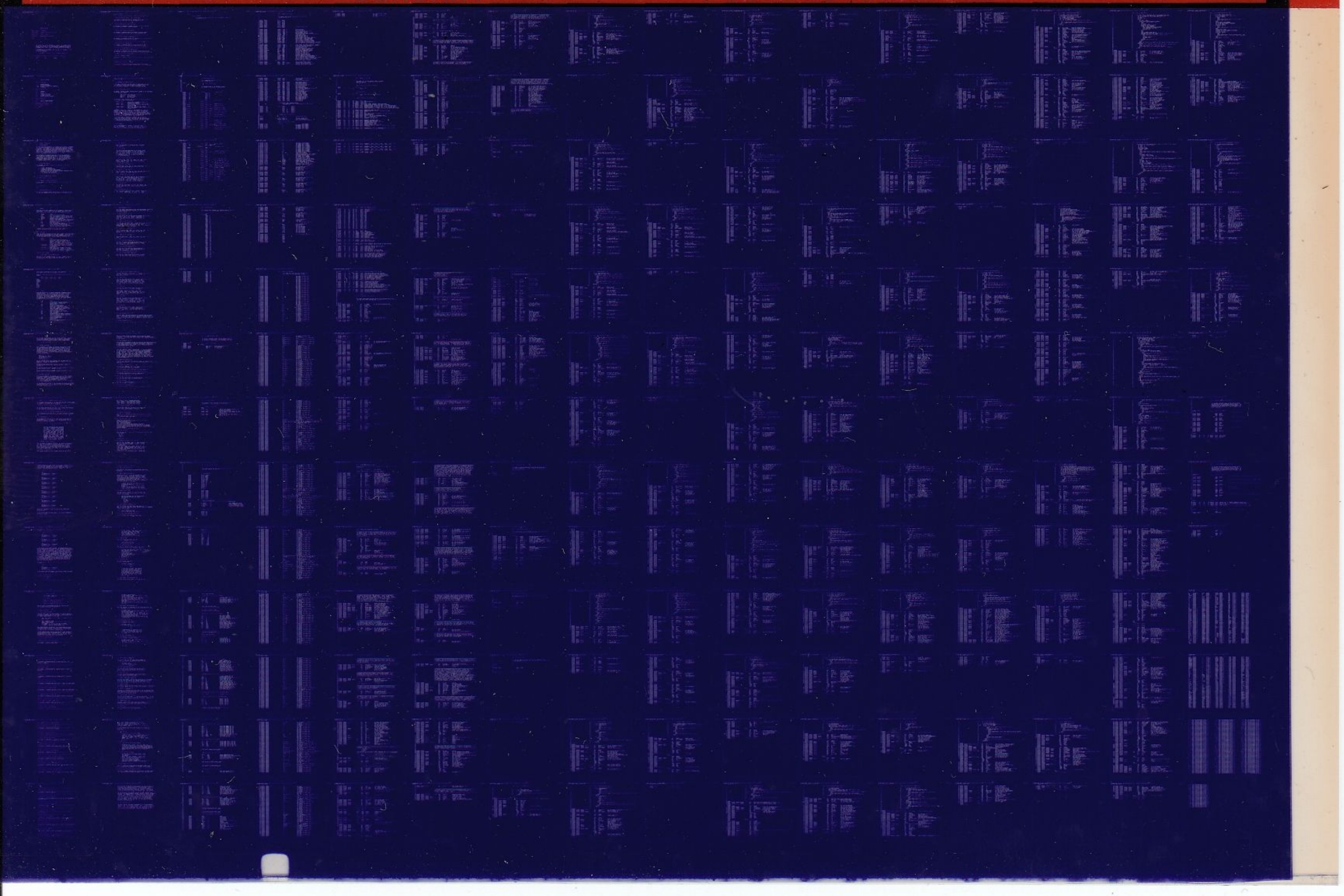
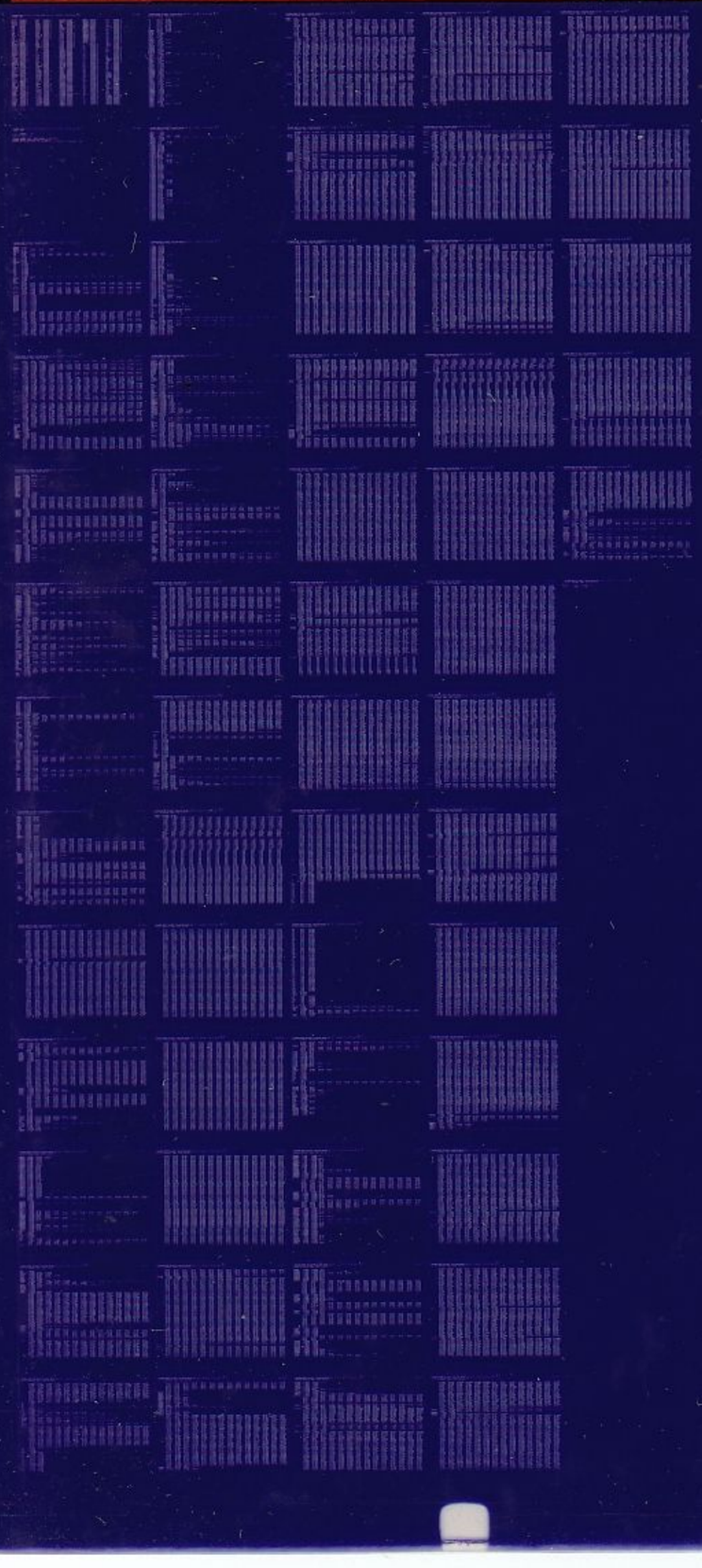
RP07 FE/HOST ISOLATOR CZRJMA0 AH-F961A-MC FICHE 1 OF 2



RP07 FE/HOST ISOLATOR CZRJMA0 AH-F961A-MC FICHE 2 OF 2



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IDENTIFICATION

PRODUCT CODE: AC-F960A-MC

PRODUCT NAME: CZRJMA0 RP07 FE/HOST ISOLATOR

PRODUCT DATE: JANUARY 1, 1983

MAINTAINER: CX DIAGNOSTIC ENGINEERING

AUTHOR: MIKE LEAVITT

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1.0 GENERAL INFORMATION

1.1 PROGRAM ABSTRACT

THE RP07 FRONT END DIAGNOSTIC IS A PROGRAM WHICH PARTIALLY AUTOMATES THE PATHFINDER DOCUMENT TO ALLOW COMPUTERIZED SEQUENTIAL DIAGNOSIS OF AN RP07. THE PROGRAM INITIALLY DEMONSTRATES HARDWARE INTEGRITY BETWEEN THE RHXX CONTROLLER, ASSOCIATED CABLING AND THE DISK CONTROL LOGIC (DCL). SATISFACTORY COMPLETION OF THIS PHASE OF TESTING THEN PERMITS "HOST" INVOCATION OF THE RP07 RESIDENT MICRODIAGNOSTICS, THOSE SPECIFICALLY ALLOWING REMOTE EXECUTION, TO ASCERTAIN A REASONABLE LEVEL OF CONFIDENCE IN THE DISK DRIVE.

