
C$MANI    2-7#
C$MEM     2-7#
C$MSG     2-7#    4-11    4-18    4-26    4-35    4-44    4-51    4-62    4-71
```

CROSS REFERENCE TABLE (CREF V04.00)

CROSS REFERENCE TABLE (CREF V04.00)

```
DRPCOD   5-170#
DRST     2-49#   8-699
DRTIM    3-35#   6-280
DRTYPE   8-A54   8-A64#
DRVRDY   5-78#   5-85
DS0      2-36#
DS1      2-37#
DS2      2-38#
DS3      2-39#
DSPCOD   4-142#
DWORD    2-124#  8-;77*  8-<11*  8-?82*  8-@17*  8-A14*
ESEND    2-7#
ESLOAD   2-7#    2-17
E.BA     2-97#   4-78    6-193*
E.BE     2-102#  6-200*
E.CS     2-96#   4-78    6-45    6-53    6-60    6-64    6-69    6-73    6-77    6-81    6-86    6-90    6-192*  8-760
         8-765   8-795   8-800   8-971*  8-972
E.DA     2-98#   4-79    6-194*
E.MP     2-99#   4-79    6-195*  8-870   8-882   8-917   8-976*  8-;44   8-;78   8-<12   8-<74   8-=20   8-=68   8->16
         8->51   8-?15   8-?46   8-?83   8-@18   8-@26   8-@80   8-A15
E.MP1    2-100#  6-196*  8-924   8-977*  8-@32
E.MP2    2-101#  6-197*  8-930   8-978*  8-@38
EF.CON   2-26#   5-30
EF.NEW   2-26#
EF.PWR   2-26#   5-15
EF.RES   2-26#   5-19
EF.STA   2-26#   5-21
ELT      2-69#   8-A77   8-A77   8-A77
EM1      3-36#   7-21
EM101    3-83#   4-82
EM102    3-84#   4-83    6-59
EM11     3-43#   8-793
EM13     3-44#   8-624
EM14     3-45#   8-572
EM15     3-46#   8-581
EM16     3-47#   8-590
EM17     3-48#   8-670
EM2      3-37#   7-47
EM3      3-38#   7-72
EM30     3-49#   8-725
EM30A    3-50#   8-737
EM32     3-51#
EM33     3-52#   8-767   8-802
EM34     3-53#
EM37     3-54#   8-841
EM4      3-39#   7-97
EM41     3-55#   8-887
EM42     3-56#   8-934   8-@42
EM43     3-57#   8-:04
EM44     3-58#   8-490
EM45     3-59#   8-499
EM46     3-60#   8-507
EM47     3-61#   8-:91
EM5      3-40#   7-132
EM52     3-62#   8-;08
EM54     3-63#   8-;82   8-<17   8-?87   8-@23   8-A19
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CROSS REFERENCE TABLE (CREF V04.00)

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EM55      3-64#     8-<79     8-=26
EM56      3-65#     8-=73     8->21
EM57      3-66#     8-?20
EM6       3-41#     7-168
EM61      3-68#     8-70
EM62      3-69#     8-108
EM63      3-70#     8-143
EM64      3-71#     8-175
EM65      3-72#     8-206
EM66      3-73#     8-238
EM67      3-74#     8-279
EM7       3-42#     8-32
EM70      3-75#     8-304
EM71      3-76#     8-327
EM72      3-77#     8-359
EM73      3-78#     8-368
EM74      3-79#     8-402
EM75      3-80#     8-412
EM76      3-81#     8-446
EM77      3-82#     8-455
EMSG      8-A77     8-A85#
END       5-70      5-97#
ENDPAT    2-205#    8-4       8-37      8-147     8-179     8-210     8-242
ERCOUN    2-296#    5-23      5-37
ERPOIN    2-295#    5-37*     5-40*     6-11*     6-12
ERR       2-29#     7-126     8-64      8-102     8-269     8-390     8-434     8-477
ERR0      4-5#      8-624     8-725     8-737     8-767     8-793     8-802     8-841     8-:91     8-;08
ERR1      4-13#     7-21      7-47      7-72      7-97
ERR2      4-20#     7-132     7-168     8-32      8-70      8-108     8-143     8-175     8-206     8-238     8-279     8-304     8-327     8-359
          8-368     8-402     8-412     8-446     8-455     8-490     8-499     8-507     8-572     8-581     8-590     8-:04
ERR3      4-28#     8-;82     8-<17     8-?87     8-@23     8-A19
ERR4      4-37#     8-887     8-934     8-<79     8-=26     8-=73     8->21     8-?20     8-@42
ERR5      4-46#     6-280
ERR6      4-53#     6-100     6-296
ERR7      4-64#     8-670
ERRVEC    2-109#    5-112     5-115     5-121     5-122     7-13      7-16      7-39      7-42      7-64      7-67      7-89      7-92
EVL       2-26#
F$AU      2-7#      5-182     5-186
F$AUTO    2-7#      5-108     5-141
F$BGN     2-7#      2-15      2-19      2-24      2-72      2-74      2-298     3-1       3-91      4-3       4-5       4-13      4-20      4-28
          4-37      4-46      4-53      4-64      4-114     4-116     4-128     4-130     4-140     4-142     4-146     5-3       5-10      5-12
          5-105     5-108     5-143     5-145     5-166     5-170     5-172     5-178     5-180     5-182     5-188     6-4       6-265     6-304
          7-3       7-23      7-28      7-49      7-54      7-74      7-79      7-99      7-104     7-118     7-133     7-141     7-146     7-157
          7-169     8-8       8-13      8-23      8-33      8-41      8-46      8-56      8-71      8-79      8-84      8-94      8-109     8-115
          8-120     8-131     8-144     8-150     8-155     8-165     8-176     8-182     8-187     8-197     8-207     8-213     8-218     8-228
          8-239     8-245     8-250     8-281     8-286     8-307     8-312     8-330     8-335     8-372     8-377     8-414     8-419     8-459
          8-463     8-512     8-516     8-540     8-545     8-566     8-594     8-599     8-631     8-636     8-650     8-659     8-662     8-672
          8-683     8-687     8-707     8-712     8-740     8-745     8-770     8-775     8-805     8-809     8-821     8-825     8-846     8-851
          8-865     8-868     8-872     8-877     8-880     8-894     8-899     8-912     8-915     8-937     8-942     8-:11     8-:16     8-:35
          8-:40     8-:65     8-:70     8-;11     8-;16     8-;34     8-<08     8-<34     8-<39     8-<72     8-<82     8-<87     8-=18     8-=29
          8-=34     8-=66     8-=76     8-=81     8->11     8->14     8->24     8->29     8-?13     8-?23     8-?28     8-?38     8-@58     8-@63
          8-A39     8-A41     8-A43     8-A68     8-A72     8-A74     8-A93
F$CLEA    2-7#      5-145     5-164
F$DU      2-7#      5-172     5-176
F$END     2-7       2-7       2-7       2-7       2-7       2-7       2-7       2-7       2-7       2-7       2-7       2-7       2-7       2-7
          2-7       2-7       2-7#      2-15      2-19      2-24      2-72      2-74      2-298     3-1       3-91      4-3       4-11      4-18
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CROSS REFERENCE TABLE (CREF V04.00)

	4-26	4-35	4-44	4-51	4-62	4-71	4-114	4-116	4-128	4-130	4-140	4-142	4-146	5-10
	5-103	5-105	5-141	5-143	5-164	5-166	5-170	5-176	5-178	5-180	5-186	5-188	6-4	6-269
	6-304	7-3	7-3	7-3	7-23	7-23	7-28	7-28	7-28	7-49	7-49	7-54	7-54	7-54
	7-74	7-74	7-79	7-79	7-79	7-99	7-99	7-104	7-104	7-104	7-133	7-140	7-141	7-141
	7-146	7-146	7-146	7-169	8-7	8-8	8-8	8-13	8-13	8-13	8-33	8-40	8-41	8-41
	8-46	8-46	8-46	8-71	8-78	8-79	8-79	8-84	8-84	8-84	8-109	8-114	8-115	8-115
	8-120	8-120	8-120	8-144	8-149	8-150	8-150	8-155	8-155	8-155	8-176	8-181	8-182	8-182
	8-187	8-187	8-187	8-207	8-212	8-213	8-213	8-218	8-218	8-218	8-239	8-244	8-245	8-245
	8-250	8-250	8-250	8-281	8-281	8-286	8-286	8-286	8-307	8-307	8-312	8-312	8-312	8-330
	8-330	8-335	8-335	8-335	8-372	8-372	8-377	8-377	8-377	8-414	8-414	8-419	8-419	8-419
	8-459	8-459	8-463	8-463	8-463	8-512	8-512	8-516	8-516	8-516	8-540	8-540	8-545	8-545
	8-545	8-566	8-594	8-594	8-599	8-599	8-599	8-631	8-631	8-636	8-636	8-636	8-659	8-662