THIS DIAGNOSTIC HAS BEEN WRITTEN FOR USE WITH THE DIAGNOSTIC RUNTIME SERVICES SOFTWARE (SUPERVISOR). THESE SERVICES PROVIDE THE INTERFACE TO THE OPERATOR AND TO THE SOFTWARE ENVIRONMENT. THIS PROGRAM CAN BE USED WITH XXDP+, ACT, APT, SLIDE AND PAPER TAPE. FOR A COMPLETE DESCRIPTION OF THE RUNTIME SERVICES, REFER TO THE XXDP+ USER'S MANUAL. THERE IS A BRIEF DESCRIPTION OF THE RUNTIME SERVICES IN SECTION 2 OF THIS DOCUMENT.

1.2 SYSTEM REQUIREMENTS

THIS PROGRAM, IN ORDER TO EXECUTE, WILL REQUIRE THE FOLLOWING SYSTEM HARDWARE:

1. AN XXDP+ LOAD MEDIUM,
2. A CONSOLE KEYBOARD/PRINTER,
3. A MINIMUM OF 28K WORD OF MAIN MEMORY,
4. A PDP11 PROCESSOR AND APPROPRIATE MASSBUS CONTROLLER WHICH CONFORMS TO (DEC STD 159) AND WHICH HAS A THROUGHPUT CAPACITY OF 2.2 MBYTES /SEC OR GREATER.
5. AT LEAST ONE RP07 WITH RHXX CONTROLLER

1.3 RELATED DOCUMENTS AND STANDARDS

XXDP+ USER'S MANUAL - CHQUS

1.4 DIAGNOSTIC HIERARCY PREREQUISITES

ALL CPU, MEMORY, AND TERMINAL DIAGNOSTICS MUST RUN SUCCESSFULLY TO COMPLETION.

1.5 ASSUMPTIONS

NONE

2.0 OPERATING INSTRUCTIONS

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

2.1 COMMANDS

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

COMMAND	EFFECT
START	START THE DIAGNOSTIC FROM AN INITIAL STATE
RESTART	START THE DIAGNOSTIC WITHOUT INITIALIZING
CONTINUE	CONTINUE AT TEST THAT WAS INTERRUPTED (AFTER ^C)
PROCEED	CONTINUE FROM AN ERROR HALT
EXIT	RETURN TO XXDP+ MONITOR (XXDP+ OPERATION ONLY!)
ADD	ACTIVATE A UNIT FOR TESTING (ALL UNITS ARE CONSIDERED TO BE ACTIVE AT START TIME
DROP	DEACTIVATE A UNIT
PRINT	PRINT STATISTICAL INFORMATION (IF IMPLEMENTED BY THE DIAGNOSTIC - SECTION 4.0)
DISPLAY	TYPE A LIST OF ALL DEVICE INFORMATION
FLAGS	TYPE THE STATE OF ALL FLAGS (SEE SECTION 2.3)
ZFLAGS	CLEAR ALL FLAGS (SEE SECTION 2.3)

A COMMAND CAN BE RECOGNIZED BY THE FIRST THREE CHARACTERS. SO YOU MAY, FOR EXAMPLE, TYPE "STA" INSTEAD OF "START".

2.2 SWITCHES

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

SWITCH	EFFECT
/TESTS:LIST	EXECUTE ONLY THOSE TESTS SPECIFIED IN THE LIST. LIST IS A STRING OF TEST NUMBERS, FOR EXAMPLE - /TESTS:1:5:7-10. THIS LIST WILL CAUSE TESTS 1,5,7,8,9,10 TO BE RUN. ALL OTHER TESTS WILL NOT BE RUN.
/PASS:DDDDD	EXECUTE DDDDD PASSES (DDDDD = 1 TO 64000)
/FLAGS:FLGS	SET SPECIFIED FLAGS. FLAGS ARE DESCRIBED IN SECTION 2.3.
/EOP:DDDDD	REPORT END OF PASS MESSAGE AFTER EVERY DDDDD PASSES ONLY. (DDDDD = 1 TO 64000)
/UNITS:LIST	TEST/ADD/DROP ONLY THOSE UNITS SPECIFIED IN THE LIST. LIST EXAMPLE - /UNITS:0:5:10-12 USE UNITS 0,5,10,11,12 (UNIT NUMBERS = 0-63)

EXAMPLE OF SWITCH USAGE:

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

THE EFFECT OF THIS COMMAND WILL BE: 1) TESTS 1 THROUGH 5 WILL BE EXECUTED, 2) ALL UNITS WILL TESTED 1000 TIMES AND 3) THE END OF PASS MESSAGES WILL BE PRINTED AFTER EACH 100 PASSES ONLY. A

SWITCH CAN BE RECOGNIZED BY THE FIRST THREE CHARACTERS. YOU MAY, FOR EXAMPLE, TYPE "/TES:1-5" INSTEAD OF "/TESTS:1-5".

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

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

2.3 FLAGS

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

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

* ERROR MESSAGES ARE DESCRIBED IN SECTION 3.1

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

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

2.4 HARDWARE QUESTIONS

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

```
UNIT 0
RPCS1 ADRS (O)  176700 ?
VECTOR ADRS (O)  254 ?
BR LEVEL (O)  5 ?
DRIVE # (O)  0 ?
```

THE 1ST QUESTION "RPCS1 ADRS" REQUIRES THAT THE USER INPUT THE ADDRESS OF RPCS1 OF THE CONTROLLER WHICH IS CONNECTED TO THE DRIVE UNDER TEST. DEFAULT IS 176700 (OCTAL).

THE 2ND QUESTION "VECTOR ADRS" REQUIRES THE USER TO INPUT THE INTERRUPT VECTOR ADDRESS OF THE RHXX CONTROLLER. DEFAULT IS 254 (OCTAL).

THE 3RD QUESTION "BR LEVEL" REQUIRES THE USER TO INPUT THE CONTROLLER INTERRUPT PRIORITY LEVEL. DEFAULT IS LEVEL 5.

THE 4TH QUESTION "DRIVE #" REQUIRES THE USER TO SPECIFY THE DRIVE NUMBER OF THE DRIVE TO BE TESTED. DEFAULT IS 0 (OCTAL).

2.5 SOFTWARE QUESTIONS

AFTER YOU HAVE ANSWERED THE HARDWARE QUESTIONS OR AFTER A RESTART OR CONTINUE COMMAND, THE RUNTIME SERVICES WILL ASK FOR SOFTWARE PARAMETERS. THESE PARAMETERS WILL GOVERN SOME DIAGNOSTIC SPECIFIC OPERATION MODES. YOU WILL BE PROMPTED BY "CHANGE SW (L) ?" IF YOU WISH TO CHANGE ANY PARAMETERS, ANSWER BY TYPING "Y". THE SOFTWARE QUESTIONS AND THE DEFAULT VALUES ARE DESCRIBED IN THE NEXT PARAGRAPH(S).

THE FOLLOWING QUESTION ASKS IF THE USER WANTS TO EXECUTE THE MASSBUS INTERFACE SWITCH TEST. THIS IS USEFUL IF THE USER IS RUNNING MULTIPLE PASSES AND DOES NOT WISH TO SLOW DOWN TESTING IN ORDER TO 'SWITCH' THE MASSBUS INTERFACE SWITCH.

''EXECUTE TEST 25., MASSBUS INTERFACE SWITCH TEST (L) Y ?''

THE FOLLOWING QUESTION ASKS IF THE USER WANTS THE RP07 INTERNAL ERROR LOG CONTENTS. THE ERROR LOG IN THE RP07 MAY BE USEFUL AS A TROUBLESHOOTING TOOL, AND AS SUCH MAY BE OUTPUT UPON REQUEST.

''EXECUTE TEST 52., PRINT CONTENTS OF INTERNAL ERROR LOG (L) Y ?''

THE FOLLOWING QUESTION ASKS THE USER IF THE INTERNAL RP07 READ/WRITE ROUTINE SHOULD BE LIMITED ONLY TO ONE TRACK. THIS MAY BE USEFUL TO HELP ISOLATE A SELECTED HEAD/CHIP FAILURE.

''SELECT A TRACK FOR THE RP07 INTERNAL RD-WRT TESTS (L) N ?''

THE FOLLOWING QUESTION ASKED ONLY IF THE ABOVE QUESTION IS ANSWERED ''YES'', ALLOWS A USER TO SELECT ONE HEAD FOR THE INTERNAL READ/WRITE TESTS.

''TRACK ADDRESS (D) 0 ?''