	8-672	8-678	8-683	8-683	8-687	8-687	8-687	8-707	8-707	8-712	8-712	8-712	8-74C	8-740
	8-745	8-745	8-745	8-770	8-770	8-775	8-775	8-775	8-805	8-805	8-809	8-809	8-809	8-821
	8-821	8-825	8-825	8-825	8-846	8-846	8-851	8-851	8-851	8-865	8-868	8-877	8-880	8-893
	8-894	8-894	8-899	8-899	8-899	8-912	8-915	8-937	8-937	8-942	8-942	8-942	8-:11	8-:11
	8-:16	8-:16	8-:16	8-:35	8-:35	8-:40	8-:40	8-:40	8-:65	8-:65	8-:70	8-:70	8-:70	8-;11
	8-;11	8-;16	8-;16	8-;16	8-<08	8-<33	8-<34	8-<34	8-<39	8-<39	8-<39	8-<72	8-<82	8-<82
	8-<87	8-<87	8-<87	8-=18	8-=29	8-=29	8-=34	8-=34	8-=34	8-=66	8-=76	8-=76	8-=81	8-=81
	8-=81	8->11	8->14	8->24	8->24	8->29	8->29	8->29	8-?13	8-?23	8-?23	8-?28	8-?28	8-?28
	8-@57	8-@58	8-@58	8-@63	8-@63	8-@63	8-A39	8-A39	8-A41	8-A58	8-A68	8-A72	8-A78	8-A93
F$HARD	2-7#	8-A43	8-A58	8-A76										
F$HW	2-7#	4-118	4-126											
F$INIT	2-7#	5-12	5-103											
F$JMP	2-7#													
F$MOD	2-7#	2-15	2-19	2-24	2-72	2-74	2-298	3-1	3-91	4-3	4-114	4-116	4-128	4-130
	4-140	4-142	4-146	5-10	5-105	5-143	5-166	5-170	5-178	5-180	5-188	6-4	6-304	8-A41
	8-A68	8-A72	8-A93											
F$MSG	2-7#	4-5	4-11	4-13	4-18	4-20	4-26	4-28	4-35	4-37	4-44	4-46	4-51	4-53
	4-62	4-64	4-71											
F$PROT	2-7#	5-3	5-7											
F$PWR	2-7#													
F$RPT	2-7#													
F$SEG	2-7#	7-118	7-140	7-157	8-7	8-23	8-40	8-56	8-78	8-94	8-114	8-131	8-149	8-165
	8-181	8-197	8-212	8-228	8-244	8-650	8-678	8-872	8-893	8-;34	8-<33	8-?38	8-@57	
F$SOFT	2-7#	8-A74	8-A76	8-A78										
F$SRV	2-7#	6-265	6-269											
F$SUB	2-7#													
F$SW	2-7#	4-132	4-138											
F$TEST	2-7#	7-3	7-23	7-28	7-49	7-54	7-74	7-79	7-99	7-104	7-141	7-146	8-8	8-13
	8-41	8-46	8-79	8-84	8-115	8-120	8-150	8-155	8-182	8-187	8-213	8-218	8-245	8-250
	8-281	8-286	8-307	8-312	8-330	8-335	8-372	8-377	8-414	8-419	8-459	8-463	8-512	8-516
	8-540	8-545	8-594	8-599	8-631	8-636	8-683	8-687	8-707	8-712	8-740	8-745	8-770	8-775
	8-805	8-809	8-821	8-825	8-846	8-851	8-894	8-899	8-937	8-942	8-:11	8-:16	8-:35	8-:40
	8-:65	8-:70	8-;11	8-;16	8-<34	8-<39	8-<82	8-<87	8-=29	8-=34	8-=76	8-=81	8->24	8->29
	8-?23	8-?28	8-@58	8-@63	8-A39									
FIRST	2-120#	8-954*	8-983	8-985*	8-:01*									
FIX	6-62	6-67	6-71	6-75	6-79	6-83	6-88	6-92	6-94	6-96	6-168			
FNDFNC	6-126*	6-127*	6-128	6-130*	6-133*	6-148#								
FRMT1	4-73	4-90#												
FRMT11	4-99#	6-15												
FRMT12	4-100#	5-86												
FRMT13	4-101#													
FRMT14	4-102#	5-126												
FRMT15	4-103#	5-137												
FRMT2	4-76	4-78	4-91#											

CROSS REFERENCE TABLE (CREF V04.00)

CROSS REFERENCE TABLE (CREF V04.00)

```
I$DU      2-7#     5-172#   5-176#
I$HRD     8-A43#   8-A58#
I$INIT    2-7#     5-12#    5-103#
I$MOD     2-7#     2-15     2-15#    2-19     2-19#    2-24     2-24#    2-72     2-72#    2-74     2-74#    2-298    2-298#   3-1
          3-1#     3-91     3-91#    4-3      4-3#     4-114    4-114#   4-116    4-116#   4-128    4-128#   4-130    4-130#   4-140
          4-140#   4-142    4-142#   4-146    4-146#   5-10     5-10#    5-105    5-105#   5-143    5-143#   5-166    5-166#   5-170
          5-170#   5-178    5-178#   5-180    5-180#   5-188    5-188#   6-4      6-4#     6-304    6-304#   8-A41    8-A41#   8-A68
          8-A68#   8-A72    8-A72#   8-A93    8-A93#
I$MSG     2-7#     4-5#     4-11#    4-13#    4-18#    4-20#    4-26#    4-28#    4-35#    4-37#    4-44#    4-46#    4-51#    4-53#
          4-62#    4-64#    4-71#
I$PROT    2-7#     5-3#
I$PTAB    2-7#
I$PWR     2-7#
I$RPT     2-7#
I$SEG     2-7#     7-3      7-28     7-54     7-79     7-104    7-118#   7-133    7-140#   7-146    7-157#   7-169    8-7#     8-13
          8-23#    8-33     8-40#    8-46     8-56#    8-71     8-78#    8-84     8-94#    8-109    8-114#   8-120    8-131#   8-144
          8-149#   8-155    8-165#   8-176    8-181#   8-187    8-197#   8-207    8-212#   8-218    8-228#   8-239    8-244#   8-250
          8-286    8-312    8-335    8-377    8-419    8-463    8-516    8-545    8-599    8-636    8-650#   8-672    8-678#   8-687
          8-712    8-745    8-775    8-809    8-825    8-851    8-872#   8-877    8-880    8-893#   8-899    8-942    8-:16    8-:40
          8-:70    8-;16    8-;34#   8-<08    8-<33#   8-<39    8-<87    8-=34    8-=81    8->29    8-?28    8-?38#   8-@57#   8-@63
I$SETU    2-7#
I$SFT     8-A74#   8-A78#
I$SRV     2-7#     6-265#   6-269#
I$SUB     2-7#     7-3      7-28     7-54     7-79     7-104    7-146    8-13     8-46     8-84     8-120    8-[illegible]5   8-187    8-218
          8-250    8-286    8-312    8-335    8-377    8-419    8-463    8-516    8-545    8-599    8-636    8-687    8-712    8-745
          8-775    8-809    8-825    8-851    8-899    8-942    8-:16    8-:40    8-:70    8-;16    8-<39    8-<87    8-=34    8-=81
          8->29    8-?28    8-@63
I$TST     2-7#     7-3      7-3#     7-23     7-[illegible]#   7-23#    7-28     7-28#    7-49     7-49#    7-49#    7-54     7-54#    7-74
          7-74#    7-74#    7-79     7-79#    7-99     7-99#    7-99#    7-104    7-104#   7-141    7-141#   7-141#   7-146    7-146#
          8-8      8-8#     8-8#     8-13     8-13#    8-41     8-41#    8-41#    8-46     8-46#    8-79     8-79#    8-79#    8-84
          8-84#    8-115    8-115#   8-115#   8-120    8-120#   8-150    8-150#   8-150#   8-155    8-155#   8-182    8-182#   8-182#
          8-187    8-187#   8-213    8-213#   8-213#   8-218    8-218#   8-245    8-245#   8-245#   8-250    8-250#   8-281    8-281#
          8-281#   8-286    8-286#   8-307    8-307#   8-307#   8-312    8-312#   8-330    8-330#   8-330#   8-335    8-335#   8-372
          8-372#   8-372#   8-377    8-377#   8-414    8-414#   8-414#   8-419    8-419#   8-459    8-459#   8-459#   8-463    8-463#
          8-512    8-512#   8-512#   8-516    8-516#   8-540    8-540#   8-540#   8-545    8-545#   8-566    8-594    8-594#   8-594#
          8-599    8-599#   8-631    8-631#   8-631#   8-636    8-636#   8-659    8-662    8-683    8-683#   8-683#   8-687    8-687#
          8-707    8-707#   8-707#   8-712    8-712#   8-740    8-740#   8-740#   8-745    8-745#   8-770    8-770#   8-770#   8-775
          8-775#   8-805    8-805#   8-805#   8-809    8-809#   8-821    8-821#   8-821#   8-825    8-825#   8-846    8-846#   8-846#
          8-851    8-[illegible]51#   8-865    8-868    8-894    8-894#   8-894#   8-899    8-899#   8-912    8-915    8-937    8-937#   8-937#
          8-942    8-942#   8-:11    8-:11#   8-:11#   8-:16    8-:16#   8-:35    8-:35#   8-:35#   8-:40    8-:40#   8-:65    8-:65#
          8-:65#   8-:70    8-:70#   8-;11    8-;11#   8-;11#   8-;16    8-;16#   8-<34    8-<34#   8-<34#   8-<39    8-<39#   8-<72
          8-<82    8-<82#   8-<82#   8-<87    8-<87#   8-=18    8-=29    8-=29#   8-=29#   8-=34    8-=34#   8-=66    8-=76    8-=76#
          8-=76#   8-=81    8-=81#   8->11    8->14    8->24    8->24#   8->24#   8->29    8->29#   8-?13    8-?23    8-?23#   8-?23#
          8-?28    8-?28#   8-@58    8-@58#   8-@58#   8-@63    8-@63#   8-A39    8-A39#   8-A39#
IBE       2-26#
IDU       2-26#
IER       2-26#
INITCO    5-10#
INTEN     2-28#    5-152    6-127    6-135    8-620    8-656    8-720    8-788    8-836    8-:86
INTFLG    2-105#   6-267*   8-617*   8-622    8-625*   8-652*   8-667    8-674    8-716*   8-723    8-728*   8-735    8-785*   8-791
          8-834*   8-839    8-:82*   8-:89    8-:98*   8-;05
INTSRV    5-97     6-267#
ISR       2-26#
IXE       2-26#
J$JMP     2-7#
L$ACP     2-17#
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CROSS REFERENCE TABLE (CREF V04.00)

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L$AUT     2-17#
L$AUTO    2-17      5-108#
L$CCP     2-17#
L$CLEA    2-17      5-145#
L$CO      2-17#
L$DEPO    2-17#
L$DESC    2-17      2-21#
L$DESP    2-17#
L$DEVP    2-17#
L$DISP    2-17      4-144#
L$DLY     2-17#     5-81      6-276     6-290     8-:29
L$DTP     2-17#
L$DTYP    2-17#
L$DU      2-17      5-172#
L$DUT     2-17#
L$DVTY    2-17      2-22#
L$EF      2-17#
L$ENVI    2-17#
L$ETP     2-17#
L$EXP1    2-17#
L$EXP4    2-17#
L$EXP5    2-17#
L$HARD    2-17      8-A43     8-A43#
L$HIME    2-17#
L$HPCP    2-17#
L$HPTP    2-17#
L$HW      2-17      4-118     4-118#
L$ICP     2-17#
L$INIT    2-17      5-12#
L$LADP    2-17#
L$LAST    2-17      8-A94#
L$LOAD    2-17#
L$LUN     2-17#
L$MREV    2-17#
L$NAME    2-17#
L$PRIO    2-17#
L$PROT    2-17      5-3#
L$PRT     2-17#
L$REPP    2-17#
L$REV     2-17#
L$SOFT    2-17      8-A74     8-A74#
L$SPC     2-17#
L$SPCP    2-17#
L$SPTP    2-17#
L$STA     2-17#
L$SW      2-17      4-132     4-132#
L$TEST    2-17#
L$TIML    2-17#
L$UNIT    2-17#     5-17      5-36
L10000    4-11#
L10001    4-18#
L10002    4-26#
L10003    4-35#
L10004    4-44#
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CROSS REFERENCE TABLE (CREF V04.00)

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L10005    4-51#
L10006    4-62#
L10007    4-71#
L10010    4-118     4-126#
L10011    4-132     4-138#
L10013    5-103#
L10014    5-141#
L10015    5-164#
L10016    5-176#
L10017    5-186#
L10020    6-269#
L10021    7-23#
L10022    7-49#
L10023    7-74#
L10024    7-99#
L10025    7-141#
L10026    8-8#
L10027    8-41#
L10030    8-79#
L10031    8-115#
L10032    8-150#
L10033    8-182#
L10034    8-213#
L10035    8-245#
L10036    8-281#
L10037    8-307#
L10040    8-330#
L10041    8-372#
L10042    8-414#
L10043    8-459#
L10044    8-512#
L10045    8-540#
L10046    8-566     8-594#
L10047    8-631#
L10050    8-659     8-662     8-683#
L10051    8-707#
L10052    8-740#
L10053    8-770#
L10054    8-805#
L10055    8-821#
L10056    8-8[illegible]#
L10057    8-8[illegible]5   8-868     8-894#
L10060    8-912     8-915     8-937#
L10061    8-:11#
L10062    8-:35#
L10063    8-:65#
L10064    8-;11#
L10065    8-<34#
L10066    8-<72     8-<82#
L10067    8-=18     8-=29#
L10070    8-=66     8-=76#
L10071    8->11     8->14     8->24#
L10072    8-?13     8-?23#
L10073    8-@58#
L10074    8-A39#
L10075    8-A43     8-A58#
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CROSS REFERENCE TABLE (CREF V04.00)

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L10076  8-A74   8-A78#
LDCSR   2-106#  6-113*  6-125*  6-126   6-135   6-140*  6-141*  6-142   8-346*  8-349
LDFUNC  6-113#  8-532   8-560   8-619   8-655   8-700   8-719   8-731   8-757   8-787   8-815   8-835   8-862   8-874
        8-909   8-:25   8-:52   8-:85   8-;36   8-;54   8-;68   8-;87   8-<01   8-<52   8-<66   8-<98   8-=12   8-=45
        8-=60   8-=93   8->08   8->43   8->84   8-?07   8-?40   8-?58   8-?73   8-?92   8-a07   8-a72   8-a90   8-A05
        8-A24   8-A33
LF      3-15#   6-100
LINE1   4-7     4-15    4-22    4-30    4-39    4-48    4-55    4-66    4-73#   5-88    5-127   5-138   6-16
LINE2   4-8     4-31    4-40    4-57    4-76#
LINE3   4-56    4-82#
LOE     2-26#
LOT     2-26#
MAXCYL  2-125#
MAXSEC  2-123#
MDHEDR  2-15#
MERLMT  4-135#  6-12
MM      2-51#   8-699   8-718   8-730   8-756   8-786   8-:24   8-:51   8-:84   8-;53   8-;86   8-<48   8-<96   8-=42
        8-=59   8-=90   8->07   8->53   8->68   8->80   8-?57   8-?91   8-a89   8-A23   8-A32
MSCRLF  3-14#   6-95
MXSEC1  2-122#  8-995
NOOP0   2-40#   8-533   8-561   8-620   8-656
NOOP7   2-41#
NOPINT  3-19#   6-151
NOPMES  3-18#   6-150
NOPWR   5-16    5-19#
NXM     2-35#   6-69
NXMMES  3-8#    6-72
NXT     5-33#   5-45    5-47
O$APTS  2-7#    2-17
O$AU    2-7#    2-13#   2-17
O$BGNR  2-7#    2-17
O$BGNS  2-7#    2-13#   2-17
O$DU    2-7#    2-13#   2-17
O$ERRT  2-7#    2-17
O$GNSW  2-7#    2-13#   2-17
O$POIN  2-7#    2-13    2-13#   2-13#   2-13#   2-13#   2-17
O$SETU  2-7#    2-17    8-A94
OKHDR   6-154#
OPI     2-31#   6-73    8-765   8-800
OPIERR  3-17#   8-762   8-797
OPIMES  3-9#    6-76
PFLG    2-103#  5-98*   5-101*
PNT     2-26#
PRI     2-26#
PRI00   2-26#   8-618   8-717   8-729   8-784   8-833   8-:83
PRI01   2-26#
PRI02   2-26#
PRI03   2-26#
PRI04   2-26#
PRI05   2-26#
PRI06   2-26#
PRI07   2-26#   5-147   8-264   8-722   8-734   8-790   8-838   8-;04
PRIOR   2-61#   8-A56   8-A56   8-A56
PWRFLG  2-78#   5-17*   5-44    5-46*   5-69    5-158   5-161*
QMAX    2-243#  8->76   8->78   8->79
QUAMAX  2-231#  8->64   8->66   8->67
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RDHDR	2-45#	8-816	8-836	8-863	8-875	8-910	8-957	8-;37	8-;69	8-<02	8-<67	8-=13	8->44	8-?08
	8-?41	8-?74	8-a08	8-a73	8-A06									
READ	2-47#													
REST	5-42#													
RESTMS	6-97#	6-139*	8-762*	8-797*	8-974*									
RHDINT	3-23#	6-159												
RHDMES	3-22#	6-158	8-974											
RHHS	2-53#	8-;51	8-=22	8->54	8->58	8-?55	8-a87							
RL2	2-242#													
RLBA	2-82#	5-59*	6-179	6-193	7-41	7-45	7-163*	7-164	8-133*	8-138*	8-139	8-167*	8-170*	8-171
	8-295*	8-298*	8-301	8-347*	8-353	8-357	8-393*	8-436*	8-449	8-453	8-479*	8-493	8-497	8-55o*
	8-577													
RLBE	2-85#	5-67*	6-184	6-200										
RLCS	2-81#	4-73	5-57*	5-76*	5-77*	5-78	5-92*	5-93*	5-94*	5-95	5-120	5-131*	5-132*	5-133
	5-149	5-152*	6-120*	6-1?2	6-142*	6-144*	6-178	6-192	6-274	6-288	7-15	7-19	7-123*	7-124
	7-127	8-58*	8-61*	8-62	8-65	8-96*	8-99*	8-100	8-103	8-265*	8-267	8-274	8-349*	8-388
	8-391*	8-397	8-432	8-435*	8-441	8-475	8-478*	8-485	8-959*	8-960*	8-961	8-963		
RLDA	2-83#	5-61*	5-91*	6-117*	6-180	6-194	7-66	7-71	8-26*	8-28	8-199*	8-201*	8-202	8-230*
	8-233*	8-234	8-321*	8-324	8-348*	8-362	8-366	8-392*	8-405	8-410	8-437*	8-480*	8-501	8-504
	8-555*	8-586	8-699*	8-718*	8-730*	8-756*	8-786*	8-:24*	8-:51*	8-:84*	8-;52*	8-;53*	8-;85*	8-;86*
	8-<48*	8-<96*	8-<97*	8-=42*	8-=59*	8-=90*	8-=91*	8->07*	8->53*	8->56*	8->63*	8->67*	8->69	8->75*
	8->79*	8->81	8->93*	8-?56*	8-?57*	8-?90*	8-?91*	8-a88*	8-a89*	8-A22*	8-A23*	8-A32*		
RLMP	2-84#	5-63*	6-181	6-195	6-196	6-197	7-91	7-95	8-481*	8-557*	8-558	8-568	8-964	8-965
	8-966													
S$LSYM	2-7#	4-11#	4-18#	4-26#	4-35#	4-44#	4-51#	4-62#	4-71#	4-126#	4-138#	5-103#	5-141#	5-164#
	5-176#	5-186#	6-269#	7-23#	7-49#	7-74#	7-99#	7-118	7-118	7-118#	7-141#	7-157	7-157	7-157#