THE FOLLOWING QUESTION ASKS IF THE USER DESIRES TO RUN ONLY ONE MICRODIAGNOSTIC. IF THE ANSWER IS YES, AND THE MANUAL MODE OF OPERATION IS ENABLED, THE USER WILL BE INTERROGATED AS TO WHICH ROUTINE TO SELECT FOR EXECUTION.

''EXECUTE TEST 60., SELECT A MICRO-DIAGNOSTIC FOR EXECUTION (L) N ?''

NOTE

ONCE THIS QUESTION HAS BEEN ANSWERED 'YES' AND THE ROUTINE HAS BEEN RUN AT LEAST ONCE, PROVIDING THAT THE USER HAS CORRECTLY INPUT A ROUTINE NUMBER WHICH IS VALID, THE SELECTED ROUTINE WILL ALWAYS RUN WHEN THE TEST IS SELECTED FOR EXECUTION. THE ONLY WAY THE USER MAY CHANGE THE ROUTINE SELECTED FOR EXECUTION IS TO HALT THE PROGRAM VIA THE CONTROL C (^C) MECHANISM AND ISSUE A NEW 'START' COMMAND. ANY OTHER METHOD OF RESUMING PROGRAM OPERATION WILL CONTINUE TO EXECUTE THE ROUTINE PREVIOUSLY ACCEPTED AS INPUT FROM THE USER.

2.6 EXTENDED P-TABLE DIALOGUE

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

TO ILLUSTRATE A MORE EFFICIENT METHOD, SUPPOSE YOU ARE TESTING A FICTIONAL DEVICE, THE XY11. SUPPOSE THIS DEVICE CONSISTS OF

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

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

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

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

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

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

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

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

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

UNIT 8
CSR ADDRESS (O)  160000<CR>
SUB-DEVICE # (O) ?  7<CR>
Q-FACTOR (O) 1 ?  <CR>
```

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

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

THE RUNTIME SERVICES CAN TAKE MULTIPLE UNIT SPECIFICATIONS HOWEVER.

LET'S BUILD THE SAME TABLE USING THE MULTIPLE SPECIFICATION FEATURE.

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

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

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

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

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

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

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

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

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

2.7 QUICK START-UP PROCEDURE (XXDP+)

TO START-UP THIS PROGRAM:

1. BOOT XXDP+

2. GIVE THE DATE AND ANSWER THE LSI AND 50HZ (IF THERE

IS A CLOCK) QUESTIONS

3. TYPE "R NAME", WHERE NAME IS THE NAME OF THE BIN OR BIC FILE FOR THIS PROGRAM

4. TYPE "START"

5. ANSWER THE "CHANGE HW" QUESTION WITH "Y"

6. ANSWER ALL THE HARDWARE QUESTIONS

7. ANSWER THE "CHANGE SW" QUESTION WITH "N"

WHEN YOU FOLLOW THIS PROCEDURE YOU WILL BE USING ONLY THE DEFAULTS FOR FLAGS AND SOFTWARE PARAMETERS. THESE DEFAULTS ARE DESCRIBED IN SECTIONS 2.3 AND 2.5.

3.0 ERROR INFORMATION

3.1 TYPES OF ERROR MESSAGES

THERE ARE THREE LEVELS OF ERROR MESSAGES THAT MAY BE ISSUED BY A DIAGNOSTIC: GENERAL, BASIC AND EXTENDED. GENERAL ERROR MESSAGES ARE ALWAYS PRINTED UNLESS THE "IER" FLAG IS SET (SECTION 2.3). THE GENERAL ERROR MESSAGE IS OF THE FORM:

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

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

BASIC ERROR MESSAGES ARE MESSAGES THAT CONTAIN SOME ADDITIONAL INFORMATION ABOUT THE ERROR. THESE ARE ALWAYS PRINTED UNLESS THE "IER" OR "IBR" FLAGS ARE SET (SECTION 2.3). THESE MESSAGES ARE PRINTED AFTER THE ASSOCIATED GENERAL MESSAGE.

EXTENDED ERROR MESSAGES CONTAIN SUPPLEMENTARY ERROR INFORMATION SUCH AS REGISTER CONTENTS OR GOOD/BAD DATA. THESE ARE ALWAYS PRINTED UNLESS THE "IER", "IBR" OR "IXR" FLAGS ARE SET (SECTION 2.3). THESE MESSAGES ARE PRINTED AFTER THE ASSOCIATED GENERAL ERROR MESSAGE AND ANY ASSOCIATED BASIC ERROR MESSAGES.

3.2 SPECIFIC ERROR MESSAGES

****

- COMPOSITE ERROR SET WHEN NOT EXPECTED -

THIS MESSAGE IS GENERATED WHEN COMPOSITE ERROR IS FOUND TO BE SET WHEN IT SHOULD HAVE BEEN RESET.

****

- DRIVE HUNG, DRY NOT SET IN TIME -

THIS MESSAGE IS GENERATED WHEN GO IS FOUND TO BE SET. THE FUNCTION IS TIMED, AND WHEN THE TIMING FUNCTION EXPIRES, THE ABOVE MESSAGE IS PRODUCED.

****

- DRIVE WRITE LOCKED -

THIS MESSAGE IS PRODUCED WHEN THE PROGRAM PREPARES TO EXECUTE A WRITE FUNCTION AND THE WRITE LOCK BIT (RPDS:WRL) IS FOUND TO BE ASSERTED.

****

- DRIVE OFFLINE -

THIS MESSAGE IS GENERATED WHEN THE PROGRAM PREPARES TO EXECUTE A COMMAND AND THE MEDIUM ON LINE BIT (RPDS:MOL) IS FOUND TO BE RESET.

****

- RPCS2: OR FAILED TO SET IN TIME -

THIS MESSAGE IS GENERATED WHEN WHILE USING A TIMER, THE OUTPUT READY BIT (RPCS2:OR) IS FOUND TO BE RESET UNTIL THE TIMER FUNCTION EXPIRES.

****

- RPCS2:OR FAILED TO CLEAR IN TIME -

THIS MESSAGE IS GENERATED WHEN WHILE USING A TIMER, THE OUTPUT READY BIT (RPCS2:OR) IS FOUND TO BE SET UNTIL THE TIMER FUNCTION EXPIRES.

****

- RH CONTROLLER DIDN'T RESPOND (NO SSYNC). -