	8-8#	8-23	8-23	8-23#	8-41#	8-56	8-56	8-56#	8-79#	8-94	8-94	8-94#	8-115#	8-131
	8-131	8-131#	8-150#	8-165	8-165	8-165#	8-182#	8-197	8-197	8-197#	8-213#	8-228	8-228	8-228#
	8-245#	8-281#	8-307#	8-330#	8-372#	8-414#	8-459#	8-512#	8-540#	8-594#	8-631#	8-650	8-650	8-650#
	8-683#	8-707#	8-740#	8-770#	8-805#	8-821#	8-846#	8-872	8-872	8-872#	8-894#	8-937#	8-:11#	8-:35#
	8-:65#	8-;11#	8-;34	8-;34	8-;34#	8-<34#	8-<82#	8-=29#	8-=76#	8->24#	8-?23#	8-?38	8-?38	8-?38#
	8-a58#	8-A39#	8-A58#	8-A78#										
SECMSK	2-107#	8-871	8-883	8-991	8-997	8-;45	8-;79	8-<13	8->52	8-?16	8-?49	8-?84	8-a19	8-a81
	8-A16													
SEEK	2-44#	8-:26	8-:53	8-:86	8-;55	8-;88	8-<53	8-<99	8-=46	8-=94	8->85	8-?59	8-?93	8-a91
	8-A25													
SEKINT	3-25#	6-157												
SEKMES	3-24#	6-156												
SFTPRM	8-A72#													
SIGN	2-52#	8-:24	8-:84	8-;86	8->63	8->75	8-?91	8-A23						
SIMBCC	6-218#	8-919	8-925	8-a27	8-a33									
SIZE	2-70#													
SKEEND	2-259#	8-<27	8-a52											
SKEND	2-241#	8-<23	8-a49											
SKLST	2-209#	8-;33	8-?37											
SPTCOD	4-130#													
START	5-28	5-35#												
START1	5-20	5-23#												
STHS	2-54#	8-=92												
SVCGBL	2-7#	2-15	2-15	2-15	2-17	2-17	2-17	2-17	2-17	2-17	2-17	2-17	2-17	2-17
	2-17	2-17	2-17	2-17	2-17	2-17	2-17	2-17	2-17	2-17	2-17	2-17	2-17	2-17
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	2-17	2-17	2-17	2-17	2-17	2-17	2-17	2-17	2-17	2-17	2-17	2-17	2-17	2-17
	2-17	2-17	2-17	2-17	2-17	2-17	2-17	2-17	2-17	2-17	2-17	2-17	2-17	2-17
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        5-170   5-170   5-170   5-172   5-172   5-172   5-180   5-180   5-180   5-182   5-182   5-182   6-4     6-4
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        8-A94   8-A94   8-A94#
SVCINS  2-7#    2-8#    2-17    2-17    2-17    2-17    2-17    2-17    2-17    2-17    2-17    2-17    2-17    2-17
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        2-21    2-21    2-22    2-22    2-22    2-22    4-11    4-11    4-18    4-18    4-23    4-23    4-23    4-23
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        4-35    4-35    4-41    4-41    4-41    4-41    4-41    4-41    4-41    4-41    4-41    4-41    4-41    4-41
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8-572	8-572	8-574	8-574	8-581	8-581	8-581	8-581	8-581	8-581	8-581	8-581	8-583	8-583
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8-:11	8-:11	8-:29	8-:29	8-:29	8-:29	8-:29	8-:29	8-:29	8-:29	8-:29	8-:29	8-:29	8-:29
8-:29	8-:29	8-:29	8-:29	8-:32	8-:32	8-:35	8-:35	8-:55	8-:55	8-:58	8-:58	8-:61	8-:61
8-:65	8-:65	8-:83	8-:83	8-:83	8-:83	8-:91	8-:91	8-:91	8-:91	8-:91	8-:91	8-:91	8-:91
8-:92	8-:92	8-:96	8-:96	8-;02	8-;02	8-;04	8-;04	8-;04	8-;04	8-;08	8-;08	8-;08	8-;08
8-;08	8-;08	8-;08	8-;08	8-;09	8-;09	8-;11	8-;11	8-;34	8-;34	8-;39	8-;39	8-;42	8-;42
8-;57	8-;57	8-;60	8-;60	8-;63	8-;63	8-;66	8-;66	8-;71	8-;71	8-;74	8-;74	8-;82	8-;82
8-;82	8-;82	8-;82	8-;82	8-;82	8-;82	8-;83	8-;83	8-;90	8-;90	8-;93	8-;93	8-;96	8-;96
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8-<17	8-<17	8-<18	8-<18	8-<33	8-<33	8-<34	8-<34	8-<55	8-<55	8-<58	8-<58	8-<61	8-<61
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CROSS REFERENCE TABLE (CREF V04.00)

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                8->21   8->21   8->21   8->21   8->21   8->21   8->24   8->24   8->46   8->46   8->49   8->49   8->87   8->87
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                8-?13   8-?13   8-?20   8-?20   8-?20   8-?20   8-?20   8-?20   8-?20   8-?20   8-?23   8-?23   8-?38   8-?38
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                8-?79   8-?79   8-?87   8-?87   8-?87   8-?87   8-?87   8-?87   8-?87   8-?87   8-?88   8-?88   8-?95   8-?95
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                8-A77   8-A77   8-A77   8-A77   8-A78   8-A78   8-A94   8-A94   8-A94   8-A94   8-A94   8-A94
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                4-126   4-138   4-138   4-138   5-103   5-103   5-103   5-141   5-141   5-141   5-164   5-164   5-164   5-176
                5-176   5-176   5-186   5-186   5-186   6-269   6-269   6-269   7-4     7-9     7-23    7-23    7-23    7-31
                7-36    7-49    7-49    7-49    7-55    7-60    7-74    7-74    7-74    7-80    7-85    7-99    7-99    7-99
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                8-830   8-846   8-846   8-846   8-854   8-858   8-893   8-893   8-893   8-894   8-894   8-894   8-901   8-905
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                8-:47   8-:65   8-:65   8-:65   8-:73   8-:77   8-;11   8-;11   8-;11   8-;21   8-;30   8-<33   8-<33   8-<33
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SVCTST          2-7#    7-3     7-3     7-3     7-28    7-28    7-28    7-54    7-54    7-54    7-79    7-79    7-79    7-104
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CROSS REFERENCE TABLE (CREF V04.00)

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T$$MSG    4-5#    4-11    4-13#   4-18    4-20#   4-26    4-28#   4-35    4-37#   4-44    4-46#   4-51    4-53#   4-62
          4-64#   4-71
T$$PRO    5-3#
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T$$SW     4-132   4-132#  4-138
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          8-@58   8-@63#  8-A39
T$ARGC    2-17    2-17    2-17    2-17    2-17    2-17    2-17    2-17    2-17    2-17    2-17#   2-17#   2-17#
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CROSS REFERENCE TABLE (CREF V04.00)

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CROSS REFERENCE TABLE (CREF V04.00)

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                8-770#  8-776   8-776#  8-781   8-781#  8-805   8-805#  8-810   8-810#  8-813   8-813#  8-821   8-821#  8-827
                8-827#  8-830   8-830#  8-846   8-846#  8-854   8-854#  8-858   8-858#  8-865   8-865#  8-868   8-868#  8-877
                8-877#  8-877#  8-880   8-880#  8-880#  8-893   8-893#  8-894   8-894#  8-901   8-901#  8-905   8-905#  8-912
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                8->14   8->14#  8->24   8->24#  8->32   8->32#  8->40   8->40#  8-?13   8-?13#  8-?23   8-?23#  8-?29   8-?29#
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                8-A46   8-A46#  8-A46#  8-A46#  8-A48   8-A48   8-A48   8-A48#  8-A48#  8-A48#  8-A50   8-A50   8-A50   8-A50#
                8-A50#  8-A50#  8-A52   8-A52   8-A52   8-A52#  8-A52#  8-A52#  8-A54   8-A54   8-A54   8-A54#  8-A54#  8-A54#
                8-A56   8-A56   8-A56   8-A56#  8-A56#  8-A56#  8-A58   8-A58#  8-A68   8-A68#  8-A75   8-A75   8-A75   8-A75#
                8-A75#  8-A75#  8-A77   8-A77   8-A77   8-A77#  8-A77#  8-A77#  8-A78   8-A78#  8-A93   8-A93#
TSTEST          2-7#    7-3     7-3     7-3#    7-28    7-28    7-28#   7-54    7-54    7-54#   7-79    7-79    7-79#   7-104