THIS MESSAGE IS GENERATED WHEN THE PROGRAM ATTEMPTS TO ACCESS THE CONTROLLER AT THE USER SPECIFIED ADDRESS, AND IT DOESN'T RESPOND.

****

- BIT(S) UNDER TEST DIDN'T CHANGE STATE -

THIS MESSAGE IS GENERATED WHEN THE REGISTER RESULTS ARE NOT THE COMPLIMENT OF THE REGISTER STATE AT THE START OF THE TEST.

****

- RPCS2:CLR DIDN'T FUNCTION PROPERLY -

THIS MESSAGE IS GENERATED WHEN THE PROGRAM FINDS THAT THE CONTROLLER

CLEAR FUNCTION DID NOT FUNCTION PROPERLY.

****

- REG CONTENTS DON'T MATCH EXPECTED DATA -

THIS MESSAGE IS PRODUCED WHEN EXTRA BITS SET OR CLEAR WHEN THEY ARE NOT EXPECTED TO FUNCTION IN THIS MANNER.

****

- REG DIDN'T CLEAR WHEN EXPECTED -

THIS MESSAGE IS GENERATED WHEN A REGISTER DOESN'T RESET WHEN EXPECTED.

****

- SC OR TRE SET WHEN NOT EXPECTED -

THIS MESSAGE IS GENERATED AS A RESULT OF DETECTING A TRANSFER ERROR (RPCS1:TRE) OR DETECTING AN UNEXPECTED ATA (RPCS1:SC)

****

- RPCS2:IR FAILED TO SET IN TIME -

THIS MESSAGE IS GENERATED WHEN USING A TIMER, INPUT READY (RPCS2:IR) IS FOUND TO BE RESET AFTER THE TIMING FUNCTION HAS EXPIRED.

****

- RPCS1, MCPE DIDN'T SET WHEN EXPECTED -

THIS MESSAGE IS GENERATED WHEN THE PROGRAM FAILS TO DETECT A MASSBUS CONTROL PARITY ERROR (RPCS1, MCPE).

****

- RPCS1, SC OR TRE DIDN'T SET WHEN EXPECTED -

THIS MESSAGE IS GENERATED WHEN THE PROGRAM FORCES AN ERROR OR ATTENTION, AND THE RESULTING TRE OR SC IN RPCS1 DOES NOT SET.

****

- BIT(S) UNDER TEST DIDN'T SET WHEN EXPECTED -

THIS MESSAGE IS GENERATED WHEN THE STIMULUS AND THE RESULT DO NOT MATCH, AND THE RESULT WAS EXPECTED TO FORCE REGISTER BIT(S) TO TOGGLE FROM 0 TO 1.

****

- BIT(S) UNDER TEST DIDN'T CLEAR WHEN EXPECTED -

THIS MESSAGE IS GENERATED WHEN THE STIMULUS AND THE RESULT DO NOT MATCH, AND THE RESULT WAS EXPECTED TO FORCE REGISTER BITS TO TOGGLE FROM

1 TO 0.

****

- RH INTERRUPTED AT WRONG PRIORITY -

THIS MESSAGE IS PRODUCED WHEN THE RH CONTROLLER INTERRUPTS AT A PRIORITY HIGHER THAN THE EXPECTED PRIORITY.

****

- RH GENERATED FALSE INTERRUPT -

THIS MESSAGE IS PRODUCED WHEN THE RH IS TESTED TO HAVE NO PREREQUISITE CONDITIONS WHICH COULD GENERATE AN INTERRUPT, YET DOES GENERATE AN INTERRUPT ANYWAY.

****

- RH DIDN'T INTERRUPT WHEN EXPECTED -

THIS MESSAGE IS GENERATED WHEN THE PROGRAM EXPECTS AN INTERRUPT BUT DOESN'T GET ONE.

****

- DRIVE NOT PRESENT, TEST INVALID -

THIS MESSAGE IS GENERATED WHEN THE UNIT UNDER TEST IS FOUND TO BE NOT PRESENT.

****

- COMMAND EXECUTION INCORRECT -

THIS MESSAGE IS GENERATED WHEN A COMMAND IS EXECUTED AND THE DRIVE DOESN'T RETURN THE CORRECT STATUS FOR THE COMPLETED OPERATION.

****

- DATA LINES STUCK LOW -

THIS MESSAGE IS GENERATED WHEN, DURING A "READ ALL TRACK DESCRIPTOR" OPERATION, THE DATA RECEIVED DOESN'T FORCE ALL 16 DATA LINES FROM A 0 TO 1.

****

- FAILED TO SEEK PROPERLY -

THIS MESSAGE IS GENERATED WHEN THE PROGRAM FAILS TO RECEIVE THE CORRECT STATUS FROM THE DRIVE UPON THE COMPLETION OF A SEEK OPERATION.

****

- DETECTED ERROR DURING WRITE DATA OPERATION -

THIS MESSAGE IS PRODUCED TO ENABLE THE USER TO DISCERN BETWEEN READ

AND WRITE ERRORS.

****

- FAILED TO CORRECTLY DETECT A WRITE CHECK ERROR -

THIS MESSAGE IS GENERATED WHEN THE PROGRAM FORCES A WRITE CHECK ERROR, BUT THE DRIVE FAILS TO POST THE CORRECT STATUS.

****

- DETECTED ERROR DURING FORMAT OPERATION -

THIS MESSAGE IS GENERATED TO ENABLE THE USER TO ISOLATE PROBLEMS WHICH OCCUR ONLY DURING A FORMAT OPERATION.

****

- DETECTED ERROR DURING DATA TRANSFER -

THIS MESSAGE IS GENERATED ANYTIME AN ERROR IS DETECTED DURING A DATA TRANSFER OPERATION OTHER THAN THE ONES MENTIONED ABOVE.

****

- FAILED AN RP07 INTERNAL MICRODIAGNOSTIC TEST -

THIS MESSAGE IS GENERATED ANYTIME THE PROGRAM DETECTS AN ERROR DURING THE MICRODIAGNOSTIC EXECUTION IN THE DRIVE.

****

- RHXX REGISTER SELECTION FAILURE -

THIS MESSAGE IS GENERATED WHEN THE RH REGISTER SELECT TESTS FAIL. IT IS INDICATIVE OF A MULTIPLEXOR OR SELECT LOGIC FAILURE.

****

- DATA RECEIVED DOESN'T MATCH EXPECTED DATA -

THIS MESSAGE IS GENERATED WHEN THE PROGRAM COMPARES EXPECTED WITH RECEIVED DATA AND FINDS THAT THEY DON'T MATCH, INDICATING A READ ERROR.

****

- DETECTED A PERMANENT ERROR -

THIS MESSAGE IS GENERATED WHEN RPDS, ERR=1 AND RPER1, RPER2 AND RPER3 ARE ALL 0.

****

- INTERNAL RP07 DIAGNOSTIC TIME-OUT -

****
THIS MESSAGE IS GENERATED WHEN THE PROGRAM FINDS, USING A MAINTENANCE

TIMER, THAT THE DIAGNOSTIC EXECUTION DID NOT COMPLETE WHEN THE TIMER FUNCTION EXPIRED.

4.0 PERFORMANCE AND PROGRESS REPORTS

AT THE END OF EACH PASS, THE PASS COUNT IS GIVEN ALONG WITH THE TOTAL NUMBER OF ERRORS REPORTED SINCE THE DIAGNOSTIC WAS STARTED. THE "EOP" SWITCH CAN BE USED TO CONTROL HOW OFTEN THE END OF PASS MESSAGE IS PRINTED. SECTION 2.2 DESCRIBES SWITCHES.

5.0 DEVICE INFORMATION TABLES

THE DEFAULT HARDWARE P-TABLE CONTAINS DEFAULT VALUES OF THE TEST-DEVICE PARAMETERS. THE STRUCTURE OF THIS TABLE IS IDENTICAL TO THE STRUCTURE OF THE HARDWARE P-TABLES.