                7-104   7-104#  7-146   7-146   7-146#  8-13    8-13    8-13#   8-46    8-46    8-46#   8-84    8-84    8-84#
                8-120   8-120   8-120#  8-155   8-155   8-155#  8-187   8-187   8-187#  8-218   8-218   8-218#  8-250   8-250
                8-250#  8-286   8-286   8-286#  8-312   8-312   8-312#  8-335   8-335   8-335#  8-377   8-377   8-377#  8-419
                8-419   8-419#  8-463   8-463   8-463#  8-516   8-516   8-516#  8-545   8-545   8-545#  8-599   8-599   8-599#
                8-636   8-636   8-636#  8-687   8-687   8-687#  8-712   8-712   8-712#  8-745   8-745   8-745#  8-775   8-775
                8-775#  8-809   8-809   8-809#  8-825   8-825   8-825#  8-851   8-851   8-851#  8-899   8-899   8-899#  8-942
                8-942   8-942#  8-:16   8-:16   8-:16#  8-:40   8-:40   8-:40#  8-:70   8-:70   8-:70#  8-;16   8-;16   8-;16#
                8-<39   8-<39   8-<39#  8-<87   8-<87   8-<87#  8-=34   8-=34   8-=34#  8-=81   8-=81   8-=81#  8->29   8->29
                8->29#  8-?28   8-?28   8-?28#  8-@63   8-@63   8-@63#  8-A94
TSTSTM          2-7#    4-11    4-18    4-23    4-26    4-32    4-35    4-41    4-44    4-51    4-60    4-62    4-67    4-71
                4-73    4-76    4-77    4-78    4-79    4-82    4-83    5-14    5-15    5-19    5-21    5-30    5-42    5-86
                5-89    5-90    5-97    5-99    5-103   5-112   5-121   5-126   5-128   5-137   5-139   5-141   5-147   5-154
                5-164   5-176   5-186   6-7     6-15    6-17    6-18    6-100   6-280   6-296   7-13    7-16    7-21    7-22
                7-23    7-39    7-42    7-47    7-48    7-49    7-64    7-67    7-72    7-73    7-74    7-89    7-92    7-97
                7-98    7-99    7-118   7-132   7-133   7-140   7-141   7-157   7-168   7-169   8-7     8-8     8-23    8-32
                8-33    8-40    8-41    8-56    8-70    8-71    8-78    8-79    8-94    8-108   8-109   8-114   8-115   8-131
                8-143   8-144   8-149   8-150   8-165   8-175   8-176   8-181   8-182   8-197   8-206   8-207   8-212   8-213
                8-228   8-238   8-239   8-244   8-245   8-264   8-271   8-279   8-281   8-300   8-304   8-307   8-323   8-327
                8-330   8-359   8-360   8-368   8-372   8-402   8-403   8-412   8-414   8-446   8-447   8-455   8-459   8-490
                8-491   8-499   8-500   8-507   8-512   8-535   8-540   8-563   8-566   8-572   8-574   8-581   8-583   8-590
                8-594   8-618   8-624   8-626   8-631   8-650   8-653   8-659   8-662   8-670   8-672   8-678   8-683   8-703
                8-707   8-717   8-722   8-725   8-726   8-729   8-734   8-737   8-738   8-740   8-764   8-767   8-770   8-784
                8-790   8-793   8-794   8-799   8-802   8-805   8-818   8-821   8-833   8-838   8-841   8-842   8-846   8-865
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CROSS REFERENCE TABLE (CREF V04.00)

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T6          4-144     7-146#
T7          4-144     8-13#
T8          4-144     8-46#
T9          4-144     8-84#
TEMP2       2-112#    6-222*    6-246*    8-993*    8-994*    8-995
TEMP3       2-113#    6-223*    6-228*
TEMP4       2-114#    6-224*    6-227     6-237*    6-239     6-244*    6-245*    6-248
TMP0        2-115#    4-32      8->57*    8->58*    8->61     8->73
TMP1        2-116#    8->68*    8->71*    8->80*    8->83*    8->93
TMP2        2-117#
TMPFNC      2-131#    6-48      6-51      6-128*
TRPFLG      2-104#    5-109*    5-124     6-262*    7-12*     7-17      7-38*     7-43      7-63*     7-68      7-88*     7-93
TRPHAN      5-112     5-114     6-262#    7-13      7-39      7-64      7-89
TYPDR       2-62#     8-A54     8-A54     8-A54
UAM         2-26#
UNITST      2-80#     5-35*     5-39*     5-42      5-89      5-128     5-139     6-17
UUT         2-79#     5-33      5-36*     5-41*
VECMSG      8-A50     8-A63#
VECT        2-60#     8-A50     8-A50     8-A50
WAIT0       5-81#     5-83
WAIT1       8-:29#    8-:31
WCKINT      3-21#     6-153
WCKMES      3-20#     6-152
WHY         2-127#
WRCHK       2-42#     6-51
WRITE       2-46#
WTCRDY      6-286#    8-534     8-562     8-621     8-658     8-702     8-721     8-733     8-759     8-789     8-817     8-837     8-864     8-876
            8-911     8-:27     8-:54     8-:87     8-;38     8-;56     8-;70     8-;89     8-<04     8-<54     8-<68     8-=00     8-=14     8-=47
            8-=62     8-=95     8->10     8->45     8->86     8->94     8-?09     8-?42     8-?60     8-?75     8-?94     8-@09     8-@74     8-@92
            8-A07     8-A26     8-A35
WTDRDY      6-272#    8-:60     8-;01     8-;62     8-;95     8-<60     8-=06     8-=53     8->01     8-?00     8-?66     8-@00     8-@98
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X$FALS      2-7#      8-A76
X$OFFS      2-7#      8-A76
X$TRUE      2-7#
XPOLY       2-108#    6-233     6-244
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CROSS REFERENCE TABLE (CREF V04.00)

CROSS REFERENCE TABLE (CREF V04.00)

CROSS ERENCE TABLE (CREF V04.00)

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        2-17    2-17    2-17    2-17    2-17    2-17    2-17    2-17    2-17    2-17    2-17    2-17#   2-17#   2-21
        2-21#   2-22    2-22#
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        4-126   4-126#  4-128   4-128#  4-138   4-138#  4-140   4-140#  4-146   4-146#  5-7     5-7#    5-103   5-103#
        5-105   5-105#  5-141   5-141#  5-164   5-164#  5-166   5-166#  5-176   5-176#  5-178   5-178#  5-186   5-186#
        5-188   5-188#  6-269   6-269#  6-304   6-304#  7-23    7-23#   7-49    7-49#   7-74    7-74#   7-99    7-99#
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        8-212   8-212   8-212#  8-212#  8-213   8-213#  8-244   8-244   8-244#  8-244#  8-245   8-245#  8-281   8-281#
        8-307   8-307#  8-330   8-330#  8-372   8-372#  8-414   8-414#  8-459   8-459#  8-512   8-512#  8-540   8-540#
        8-594   8-594#  8-631   8-631#  8-678   8-678   8-678#  8-678#  8-683   8-683#  8-707   8-707#  8-740   8-740#
        8-770   8-770#  8-805   8-805#  8-821   8-821#  8-846   8-846#  8-893   8-893   8-893#  8-893#  8-894   8-894#
        8-937   8-937#  8-:11   8-:11#  8-:35   8-:35#  8-:65   8-:65#  8-;11   8-;11#  8-<33   8-<33   8-<33#  8-<33#
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        5-188#  6-269#  6-304#  7-23#   7-49#   7-74#   7-99#   7-140#  7-141#  8-7#    8-8#    8-40#   8-41#   8-78#
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        8-175   8-175#  8-206   8-206#  8-238   8-238#  8-279   8-279#  8-304   8-304#  8-327   8-327#  8-359   8-359#
        8-368   8-368#  8-402   8-402#  8-412   8-412#  8-446   8-446#  8-455   8-455#  8-490   8-490#  8-499   8-499#
        8-507   8-507#  8-572   8-572#  8-581   8-581#  8-590   8-590#  8-624   8-624#  8-670   8-670#  8-725   8-725#