```
            .WORD 176700 ;RPCS1 BASE REGISTER ADDRESS
            .WORD 254    ;VECTOR ADDRESS
            .WORD 240    ;BR LEVEL 5 DEVICE
            .WORD 0      ;DRIVE NUMBER
```

THE SOFTWARE P-TABLE CONTAINS THE VALUES OF THE PROGRAM PARAMETERS THAN CAN BE CHANGED BY THE OPERATOR.

```
    SWTTST: .WORD 1      ;USED TO SELECT MASSBUS INTERFACE TEST;
                         ;DISABLED= 0, ENABLED= 1
    ERRDMP: .WORD 1      ;USED TO ENABLE THE RP07 ERROR LOG DUMP
    SELTRK: .WORD 0      ;USED TO SELECT A TRACK ADDRESS IN THE MICRO-
                         ;DIAGNOSTIC TEST
    TRAKAD: .WORD 0      ;USED TO GET THE USER TRACK ADDRESS
    SELRUN: .WORD 0      ;USED TO DETERMINE IF USER SELECTED A MICRO-
                         ;DIAGNOSTIC TEST
```

IN THE BASIC DRIVE TEST, THERE IS A USER PROMPT WHICH ASKS THE OPERATOR TO DISABLE SWITCH A12-S01 IN THE DRIVE. IF THE USER RESPONDS "NO", THE TEST IS BYPASSED. IF THE USER RESPONDS "YES", THE PROGRAM EXPECTS THE SWITCH TO BE DISABLED WHEN THE USER RESPONDS. THE PROGRAM, UPON COMPLETION OF THE TEST, ASKS THE USER TO RE-ENABLE THE SWITCH. IF THE USER RESPONDS "NO" THE PROGRAM LOOPS UNTIL THE SWITCH HAS BEEN RE-ENABLED AND THE USER RESPONDS "YES".

IF THE MANUAL MODE OF OPERATION IS ENABLED AND THE USER HAS, THROUGH THE SOFTWARE QUESTIONS, INDICATED THAT ONE MICRO-DIAGNOSTIC IS TO BE SELECTED FOR EXECTUION, THE USER WILL BE ASKED TO INPUT A 2 CHARACTER HEX ENTRY WHICH WILL ALLOW SELECTION AND EXECUTION OF THAT PARTICULAR MICRO-DIAGNOSTIC.

6.0 TEST SUMMARIES

THE FOLLOWING REPRESENT A GENERAL LIST OF TESTS WHICH WILL BE PERFORMED ON THE RH70 CONTROLLER. THOSE TESTS MARKED WITH AN ASTERISK (*) WILL NOT BE EXECUTED WHEN AN RH11 CONTROLLER IS DETERMINED TO BE THE RP07 INTERFACE.

TEST 1: UNIT UNDER TEST

SELECTS A USER SPECIFIED CONTROLLER AND ASCERTAINS THAT THE CONTROLLER DOES INDEED EXIST, IE VALID SSYN RESPONSE

TEST 2: RP CLEAR TEST

THIS TEST ASCERTAINS CORRECTNESS OF THE DEVICE CLEAR FUNCTION BY WRITTING RPBA TO ALL ONES, SETTING RP CLR (BIT 5) IN RPCS2 AND PROVING THAT AT LEAST SOME OF THE BITS DID CLEAR IN RPBA. IT IS NOT THE INTENT OF THE PROGRAM, AT THIS TIME, TO PROVE THE CORRECTNESS OF THE RPBA REGISTER, IT IS JUST TO PROVE THAT THE RPCLR FUNCTION DOES WORK.

TEST 3. RPCS2 STATIC FUNCTIONAL TEST

THIS WALKS A ONE, ZERO, ALL ZEROS, ALL ONES THROUGH RPCS2. THE RANGE WILL BE FROM BIT 0 TO BIT 2. EXECUTE A DEVICE CLEAR (RPCS2: CLR) AND ENSURE THAT REGISTER DID RESET.

TEST 4: RPWC STATIC FUNCTIONAL TEST

THIS TEST WALKS A ONE, ZERO, ALL ONES THROUGH RPWC. WRITE REGISTER TO ZERO, AND ENSURE THAT REGISTER DID RESET.
BITS TO TEST = BIT 0 - BIT 15.

TEST 5: RPBA STATIC FUNCTIONAL TEST

THIS TEST WALKS A ONE, ZERO, ALL ZER/A, ALL ONES THROUGH RPBA. ALLOW A DEVICE CLEAR AND CHECK THAT REGISTER DID RESET. BITS TO TEST = BIT 1 - BIT 15.

TEST 6: SC AND TRE TEST #1 (RH11 ONLY)

THIS TEST WILL TEST RPCS2, MXF (BIT 09) TO PROPERLY SET AND CLEAR. ONCE PROVEN FUNCTIONALLY CORRECT, SET THE BIT (RPCS2, MXF) = 1 AGAIN AND OBSERVE RPCS1, SC AND RPCS1, TRE. BOTH BITS SHOULD BE SET DUE TO MISSED TRANSFER (RPCS2, MXF - BIT09) BEING SET. SET RPCS2, CLR = 1 AND ENSURE THAT BITS CLEARED.

TEST 7: IR AND OR TEST

THIS TEST WILL TEST RPCS2, IR TO SET AND ENSURE THAT IT DOES WITHIN A FIXED TIME LIMIT. WHEN IT SETS, WRITE RPDB ONCE AND THEN TEST FOR RPCS2, OR TO SET WITHIN A FIXED TIME LIMIT.

TEST 8: RPDB READ/WRITE TEST #1

THIS TEST WRITES RPDB WITH 3 DATA PATTERNS INTERLOCKED WITH THE CORRECT TRANSITION OF RPCS2, IR. WHEN RPCS2, OR SET, READ RPDB AND CHECK DATA FOR CORRECTNESS.

TEST 9: RPDB READ/WRITE TEST #2

THIS TEST WRITES RPDB TWICE WITH THE SAME DATA PATTERN, INTERLOCKED WITH THE CORRECT TRANSITION OF RPCS2, IR. READ RPDB TWICE, INTERLOCKED WITH THE CORRECT TRANSITION OF RPCS2, OR, AND ENSURE THAT DATA IS CORRECT.

TEST 10: RPDB READ/WRITE TEST #3

THIS TEST WRITES DATA TO RPDB USING 8 DIFFERENT DATA PATTERNS, INTERLOCKED WITH THE CORRECT TRANSITIONS OF RPCS2, IR. READ RPDB AND VERIFY CORRECTNESS OF DATA, INTERLOCKED WITH THE CORRECT TRANSITIONS OF RPCS2, OR.

TEST 11: *MDPE, SC AND TRE TEST #2

THIS TEST WILL SET RPCS2, PAT=1. ENSURE THAT SC AND TRE IN RPCS1 = 0. ENSURE THAT RPCS2, MDPE DID NOT SET. WRITE RPDB ONCE AND VERIFY THAT RPCS1 SC AND TRE=1, DUE TO THE INVERTED (WRONG) PARITY. CHECK RPCS2, MDPE = 1. SET RPCS2, CLR AND ENSURE THAT BITS DID CLEAR.

TEST 12: *RPCS3 STATIC FUNCTIONAL TEST

THIS TEST WALKS A ONE, ZERO, ALL ZEROS, ALL ONES THROUGH RPCS3, FOR THE RANGE OF BITS 0-3 AND BIT 6. EXECUTE A DEVICE CLEAR AND ENSURE THAT REGISTER DID RESET.

TEST 13: *RPBAE STATIC FUNCTIONAL TEST

THIS TEST WALKS A ONE, ZERO, ALL ZEROS, ALL ONES THROUGH RPBAE. ISSUE DEVICE CLEAR AND ENSURE THAT REGISTER DID RESET.

TEST 14: *TEST DUPLICATED ADDRESS BIT 16

THIS TEST WILL RESET DEVICE AND SET RPCS1 A16 = 1, TEST THAT A16 ONLY SET. ENSURE THAT CORRESPONDING BIT IN RPBAE (BIT 0) ALSO = 1. ISSUE DEVICE CLEAR AND ENSURE THAT CORRESPONDING BITS DID CLEAR.

TEST 15: *TEST DUPLICATED ADDRESS BIT 17

THIS TEST WILL RESET THE DEVICE AND SET RPCS1 A17 = 1, TEST THAT A17 ONLY SET. ENSURE THAT CORRESPONDING BIT IN RPBAE (BIT 1) ALSO = 1. ISSUE DEVICE CLEAR AND ENSURE THAT CORRESPONDING BITS DID CLEAR.

TEST 16: TEST RPCS1 INTERRUPT ENABLE BIT

THIS TEST WILL RESET DEVICE AND SET RPCS1 IE (BIT 6) = 1. ENSURE THAT THE BIT UNDER TEST DID SET. ISSUE DEVICE CLEAR AND ENSURE THAT CORRESPONDING BITS DID CLEAR.

TEST 17: *TEST DUPLICATED INTERRUPT ENABLE BIT

THIS TEST SETS RPCS1, IE (BIT 06) = 1. ENSURE THAT RPCS3:IE ALSO SETS. ISSUE DEVICE CLEAR AND ENSURE THAT APPROPRIATE BITS CLEAR.

TEST 18: *IPCK0 TEST

THIS TEST WILL ISSUE DEVICE CLEAR, THEN SET IPCK0 (RPCS3 BIT 0)=1. CHECK THAT (RPCS2 IR (BIT 6) = 1) WITHIN A TIME PERIOD. WHEN IT DOES, WRITE 0'S (ONCE) INTO RPDB. THIS SHOULD FORCE (RPCS1 TRE AND SC = 1). READ RPDB WITH (RPCS2 OR = 1) AND (RPCS2 MDPE SHOULD = 1). DO SECOND INITIALIZATION AND DEVICE SHOULD CLEAR OUT.

TEST 19: *IPCK1 TEST