        8-737   8-737#  8-767   8-767#  8-793   8-793#  8-802   8-802#  8-841   8-841#  8-887   8-887#  8-934   8-934#
        8-:04   8-:04#  8-:91   8-:91#  8-;08   8-;08#  8-;82   8-;82#  8-<17   8-<17#  8-<79   8-<79#  8-=26   8-=26#
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        8-659#  8-662   8-662#  8-672#  8-865   8-865#  8-868   8-868#  8-877#  8-880#  8-912   8-912#  8-915   8-915#
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        8-877#  8-880   8-880#  8-912#  8-915#  8-<08   8-<08#  8-<72#  8-=18#  8-=66#  8->11#  8->14#  8-?13#
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        8-A56   8-A56   8-A56#  8-A77   8-A77   8-A77#
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MSEXSE  1-D20#  2-7#
MSEXTJ  1-D16#  2-7#
MSGEN   1-D36#  2-7#    2-15    2-15#   2-17    2-17    2-17    2-17    2-17    2-17    2-17    2-17    2-17    2-17
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8-737# 8-737# 8-737# 8-737# 8-738 8-738# 8-740 8-740# 8-764 8-764# 8-767 8-767 8-767 8-767
8-767# 8-767# 8-767# 8-767# 8-767# 8-770 8-770# 8-784 8-784 8-784# 8-784# 8-790 8-790 8-790#
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8-821# 8-833 8-833 8-833# 8-833# 8-838 8-838 8-838# 8-838# 8-841 8-841 8-841 8-841 8-841#
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8-:05# 8-:11 8-:11# 8-:29 8-:29 8-:29 8-:29 8-:29 8-:29 8-:29 8-:29# 8-:32 8-:32#
8-:35 8-:35# 8-:55 8-:55# 8-:58 8-:58# 8-:61 8-:61# 8-:65 8-:65# 8-:33 8-:83 8-:83# 8-:83#
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8-:02# 8-;04 8-;04 8-;04# 8-;04# 8-;08 8-;08 8-;08 8-;08 8-;08# 8-;08# 8-;08# 8-;08# 8-;08#
8-:09 8-:09# 8-;11 8-;11# 8-:34 8-;34# 8-;39 8-;39# 8-;42 8-;42# 8-;57 8-;57# 8-;60 8-;60#
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8-=48 8-=48# 8-=51 8-=51# 8-=54 8-=54# 8-=57 8-=57# 8-=63 8-=63# 8-=66 8-=66 8-=66# 8-=66#
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8-=99# 8->02 8->02# 8->05 8->05# 8->11 8->11 8->11# 8->11# 8->14 8->14 8->14# 8->14# 8->21
8->21 8->21 8->21 8->21# 8->21# 8->21# 8->21# 8->21# 8->24 8->24# 8->46 8->46# 8->49 8->49#
8->87 8->87# 8->91 8->91# 8->95 8->95# 8->98 8->98# 8-?01 8-?01# 8-?05 8-?05# 8-?10 8-?10#
8-?13 8-?13 8-?13# 8-?13# 8-?20 8-?20 8-?20 8-?20 8-?20# 8-?20# 8-?20# 8-?20# 8-?20# 8-?23
8-?23# 8-?38 8-?38# 8-?43 8-?43# 8-?46 8-?46# 8-?61 8-?61# 8-?64 8-?64# 8-?67 8-?67# 8-?70
8-?70# 8-?76 8-?76# 8-?79 8-?79# 8-?87 8-?87 8-?87 8-?87 8-?87# 8-?87# 8-?87# 8-?87# 8-?87#
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8-@23 8-@23 8-@23 8-@23 8-@23# 8-@23# 8-@23# 8-@23# 8-@23# 8-@24 8-@24# 8-@42 8-@42 8-@42

CROSS REFERENCE TABLE (CREF V04.00)

	8-a42	8-a42#	8-a42#	8-a42#	8-a42#	8-a42#	8-a43	8-a43#	8-a57	8-a57#	8-a58	8-a58#	8-a75	8-a75#
	8-a78	8-a78#	8-a93	8-a93#	8-a96	8-a96#	8-a99	8-a99#	8-A02	8-A02#	8-A08	8-A08#	8-A11	8-A11#
	8-A19	8-A19	8-A19	8-A19	8-A19#	8-A19#	8-A19#	8-A19#	8-A19#	8-A20	8-A20#	8-A27	8-A27#	8-A31
	8-A31#	8-A36	8-A36#	8-A39	8-A39#	8-A43	8-A43#	8-A46	8-A46	8-A46	8-A46	8-A46	8-A46#	8-A48
	8-A48	8-A48	8-A48	8-A48#	8-A50	8-A50	8-A50	8-A50	8-A50#	8-A52	8-A52	8-A52	8-A52	8-A52
	8-A52#	8-A54	8-A54	8-A54	8-A54#	8-A56	8-A56	8-A56	8-A56	8-A56	8-A56#	8-A58	8-A58#	8-A74
	8-A74#	8-A75	8-A75	8-A75	8-A75#	8-A76	8-A76#	8-A77	8-A77	8-A77	8-A77	8-A77	8-A77#	8-A78
	8-A78#	8-A94	8-A94	8-A94	8-A94#	8-A94#	8-A94#							
MSGNLS	1-C11#	2-7#	7-140	7-140#	8-7	8-7#	8-40	8-40#	8-78	8-78#	8-114	8-114#	8-149	8-149#
	8-181	8-181#	8-212	8-212#	8-244	8-244#	8-678	8-678#	8-893	8-893#	8-<33	8-<33#	8-a57	8-a57#
MSGNSU	1-B96#	2-7#												
MSGNTA	1-B88#	2-7#	4-11	4-11#	4-18	4-18#	4-26	4-26#	4-35	4-35#	4-44	4-44#	4-51	4-51#
	4-62	4-62#	4-71	4-71#	4-126	4-126#	4-138	4-138#	5-103	5-103#	5-141	5-141#	5-164	5-164#
	5-176	5-176#	5-186	5-186#	6-269	6-269#	7-23	7-23#	7-49	7-49#	7-74	7-74#	7-99	7-99#
	7-141	7-141#	8-8	8-8#	8-41	8-41#	8-79	8-79#	8-115	8-115#	8-150	8-150#	8-182	8-182#
	8-213	8-213#	8-245	8-245#	8-281	8-281#	8-307	8-307#	8-330	8-330#	8-372	8-372#	8-414	8-414#
	8-459	8-459#	8-512	8-512#	8-540	8-540#	8-594	8-594#	8-631	8-631#	8-683	8-683#	8-707	8-707#
	8-740	8-740#	8-770	8-770#	8-805	8-805#	8-821	8-821#	8-846	8-846#	8-894	8-894#	8-937	8-937#
	8-:11	8-:11#	8-:35	8-:35#	8-:65	8-:65#	8-;11	8-;11#	8-<34	8-<34#	8-<82	8-<82#	8-=29	8-=29#
	8-=76	8-=76#	8->24	8->24#	8-?23	8-?23#	8-a58	8-a58#	8-A39	8-A39#	8-A58	8-A58#	8-A78	8-A78#
MSGNTE	1-B92#	2-7#	7-3	7-3#	7-28	7-28#	7-54	7-54#	7-79	7-79#	7-104	7-104#	7-146	7-146#
	8-13	8-13#	8-46	8-46#	8-84	8-84#	8-120	8-120#	8-155	8-155#	8-187	8-187#	8-218	8-218#
	8-250	8-250#	8-286	8-286#	8-312	8-312#	8-335	8-335#	8-377	8-377#	8-419	8-419#	8-463	8-463#
	8-516	8-516#	8-545	8-545#	8-599	8-599#	8-636	8-636#	8-687	8-687#	8-712	8-712#	8-745	8-745#
	8-775	8-775#	8-809	8-809#	8-825	8-825#	8-851	8-851#	8-899	8-899#	8-942	8-942#	8-:16	8-:16#
	8-:40	8-:40#	8-:70	8-:70#	8-;16	8-;16#	8-<39	8-<39#	8-<87	8-<87#	8-=34	8-=34#	8-=81	8-=81#
	8->29	8->29#	8-?28	8-?28#	8-a63	8-a63#								
MSHAPT	1-A37#	2-7#	2-17	2-17#										
MSHNAP	1-B22#	2-7#	2-17	2-17#										
MSINCR	1-D24#	2-7#	2-15	2-15#	2-24	2-24#	2-74	2-74#	3-1	3-1#	4-3	4-3#	4-5	4-5
	4-5#	4-5#	4-11#	4-13	4-13	4-13#	4-13#	4-18#	4-20	4-20	4-20#	4-20#	4-23#	4-26#
	4-28	4-28	4-28#	4-28#	4-32#	4-35#	4-37	4-37	4-37#	4-37#	4-41#	4-44#	4-46	4-46
	4-46#	4-46#	4-51#	4-53	4-53	4-53#	4-53#	4-60#	4-62#	4-64	4-64	4-64#	4-64#	4-67#
	4-71#	4-73#	4-76#	4-77#	4-78#	4-79#	4-82#	4-83#	4-116	4-116#	4-118	4-118	4-118#	4-118#
	4-130	4-130#	4-132	4-132	4-132#	4-132#	4-142	4-142#	5-3	5-3	5-3#	5-3#	5-10	5-10#
	5-12	5-12	5-12#	5-12#	5-14#	5-15#	5-19#	5-21#	5-30#	5-42#	5-86#	5-89#	5-90#	5-97#
	5-99#	5-103#	5-108	5-108	5-108#	5-108#	5-112#	5-121#	5-126#	5-128#	5-137#	5-139#	5-141#	5-143
	5-143#	5-145	5-145	5-145#	5-145#	5-147#	5-154#	5-164#	5-170	5-170#	5-172	5-172	5-172#	5-172#
	5-176#	5-180	5-180#	5-182	5-182	5-182#	5-182#	5-186#	6-4	6-4#	6-7#	6-15#	6-17#	6-18#
	6-100#	6-265	6-265	6-265#	6-265#	6-280#	6-296#	7-3	7-3	7-3	7-3#	7-3#	7-3#	7-13#
	7-16#	7-21#	7-22#	7-23#	7-28	7-28	7-28	7-28#	7-28#	7-28#	7-39#	7-42#	7-47#	7-48#
	7-49#	7-54	7-54	7-54	7-54#	7-54#	7-54#	7-64#	7-67#	7-72#	7-73#	7-74#	7-79	7-79
	7-79	7-79#	7-79#	7-79#	7-89#	7-92#	7-97#	7-98#	7-99#	7-104	7-104	7-104	7-104#	7-104#
	7-104#	7-118	7-118	7-118	7-118#	7-118#	7-118#	7-118#	7-132#	7-133#	7-140#	7-141#	7-146	7-146
	7-146	7-146#	7-146#	7-146#	7-157	7-157	7-157	7-157#	7-157#	7-157#	7-157#	7-168#	7-169#	8-7#
	8-8#	8-13	8-13	8-13	8-13#	8-13#	8-13#	8-23	8-23	8-23	8-23#	8-23#	8-23#	8-23#
	8-32#	8-33#	8-40#	8-41#	8-46	8-46	8-46	8-46#	8-46#	8-46#	8-56	8-56	8-56	8-56#
	8-56#	8-56#	8-56#	8-70#	8-71#	8-78#	8-79#	8-84	8-84	8-84	8-84#	8-84#	8-84#	8-94
	8-94	8-94	8-94#	8-94#	8-94#	8-94#	8-108#	8-109#	8-114#	8-115#	8-120	8-120	8-120	8-120#
	8-120#	8-120#	8-131	8-131	8-131	8-131#	8-131#	8-131#	8-131#	8-143#	8-144#	8-149#	8-150#	8-155
	8-155	8-155	8-155#	8-155#	8-155#	8-165	8-165	8-165	8-165#	8-165#	8-165#	8-165#	8-175#	8-176#
	8-181#	8-182#	8-187	8-187	8-187	8-187#	8-187#	8-187#	8-197	8-197	8-197	8-197#	8-197#	8-197#