THIS TEST WILL ISSUE DEVICE CLEAR, THEN SET IPCK1 (RPCS3 BIT 1)=1. CHECK THAT (RPCS2 IR = 1) WITHIN A TIME PERIOD.

WHEN IT DOES, WRITE 0'S (ONCE) INTO RPDB. THIS SHOULD FORCE (RPCS1 TRE AND SC = 1). READ RPDB WITH (RPCS2 OR = 1) AND (RPCS2 MDPE (BIT 7) SHOULD = 1). DO SECOND INITIALIZATION AND DEVICE SHOULD CLEAR OUT.

TEST 20: *IPCK2 TEST

THIS TEST WILL ISSUE DEVICE CLEAR THEN SET IPCK2 (RPCS3 BIT 2)=1. CHECK THAT (RPCS2 IR = 1) WITHIN A TIME LIMIT. WHEN IT DOES, WRITE 0'S (TWICE) INTO RPDB. THIS SHOULD FORCE (RPCS1 TRE AND SC = 1). READ RPDB WITH (RPCS2 OR = 1) AND (RPCS2 MDPE SHOULD = 1). DO SECOND INITIALIZATION AND DEVICE SHOULD CLEAR OUT.

TEST 21: *IPCK3 TEST

THIS TEST WILL ISSUE DEVICE CLEAR, THEN SET IPCK3 (RPCS3 BIT 3)=1. CHECK THAT (RPCS2 IR = 1). WHEN IT DOES, WRITE RPBD WITH 0'S (TWICE). CHECK FOR SAME ERRORS AS 14 ABOVE. ISSUE DEVICE CLEAR AND ENSURE THAT DEVICE DID CLEAR OUT.

TEST 22: RHXX INTERRUPT TEST # 1

THIS TEST FORCES THE RHXX CONTROLLER TO INTERRUPT FROM THE HIGHEST PRIORITY LEVEL DOWN TO AND INCLUDING THE USER SPECIFIED PRIORITY LEVEL. IF THE DEVICE DOES ACTUALLY GENERATE AN INTERRUPT WHICH DOES GET RECOGNIZED BY THE PROGRAM, THE CONTROLLER PRIORITY CIRCUITRY IS SUSPECT.

TEST 23: RHXX INTERRRUPT TEST #2

THIS TEST ASSUMES THAT SC=0 AND RPDS, ATA ALSO=0. IT THEN

ARMS THE CONTROLLER FOR AN INTERRUPT WHICH IT DOES NOT EXPECT TO RECEIVE. IF IT DOES, AND THERE IS NO APPARENT REASON FOR HAVING RECEIVED IT, IE SC=0 AND RDY DID NOT TOGGLE, THEN A HARDWARE MALFUNCTION MAY BE ASSUMED.

TEST 24: RHXX INTERRUPT TEST #3

THIS TEST SETS THE PRIORITY TO ONE LESS THAN THE USER SPECIFIED PRIORITY. IT THEN ARMS AN INTERRUPT AND FORCES THE CONTROLLER TO TOGGLE RDY. THESE ACTIONS SHOULD GENERATE AND INTERRUPT TO THE CORRECT VECTOR ADDRESS. IF THE INTERRUPT DOESN'T OCCUR, OR OCCURS AT THE WRONG ADDRESS, A HARDWARE MALFUNCTION IS ASSUMED.

TEST 25: BASIC DRIVE SELECT TEST

THIS TEST REQUIRES MANUAL INTERVENTION. IT WILL BE SKIPPED IF THE DIAGNOSTIC IS RUN IN UNATTENDED MODE, OR THE USER RESPONDS "N" TO THE QUESTION: "FOR DRIVE) N, WILL YOU PLACE THE MASSBUS DISABLE SWITCH J12-S01 IN THE 'DISABLED' (DOWN) POSITION?" TO RUN THIS TEST, USE THE DISABLE SWITCH (J12-S01) TO DISCONNECT THE "DRIVE UNDER TEST" FROM THE MASSBUS. NOW READ REG 06 (RPDT) AND VERIFY THAT NO DRIVE RESPONDS TO THIS DRIVE'S ADDRESS (REGISTER SHOULD = 0). WHEN THE TEST IS COMPLETE, THE USER WILL BE REQUIRED TO RE-ENABLE THE MASSBUS DISABLE SWITCH IN ORDER TO RUN ALL OTHER TESTS.

TEST 26: DEMAND AND TRANSFER TEST

THIS TEST WILL READ DRIVE TYPE REGISTER (SHOULD NOT EQUAL 0), BUT IGNORE DATA AND ERRORS. THE DRIVE TYPE REGISTER SHOULD NOT =0, ELSE THE TEST WILL FAIL.

TEST 27: UNIQUE UNIT UNDER TEST

THIS TEST WILL GUARANTEE THAT A UNIT UNDER TEST DOES NOT RESPOND TO ANY OTHER DRIVE ADDRESS ON THE MASSBUS.

WRITE DATA PATTERN 46(8) TO REGISTER 0 OF DRIVE UNDER TEST

WRITE 0'S TO REGISTER 0 OF ALL OTHER DRIVES ON THE BUS.

AFTER WRITING EACH DRIVE ON THE BUSS, READ AND VERIFY THAT REGISTER 0 IN THE DRIVE UNDER TEST HAS NOT BEEN MODIFIED.

TEST 28: READ DRIVE TYPE TEST

THIS TEST WILL READ DRIVE TYPE REGISTER AND ACCEPT 20022, 24042. ANY OTHER VALUE WILL PRODUCE AN ERROR MESSAGE.

TEST 29: RPDA CONSTANT'S TEST

THIS TEST WILL WRITE-READ-VERIFY 1'S AND 0'S IN RPDA, AND AND FLOAT 1'S AND 0'S THROUGH RPDA.

TEST 30: PARITY BIT TRANSITION TEST

THIS TEST WILL VERIFY THAT PARITY BIT SENT FROM DRIVE TO RHXX IS

NOT STUCK AT 1 OR 0. (USE RPDA REGISTER),
WRITE 000000 => P=1 READ/CHECK FOR PARITY
(SHOULD NOT GET A CONTROLLER PARITY ERROR),
WRITE 000001 => P=0 READ/CHECK FOR PARITY
(SHOULD NOT GET A CONTROLLER PARITY ERROR)

TEST 31: FLOATING DATA PARITY TEST

THIS TEST WILL WRITE ALL 1'S AND ALL 0'S, THEN FLOAT 1'S AND 0'S
THROUGH RPDA, READING RPER1 AFTER EACH WRITE, AND
VERIFY THAT NO PARITY ERROR SET IN RPER1.

TEST 32: REGISTER SELECT TEST 1

THIS TEST WILL WRITE EACH WRITEABLE REGISTER WITH THE PATTERN
70(8)
READ IT BACK AND VERIFY FOR CORRECTNESS. REGISTERS USED IN THE
TEST ARE; RPCS1, RPDA, RPDC, RPOF.

TEST 33: REGISTER SELECT TEST 2

ENSURE THAT EACH WRITEABLE REGISTER HAS A UNIQUE ADDRESS.
WRITEABLE REGISTERS 0, 5, 11, 12
DATA = 70(8) REF REGISTERS,
DATA = 0 OTHER REGISTERS
WRITE 70(8) INTO SOME MASSBUS WRITEABLE REGISTER
WRITE 0'S TO EVERY OTHER ADDRESSABLE REGISTER ON THE MASSBUS.
AFTER EACH WRITE (STOP-2), READ AND VERIFY THAT THE REFERENCE
REGISTER HAS NOT BEEN MODIFIED (IF SO, IDENTIFY CONTROL LINE PAIR BY
REGISTER NUMBERS)
REPEAT 1 - 3 FOR ALL WRITEABLE REGISTERS.

TEST 34: DATA TEST RPMR1

THIS TEST WILL WRITE, READ/VERIFY THE MAINTENANCE REGISTER (RPMR1)
USING PATTERNS:
ALL 0'S
ALL 1'S
FLOAT 0'S
FLOAT 1'S

POSSIBLE FAULT: J8

TEST 35: MASSBUS INITIALIZE DRIVE CLEAR TEST

THIS TEST WILL SET RPMR1: DMD = 1, THEN ISSUE RPCS2, CLR. CHECK
DMD = 0. IF 0, MARK THE EVENT. SET DMD = 1 AGAIN,
THEN ISSUE DRIVE CLEAR COMMAND. VERIFY THAT DMD
DID AGAIN CLEAR.
IF DMD DIDN'T CLEAR WITH EITHER RPCS2, CLR OR
DRIVE CLEAR COMMAND, POSSIBLE FAULTS ARE: J12 OR J8.
IF DMD DIDN'T CLEAR WITH RPCS2, CLR, BUT DID CLEAR
WITH DRIVE CLEAR COMMAND, POSSIBLE FAULTS ARE J12,
CABLE, OR THE RHXX.
IF DMD DIDN'T CLEAR WHEN DRIVE CLEAR COMMAND WAS
EXECUTED, BUT DID CLEAR WHEN RPCS2, CLR WAS ASSERTED,

POSSIBLE FAULTS ARE J11, OR J12.

TEST 36: PARITY INITIALIZE TEST

THIS TEST WILL CHECK PARITY FOLLOWING MASSBUS INITIALIZE. PROGRAM WILL THEN READ RPER1 AND VERIFY THAT RPER1, PAR AND ILF ARE CLEAR.

TEST 37: PARITY ERROR DETECTION TEST

IMPLIED IN THIS TEST IS THAT THE PREVIOUS TEST DID SUCCESSFULLY PASS. THIS TEST CREATES A "DOUBLE FAULT", WHICH IS USED TO DETERMINE THAT THE PARITY DETECTION CIRCUITS WORK PROPERLY, AND THAT ANY COMMAND IS REJECTED WHEN A PARITY ERROR IS DETECTED.
THE PROGRAM WILL SET RPCS2, PAT AND ISSUE A KNOWN ILLEGAL COMMAND, CHECK RPCS1 AND VERIFY THAT GO (BIT 0) DID RESET
READ RPER1 AND CHECK FOR FOLLOWING:

1. IF RPER1, PAR IS THE ONLY ERROR BIT SET, THERE WAS NO ERROR,
2. IF RPER1, ILF IS THE ONLY ERROR BIT FOUND, REPLACE J12,