	8-197#	8-206#	8-207#	8-212#	8-213#	8-218	8-218	8-218	8-218#	8-218#	8-218#	8-228	8-228	8-228
	8-228#	8-228#	8-228#	8-228#	8-238#	8-239#	8-244#	8-245#	8-250	8-250	8-250	8-250#	8-250#	8-250#
	8-264#	8-271#	8-279#	8-281#	8-286	8-286	8-286	8-286#	8-286#	8-286#	8-300#	8-304#	8-307#	8-312
	8-312	8-312	8-312#	8-312#	8-312#	8-323#	8-327#	8-330#	8-335	8-335	8-335	8-335#	8-335#	8-335#

CROSS REFERENCE TABLE (CREF V04.00)

CROSS REFERENCE TABLE (CREF V04.00)

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                5-182   5-182#  6-4     6-4#    6-265   6-265#  7-3     7-3#    7-28    7-28#   7-54    7-54#   7-79    7-79#
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                8-23#   8-46    8-46#   8-56    8-56    8-56#   8-84    8-84#   8-94    8-94    8-94#   8-120   8-120#  8-131
                8-131   8-131#  8-155   8-155#  8-165   8-165   8-165#  8-187   8-187#  8-197   8-197   8-197#  8-218   8-218#
                8-228   8-228   8-228#  8-250   8-250#  8-286   8-286#  8-312   8-312#  8-335   8-335#  8-377   8-377#  8-419
                8-419#  8-463   8-463#  8-516   8-516#  8-545   8-545#  8-599   8-599#  8-636   8-636#  8-650   8-650   8-650#
                8-687   8-687#  8-712   8-712#  8-745   8-745#  8-775   8-775#  8-809   8-809#  8-825   8-825#  8-851   8-851#
                8-872   8-872   8-872#  8-899   8-899#  8-942   8-942#  8-:16   8-:16#  8-:40   8-:40#  8-:70   8-:70#  8-;16
                8-;16#  8-;34   8-;34   8-;34#  8-<39   8-<39#  8-<87   8-<87#  8-=34   8-=34#  8-=81   8-=81#  8->29   8->29#
                8-?28   8-?28#  8-?38   8-?38   8-?38#  8-@63   8-@63#  8-A41   8-A41#  8-A43   8-A43#  8-A72   8-A72#  8-A74
                8-A74#
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                4-73    4-73#   4-76    4-76    4-76    4-76    4-76    4-76    4-76    4-76#   4-77    4-77    4-77    4-77
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                4-79    4-79    4-79    4-79#   4-82    4-82    4-82    4-82#   4-83    4-83    4-83    4-83#   5-86    5-86
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                7-39#   7-39#   7-39#   7-39#   7-64    7-64    7-64    7-64    7-64#   7-64#   7-64#   7-64#   7-89    7-89
                7-89    7-89    7-89#   7-89#   7-89#   7-89#
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                8-A75   8-A75#  8-A77   8-A77#
M$RBRO          1-C50#  2-7#
M$RNRO          1-C60#  2-7#    5-42    5-42#
M$SETS          1-D30#  2-7#    2-15    2-15#   2-24    2-24#   2-74    2-74#   3-1     3-1#    4-3     4-3#    4-5     4-5#
                4-13    4-13#   4-20    4-20#   4-28    4-28#   4-37    4-37#   4-46    4-46#   4-53    4-53#   4-64    4-64#
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                7-104   7-104#  7-118   7-118   7-118#  7-118#  7-146   7-146#  7-157   7-157   7-157#  7-157#  8-13    8-13#
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                8-745   8-745#  8-775   8-775#  8-809   8-809#  8-825   8-825#  8-851   8-851#  8-872   8-872   8-872#  8-872#
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CROSS REFERENCE TABLE (CREF V04.00)

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        4-73    4-73#   4-76    4-76#   4-77    4-77#   4-78    4-78#   4-79    4-79#   4-82    4-82#   4-83    4-83#
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        5-89    5-89#   5-90    5-90#   5-97    5-97#   5-99    5-99#   5-103   5-103#  5-112   5-112#  5-121   5-121#
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        5-164   5-164#  5-176   5-176#  5-186   5-186#  6-7     6-7#    6-15    6-15#   6-17    6-17#   6-18    6-18#
        6-100   6-280   6-296   7-13    7-13#   7-16    7-16#   7-21    7-22    7-22#   7-23    7-23#   7-39    7-39#
        7-42    7-42#   7-47    7-48    7-48#   7-49    7-49#   7-64    7-64#   7-67    7-67#   7-72    7-73    7-73#
        7-74    7-74#   7-89    7-89#   7-92    7-92#   7-97    7-98    7-98#   7-99    7-99#   7-118   7-118#  7-132
        7-133   7-133#  7-140   7-140#  7-141   7-141#  7-157   7-157#  7-168   7-169   7-169#  8-7     8-7#    8-8
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        8-764#  8-767   8-770   8-770#  8-784   8-784#  8-790   8-790#  8-793   8-794   8-794#  8-799   8-799#  8-802
        8-805   8-805#  8-818   8-818#  8-821   8-821#  8-833   8-833#  8-838   8-838#  8-841   8-842   8-842#  8-846
        8-846#  8-865   8-865#  8-868   8-868#  8-872   8-872#  8-877   8-877#  8-880   8-880#  8-887   8-889   8-889#
        8-893   8-893#  8-894   8-894#  8-912   8-912#  8-915   8-915#  8-934   8-937   8-937#  8-:04   8-:05   8-:05#
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        8-:83   8-:83#  8-:91   8-:92   8-:92#  8-:96   8-:96#  8-;02   8-;02#  8-;04   8-;04#  8-;08   8-;09   8-;09#
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        8-<82#  8-=01   8-=01#  8-=04   8-=04#  8-=07   8-=07#  8-=10   8-=10#  8-=15   8-=15#  8-=18   8-=18#  8-=26
        8-=29   8-=29#  8-=48   8-=48#  8-=51   8-=51#  8-=54   8-=54#  8-=57   8-=57#  8-=63   8-=63#  8-=66   8-=66#
        8-=73   8-=76   8-=76#  8-=96   8-=96#  8-=99   8-=99#  8->02   8->02#  8->05   8->05#  8->11   8->11#  8->14
        8->14#  8->21   8->24   8->24#  8->46   8->46#  8->49   8->49#  8->87   8->87#  8->91   8->91#  8->95   8->95#
        8->98   8->98#  8-?01   8-?01#  8-?05   8-?05#  8-?10   8-?10#  8-?13   8-?13#  8-?20   8-?23   8-?23#  8-?38
        8-?38#  8-?43   8-?43#  8-?46   8-?46#  8-?61   8-?61#  8-?64   8-?64#  8-?67   8-?67#  8-?70   8-?70#  8-?76
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        8-@10   8-@10#  8-@14   8-@14#  8-@23   8-@24   8-@24#  8-@42   8-@43   8-@43#  8-@57   8-@57#  8-@58   8-@58#
        8-@75   8-@75#  8-@78   8-@78#  8-@93   8-@93#  8-@96   8-@96#  8-@99   8-@99#  8-A02   8-A02#  8-A08   8-A08#
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        5-154#  5-164#  5-176#  5-186#  6-7#    6-15#   6-17#   6-18#   6-100#  6-280#  6-296#  7-13#   7-16#   7-21#
        7-22#   7-23#   7-39#   7-42#   7-47#   7-48#   7-49#   7-64#   7-67#   7-72#   7-73#   7-74#   7-89#   7-92#
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CROSS REFERENCE TABLE (CREF V04.00)

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	8-784#	8-790#	8-793#	8-794#	8-799#	8-802#	8-805#	8-818#	8-821#	8-833#	8-838#	8-841#	8-842#	8-846#
	8-865#	8-868#	8-872#	8-877#	8-880#	8-887#	8-889#	8-893#	8-894#	8-912#	8-915#	8-934#	8-937#	8-:04#
	8-:05#	8-:11#	8-:32#	8-:35#	8-:55#	8-:58#	8-:61#	8-:65#	8-:83#	8-:91#	8-:92#	8-:96#	8-;02#	8-;04#
	8-;08#	8-;09#	8-;11#	8-;34#	8-;39#	8-;42#	8-;57#	8-;60#	8-;63#	8-;66#	8-;71#	8-;74#	8-;82#	8-;83#
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	8-<69#	8-<72#	8-<79#	8-<82#	8-=01#	8-=04#	8-=07#	8-=10#	8-=15#	8-=18#	8-=26#	8-=29#	8-=48#	8-=51#