3. IF RPER1, ILF AND PAR ARE BOTH SET OR BOTH CLEAR, REPLACE EITHER J9, J10, OR J12. (THERE IS A GOOD CHANCE THAT THE 2901 IS BROKEN.)

TEST 38: CORRECT PARITY TEST

THIS TEST CHECKS A VARIETY OF DATA PATTERNS AND VERIFIES THAT NO PARITY ERRORS OCCURRED. THE OPERATING SEQUENCE IS AS FOLLOWS:

1. LOAD DATA PATTERNS INTO THE RPDA REGISTER,
2. READ THE RPDA REGISTER AND ENSURE THAT RHXX DOES NOT DETECT ANY PARITY ERRORS.
   PATTERNS:
   - ALL ONES
   - ALL ZEROS
   - FLOAT 1'S
   - FLOAT 0'S

TEST 39: CLEAR COMPOSITE ERROR BIT TEST

THIS TEST ENSURES THAT RPDS, ERR IS NOT STUCK AT A ONE. IF IT IS (1) AND RPER1, RPER2 AND RPER3 ARE 0, A PERMANENT ERROR IS REPORTED, ELSE A COMPOSITE ERROR IS REPORTED. OPERATING SEQUENCE IS AS FOLLOWS:

1. ISSUE A CONTROLLER CLEAR.
2. READ RPDS AND ENSURE THAT ERR (BIT 14) IS CLEAR.

TEST 40: SET AND CLEAR COMPOSITE ERROR TEST

THIS TEST ENSURES THAT COMPOSITE ERROR RPDS, BIT 14 WILL SET AND CLEAR. SEQUENCE IS AS FOLLOWS:

1. SET PAT IN RPCS2, THEN WRITE DATA TO RPDA. THIS SHOULD CAUSE A PARITY ERROR,
2. READ RPDS AND CHECK THAT RPDS, ERR=1. ALSO CHECK THAT RPER1, PAR IS ALSO SET,
3. ISSUE A CONTROLLER CLEAR,
4. READ RPDS AND ENSURE THAT ERR (BIT 14)=0. READ RPER1 AND ENSURE THAT PAR (BIT 3)=0.

TEST 41: CLEAR ATA TEST

THIS TEST ENSURES THAT RPDS, ATA (BIT 15) IS NOT STUCK AT 1. SEQUENCE IS AS FOLLOWS:

1. ISSUE CONTROLLER CLEAR.
2. READ RPDS, ATA AND VERIFY THAT IT IS CLEAR.

TEST 42: SET AND CLEAR ATA TEST

THIS TEST, BY FORCING AN ERROR, TESTS THE CORRECT FUNCTIONALITY OF RPDS, ATA. SEQUENCE FOLLOWS:

1. SET RPCS2, PAT (BIT 04)=1, THEN WRITE DATA TO RPDA, FORCING A PARITY ERROR,
2. READ RPDS AND CHECK ATA (BIT 15) AND ERR (BIT 14) TO BOTH BE SET,
3. ISSUE A DRIVE CLEAR,
4. READ RPDS AND VERIFY THAT ATA (BIT 15) AND ERR (BIT 14) DID BOTH CLEAR,
5. REPEAT STEP 1,
6. SET RPCS2, CLR (BIT 5),
7. REPEAT STEP 4.

TEST 43: CLEAR RPAS TEST

THIS TEST ENSURES THAT NO BITS ARE SET IN RPAS. SEQUENCE IS AS FOLLOWS:

1. SET RPCS2, CLR (BIT 5)=1,
2. READ RPAS AND ENSURE THAT IT IS CLEAR.

NOTE

IF THIS TEST IS FAILED, THE CONTENTS OF THE PSEUDO REGISTER (RPAS) WILL BE PRINTED OUT, AND THE CONTENTS OF THE STATUS REGISTER FOR EVERY OTHER DRIVE ON THE MASSBUS. IF THE CAUSE OF THE FAILURE IS ANOTHER DRIVE ON THE BUS, EACH DRIVE MAY NEED TO BE POWERED DOWN ONE AT A TIME, UNTIL THE BAD DRIVE IS FOUND.

TEST 44: RPAS CORRECT POSITION DECODE TEST

THIS TEST CHECKS FOR THE CORRECT POSITION OF THE BIT DECODED IN THE PSEUDO REGISTER. SEQUENCE OF TEST FOLLOWS:

1. SET RPCS2, CLR (BIT 05)=1,
2. SET PAT IN RPCS2, THEN WRITE DATA TO RPDA, FORCING A PARITY ERROR,
3. READ RPAS AND VERIFY THAT BIT POSITION IS CORRECT FOR THE DRIVE UNDER TEST. ALSO VERIFY THAT RPDS, ATA AND ERR IS ALSO SET,
4. WRITE RPAS WITH THE CORRECT BIT FOR THE DRIVE UNDER TEST,
5. READ RPAS AND VERIFY THAT IT DID CLEAR. READ RPDS AND ENSURE THAT ATA CLEARED, BUT ERR DID NOT CLEAR.

TEST 45: RPAS UNIQUE POSITION DECODE TEST

THIS TEST VERIFIES THE UNIQUENESS OF THE PSEUDO REGISTER'S BIT WHICH CORRESPONDS TO THE UNIT-UNDER-TEST. SEQUENCE IS AS FOLLOWS:

1. SET RPCS2, CLR=1,
2. SET RPCS2, PAT=1, AND WRITE DATA TO RPDA, FORCING YET ANOTHER PARITY ERROR,
3. READ RPAS AND ENSURE THAT THE PROPER BIT IS SET. ENSURE THAT RPDS, ATA AND ERR ARE ALSO SET.
4. WRITE THE PSEUDO REGISTER WITH THE COMPLIMENT OF THE EXPECTED DATA IN ITEM 3,
5. READ RPAS AND ENSURE THAT THE BIT FOUND IN ITEM 3 DID NOT CLEAR. VERIFY THAT RPDS, ATA AND ERR DID NOT CLEAR.

TEST 46: CLEAR MASSBUS ATTN TEST

THIS TEST VERIFIES THAT MASSBUS ATTN IS NOT STUCK AT A 1. SEQUENCE IS AS FOLLOWS:

1. SET RPCS2, CLR=1,
2. READ RPCS1 AND VERIFY THAT SC (BIT 15) DID NOT SET (FOR RH20, ENSURE THAT ATTN=0).

NOTE

IF ANOTHER DRIVE IS SUSPECTED TO BE CAUSING THE MALFUNCTION, EACH DRIVE ON THE BUS MUST BE POWERED DOWN, ONE AT A TIME, UNTIL THE OFFENDING UNIT IS LOCATED.

TEST 47: SET AND CLEAR MASSBUS ATTN

THIS TEST VERIFIES THAT THE MASSBUS LINE "ATTN" CAN BE SET AND CLEARED. SEQUENCE FOLLOWS:

1. SET RPCS2, PAT=1, AND WRITE RPDA WITH DATA, FORCING A PARITY ERROR,
2. READ RPCS1, SC (BIT 15) AND VERIFY THAT IT SET. (USE "ATTN" IN RH20.),
3. SET RPCS2, CLR = 1, AND ENSURE THAT RPCS1, SC DID CLEAR.

TEST 48: READ-IN-PRESET COMMAND TEST

THIS IS THE FIRST TEST TO ISSUE A VALID COMMAND TO THE RP07. IT ENSURES THAT COMPOSITE ERROR DOES NOT SET AS A RESULT OF THE COMMAND EXECUTION. SEQUENCE FOLLOWS:

1. SET RPCS2, CLR=1,
2. ISSUE READ-IN-PRESET COMMAND,
3. VERIFY THAT RPDS, ERR=0.

TEST 49: RHXX UNIQUE REGISTER TEST

THIS TEST LOADS EACH WRITABLE RHXX REGISTER WITH A UNIQUE DATA PATTERN, AND EXPECTS THAT THE PATTERN WILL NOT CHANGE AS FURTHER REGISTERS ARE WRITTEN.

TEST 50: RPLA STATIC TEST

THIS TEST CHECKS RPLA FOR EVERY VALID SECTOR ADDRESS. IF, WHILE USING A MAINTENANCE TIMER, A SECTOR ADDRESS IS NOT FOUND IN TIME, AN ERROR IS REPORTED.

TEST 51: RPMR1 - RPER2 WRAP AROUND TEST

THIS TEST WRITE RPMR1 - LOW BYTE AND, AFTER WAITING A REASONABLE AMOUNT OF TIME FOR HARDWARE AND FIRMWARE LATENCY, EXPECTS RPER2, LOW BYTE, TO CONTAIN THE SAME DATA AS JUST WRITTEN INTO RPMR1. IF THE DATA IS NOT THE SAME, A HARDWARE MALFUNCTION MAY BE ASSUMED.

TEST 52: ERROR LOG DUMP

THIS ROUTINE UNLOADS THE RP07 INTERNAL ERROR LOG WHEN IT WAS REQUESTED BY THE USER. CONTENTS ARE NOT CHECKED, JUST REPORTED TO THE USER.

TEST 53: COMPOSITE MICROCODE TEST

THIS TEST IS A COMPOSITE TEST WHICH RUNS ALL OF THE AVAILABLE RP07 MICRODIAGNOSTICS. THE ROUTINE EMULATES THE RP07 POWER UP SEQUENCE. ERROR CODES ARE REPORTED IN HEX AS ARE THE ROUTINE NUMBERS WHICH WERE RUNNING AT THE TIME OF THE FAILURE.

TEST 54: READ-IN-PRESET FUNCTIONAL TEST

THIS TEST SETS UP RPDC, RPDA = -1, AND SETS RPOF:FMT16=1. IT THEN ISSUES A RIP AND EXPECTS RPDC AND RPDA TO BE ZERO. IT ALSO EXPECTS RPDC AND RPDA TO BE ZERO. IT ALSO EXPECTS RPOF.FMT TO BE RESET.

TEST 55: COMMAND REJECT TEST

THIS TEST, INVERTS PARITY AND ISSUES A RIP COMMAND. IF THE COMMAND EXECUTED WITH A PARITY ERROR PRESENT, IE RPDC OR RPDA=0 OR FMT16=0, THEN A HARDWARE MALFUNCTION MAY BE ASSUMED.

TEST 56: DATA TEST # 1