	8-=54#	8-=57#	8-=63#	8-=66#	8-=73#	8-=76#	8-=96#	8-=99#	8->02#	8->05#	8->11#	8->14#	8->21#	8->24#
	8->46#	8->49#	8->87#	8->91#	8->95#	8->98#	8-?01#	8-?05#	8-?10#	8-?13#	8-?20#	8-?23#	8-?38#	8-?43#
	8-?46#	8-?61#	8-?64#	8-?67#	8-?70#	8-?76#	8-?79#	8-?87#	8-?88#	8-?95#	8-?98#	8-@01#	8-@05#	8-@10#
	8-@14#	8-@23#	8-@24#	8-@42#	8-@43#	8-@57#	8-@58#	8-@75#	8-@78#	8-@93#	8-@96#	8-@99#	8-A02#	8-A08#
	8-A11#	8-A19#	8-A20#	8-A27#	8-A31#	8-A36#	8-A39#							
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	4-41	4-41#	4-44	4-44#	4-51	4-51#	4-60	4-60#	4-62	4-62#	4-67	4-67#	4-71	4-71#
	4-73	4-73#	4-76	4-76#	4-77	4-77#	4-78	4-78#	4-79	4-79#	4-82	4-82#	4-83	4-83#
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	7-132#	7-132#	7-133	7-133#	7-140	7-140#	7-141	7-141#	7-157	7-157#	7-168	7-168#	7-168#	7-169
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	8-94#	8-108	8-108#	8-108#	8-109	8-109#	8-114	8-114#	8-115	8-115#	8-131	8-131#	8-143	8-143#
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	8-368#	8-372	8-372#	8-402	8-402#	8-402#	8-403	8-403#	8-412	8-412#	8-412#	8-414	8-414#	8-446
	8-446#	8-446#	8-447	8-447#	8-455	8-455#	8-455#	8-459	8-459#	8-490	8-490#	8-490#	8-491	8-491#
	8-499	8-499#	8-499#	8-500	8-500#	8-507	8-507#	8-507#	8-512	8-512#	8-535	8-535#	8-540	8-540#
	8-563	8-563#	8-566	8-566#	8-572	8-572#	8-572#	8-574	8-574#	8-581	8-581#	8-581#	8-583	8-583#
	8-590	8-590#	8-590#	8-594	8-594#	8-618	8-618#	8-624	8-624#	8-624#	8-626	8-626#	8-631	8-631#
	8-650	8-650#	8-653	8-653#	8-659	8-659#	8-662	8-662#	8-670	8-670#	8-670#	8-672	8-672#	8-678
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	8-794#	8-799	8-799#	8-802	8-802#	8-802#	8-805	8-805#	8-818	8-818#	8-821	8-821#	8-833	8-833#
	8-838	8-838#	8-841	8-841#	8-841#	8-842	8-842#	8-846	8-846#	8-865	8-865#	8-868	8-868#	8-872
	8-872#	8-877	8-877#	8-880	8-880#	8-887	8-887#	8-887#	8-889	8-889#	8-893	8-893#	8-894	8-894#
	8-912	8-912#	8-915	8-915#	8-934	8-934#	8-934#	8-937	8-937#	8-:04	8-:04#	8-:04#	8-:05	8-:05#
	8-:11	8-:11#	8-:32	8-:32#	8-:35	8-:35#	8-:55	8-:55#	8-:58	8-:58#	8-:61	8-:61#	8-:65	8-:65#
	8-:83	8-:83#	8-:91	8-:91#	8-:91#	8-:92	8-:92#	8-:96	8-:96#	8-;02	8-;02#	8-;04	8-;04#	8-;08
	8-;08#	8-;08#	8-;09	8-;09#	8-;11	8-;11#	8-;34	8-;34#	8-;39	8-;39#	8-;42	8-;42#	8-;57	8-;57#
	8-;60	8-;60#	8-;63	8-;63#	8-;66	8-;66#	8-;71	8-;71#	8-;74	8-;74#	8-;82	8-;82#	8-;82#	8-;83
	8-;83#	8-;90	8-;90#	8-;93	8-;93#	8-;96	8-;96#	8-;99	8-;99#	8-<05	8-<05#	8-<08	8-<08#	8-<17
	8-<17#	8-<17#	8-<18	8-<18#	8-<33	8-<33#	8-<34	8-<34#	8-<55	8-<55#	8-<58	8-<58#	8-<61	8-<61#
	8-<64	8-<64#	8-<69	8-<69#	8-<72	8-<72	8-<79	8-<79#	8-<79#	8-<82	8-<82#	8-=01	8-=01#	8-=04
	8-=04#	8-=07	8-=07#	8-=10	8-=10#	8-=15	8-=15#	8-=18	8-=18#	8-=26	8-=26#	8-=26#	8-=29	8-=29#
	8-=48	8-=48#	8-=51	8-=51#	8-=54	8-=54#	8-=57	8-=57#	8-=63	8-=63#	8-=66	8-=66#	8-=73	8-=73#
	8-=73#	8-=76	8-=76#	8-=96	8-=96#	8-=99	8-=99#	8->02	8->02#	8->05	8->05#	8->11	8->11#	8->14
	8->14#	8->21	8->21#	8->21#	8->24	8->24#	8->46	8->46#	8->49	8->49#	8->87	8->87#	8->91	8->91#

CROSS REFERENCE TABLE (CREF V04.00)

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                8-?67#   8-?70    8-?70#   8-?76    8-?76#   8-?79    8-?79#   8-?87    8-?87#   8-?87#   8-?88    8-?88#   8-?95    8-?95#
                8-?98    8-?98#   8-@01    8-@01#   8-@05    8-@05#   8-@10    8-@10#   8-@14    8-@14#   8-@23    8-@23#   8-@23#   8-@24
                8-@24#   8-@42    8-@42#   8-@42#   8-@43    8-@43#   8-@57    8-@57#   8-@58    8-@58#   8-@75    8-@75#   8-@78    8-@78#
                8-@93    8-@93#   8-@96    8-@96#   8-@99    8-@99#   8-A02    8-A02#   8-A08    8-A08#   8-A11    8-A11#   8-A19    8-A19#
                8-A19#   8-A20    8-A20#   8-A27    8-A27#   8-A31    8-A31#   8-A36    8-A36#   8-A39    8-A39#
MSWORD          1-C92#   2-7#     2-17     2-17#    4-144    4-144    4-144    4-144    4-144    4-144    4-144    4-144    4-144    4-144
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                4-144    4-144    4-144    4-144    4-144    4-144    4-144    4-144#   6-100    6-100    6-100    6-100#   6-280    6-280
                6-280    6-280#   6-296    6-296    6-296    6-296#   7-21     7-21     7-21     7-21#    7-47     7-47     7-47     7-47#
                7-72     7-72     7-72     7-72#    7-97     7-97     7-97     7-97#    7-132    7-132    7-132    7-132#   7-168    7-168
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                8-238    8-238#   8-279    8-279    8-279    8-279#   8-304    8-304    8-304    8-304#   8-327    8-327    8-327    8-327#
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                8-934    8-934    8-934    8-934#   8-:04    8-:04    8-:04    8-:04#   8-:91    8-:91    8-:91    8-:91#   8-;08    8-;08
                8-;08    8-;08#   8-;82    8-;82    8-;82    8-;82#   8-<17    8-<17    8-<17    8-<17#   8-<79    8-<79    8-<79    8-<79#
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                8-A56    8-A56#   8-A75    8-A75#   8-A76    8-A76#   8-A77    8-A77#   8-A94    8-A94
MSXFER          1-@80#   2-7#     8-A76    8-A76#
MANUAL          1-;60#   2-7#
MEMORY          1-;64#   2-7#
OPEN            1-;69#   2-7#
POINTE          1-;74#   2-7#     4-13
PRINTB          1-<37#   2-7#     4-23     4-32     4-41     4-60     4-67     4-73     4-76     4-77     4-78     4-79     4-82     4-83
                5-86     5-126    5-137
PRINTF          1-<77#   2-7#     6-15
PRINTS          1-=17#   2-7#
PRINTX          1-=57#   2-7#
READBU          1-=97#   2-7#     5-99
READEF          1->01#   2-7#     5-15     5-19     5-21     5-30
RDFLAGS         1->06#   2-7#
SETPRI          1->11#   2-7#     5-147    8-264    8-618    8-653    8-717    8-722    8-729    8-734    8-784    8-790    8-833    8-838
                8-:83    8-:04
SETVEC          1->16#   2-7#     5-97     5-112    7-13     7-39     7-64     7-89
SLASH           1->22#   2-7#
STARS           1->36#   2-7#     7-4      7-9      7-31     7-36     7-55     7-60     7-80     7-85     7-108    7-113    7-148    7-153
                8-15     8-19     8-47     8-52     8-86     8-90     8-122    8-127    8-157    8-161    8-189    8-193    8-220    8-224
                8-252    8-261    8-288    8-292    8-314    8-318    8-337    8-343    8-378    8-384    8-422    8-428    8-466    8-471
                8-520    8-525    8-547    8-550    8-601    8-611    8-638    8-642    8-690    8-696    8-747    8-753    8-776    8-781
                8-810    8-813    8-827    8-830    8-854    8-858    8-901    8-905    8-945    8-951    8-:17    8-:21    8-:43    8-:47
                8-:73    8-:77    8-;21    8-;30    8-<43    8-<46    8-<90    8-<93    8-=36    8-=40    8-=83    8-=87    8->32    8->40
                8-?29    8-?34    8-@65    8-@68
SVC             1->50#   2-5#     2-7
XFER            1-@10#   2-7#
XFERF           1-@14#   2-7#     8-A76
XFERT           1-@18#   2-7#
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