THIS TEST EXECUTES IN THE FOLLOWING MANNER;
READ TRACK DESCRIPTORS FROM ANYWHERE ON THE

PACK. THE PURPOSE IS TO ENSURE THAT THE DATA LINES TOGGLE. REPEAT PROCESS UNTIL ALL TESTABLE LINES HAVE TOGGLED (BITS 0 THROUGH 15). IGNORE ALL ERRORS; THEY MAY BE CAUSED BY CORRUPTED TRACK DESCRIPTOR RECORDS.

IF AFTER READING EVERY TRACK AND CYLINDER ON THE DRIVE, ALL DATA LINES STILL HAVE NOT TOGGLED FROM 0 TO 1, AN ERROR WILL BE REPORTED.

TEST 57: DATA TEST #2

THIS TEST EXECUTES IN THE FOLLOWING MANNER:

1. ATTEMPT TO ACCESS A C.E. CYLINDER WITHOUT SETTING RPMR1:DMD (BIT 15). EXPECT RPER1, IAE TO SET.
2. ISSUE A RECAL COMMAND, THEN CHECK RPCC = 0.
3. ATTEMPT TO ACCESS A C.E. CYLINDER WITH RPMR1: DMD=1, VERIFY CORRECT POSITION BY COMPARING RPDC WITH RPCC.

TEST 58: DATA TEST #3

THIS TEST EXECUTES IN THE FOLLOWING MANNER:

1. ATTEMPT TO FIND A DEFECT FREE C.E. TRACK BY DETERMINING PRESENCE OF A TD WITH NULL SET INFORMATION. IF ONE IS NOT FOUND DISPATCH MESSAGE STATING THAT C.E. TRACK #0 WILL BE FORMATTED PRIOR TO PERFORMING OPERATION.
2. FORMAT TRACK AND VERIFY SAME (USING NULLSET INFORMATION).
3. PERFORM SIMPLE DATA TESTING ON THE FORMATTED TRACK.

SIMPLE DATA TESTING TO INCLUDE:

1. WRITING DATA PATTERNS WITHOUT ERROR. RPWC WILL BE TESTED TO = 0, RPBA WILL BE TESTED TO INCREMENT.
2. WRITE CHECK DATA FORCING A WRITE CHECK ERROR. BUFFER POSITION OF THE ERROR WILL BE VERIFIED USING THE RPBA REGISTER.
3. WRITE CHECK DATA WITHOUT ERROR.
4. ISSUE A RIP COMMAND, FOLLOWED BY A READ HEADER AND DATA COMMAND ON CYL 630 TRACK JUST FORMATTED. VERIFY THAT RPER1, FER DID SET.

TEST 59: RPER1 NEGATIVE BIT TEST

THIS TEST ISSUES AN ILLEGAL FUNCTION AND EXPECTS RPER1, ILF TO SET. IT THEN ISSUES A COMMAND WITH THE WRONG SECTOR, WRONG TRACK ADDRESS AND EXPECTS RPER1, IAE TO SET AFTER EACH COMMAND.

TEST 60: USER SELECTED MICRODIAGNOSTIC ROUTINE

THIS TEST, IF MANUAL INTERVENTION IS ALLOWED AND THE USER, THROUGH USE OF THE SOFTWARE QUESTIONS, DID ANSWER 'YES' TO THE QUESTION 'DO YOU WANT TO SELECT ONE MICRODIAGNOSTIC FOR EXECUTION?', WILL

ALLOW THE USER TO SPECIFY A MICRODIAGNOSTIC ROUTINE FOR EXECUTION. ONLY LEGAL 'HEX' CHARACTERS WILL BE ACCEPTED AS INPUT. ANY PAIR OF HEX CHARACTERS WILL BE ACCEPTED. IT IS UP TO THE USER TO INSURE THAT A VALID ROUTINE IS SELECTED, OTHERWISE THE DRIVE WILL PRODUCE AN ERROR FOR AN INVALID ROUTINE SELECTION. THIS ROUTINE IS INTENDED PRIMARILY FOR DEBUG OF A PROBLEM, NOT SYSTEM ACCEPTANCE.

ONE APPLICATION OF THIS ROUTINE COULD BE TO LOOP 'FOREVER' ON A USER SELECTED MICRO DIAGNOSTIC ROUTINE, POSSIBLY TO DETECT INTERMITTENT PROBLEMS. THE COMMAND STRING TO PERFORM THIS WOULD BE AS FOLLOWS: 'STA/TES:60/FLA:<OPTION LIST>'. THE OPTION IN THIS CASE WOULD BE 'LOT' (LOOP ON TEST). TO CHANGE THE ROUTINE, THE USER WOULD AGAIN USE THE 'START' COMMAND: 'STA/TES:60/FLA:LOT'. THIS ACTION WOULD PERMIT THE USER TO CHANGE THE ROUTINE SELECTED FOR EXECUTION. ANY OTHER COMMAND, IE 'RES' OR 'CON', ETC, WILL USE THE ROUTINE PREVIOUSLY SELECTED BY THE USER, AND WILL NOT PERMIT THE USER TO CHANGE THE SELECTED ROUTINE.

TEST 61: NOP FUNCTIONAL TEST

THIS TEST VERIFIES THE CORRECT FUNCTIONALITY OF THE NOP COMMAND. INITIALLY, THE TEST VERIFIES THAT RPDS, DRY = 1, THEN ISSUES THE COMMAND. RPDS, DRY IS AGAIN CHECKED TO BE SET WITHIN A FIXED TIME LIMIT. IF THE LIMIT EXPIRES AND RPDS, DRY IS NOT SET, A 'DRIVE HUNG' MESSAGE WILL BE GENERATED. COMPOSITE ERROR AND TRANSFER ERROR ARE ALSO CHECKED AND VERIFIED TO NOT BE ASSERTED.

HISTORY

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.REM @

        VERSION (CZRJM-A-0)

            1.  THIS VERSION IS THE STARTING POINT FOR CX DIAGNOSTIC SUPPORT OF
                THE RP07 DISK DRIVE.

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HISTORY

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                        ;*LAST REVISION 01-JAN-83
                        ;
                        .TITLE CZRJMA0 RP07 FE/HOST ISOLATOR
                        .SBTTL  PROGRAM HEADER
                        ;
000000                          .ENABL  AMA,ABS
002000                  .       =       2000
                        ;
                        ;++
                        ; THE PROGRAM HEADER IS THE INTERFACE BETWEEN
                        ; THE DIAGNOSTIC PROGRAM AND THE SUPERVISOR.
                        ;--
                        ;
                        ;
                        ;
002000                  L$NAME::                ;DIAGNOSTIC NAME
002000  103                     .ASCII /C/
002001  132                     .ASCII /Z/
002002  122                     .ASCII /R/
002003  112                     .ASCII /J/
002004  115                     .ASCII /M/
002005  000                     .BYTE   0
002006  000                     .BYTE   0
002007  000                     .BYTE   0
002010                  L$REV::                 ;REVISION LEVEL
002010  101                     .ASCII  /A/
002011                  L$DEPO::                ;0
002011  060                     .ASCII  /0/
002012                  L$UNIT::                ;NUMBER OF UNITS
002012  000001                  .WORD   T$PTHV
002014                  L$TIML::                ;LONGEST TEST TIME
002014  000200                  .WORD   200
002016                  L$HPCP::                ;POINTER TO H.W. QUES.
002016  044762                  .WORD   L$HARD
002020                  L$SPCP::                ;POINTER TO S.W. QUES.
002020  045100                  .WORD   L$SOFT
002022                  L$HPTP::                ;PTR. TO DEF. H.W. PTABLE
002022  002320                  .WORD   L$HW
002024                  L$SPTP::                ;PTR. TO S.W. PTABLE
002024  002332                  .WORD   L$SW
002026                  L$LADP::                ;DIAG. END ADDRESS
002026  045656                  .WORD   L$LAST
002030                  L$STA::                 ;RESERVED FOR APT STATS
002030  000000                  .WORD   0
002032                  L$CO::
002032  000000                  .WORD   0
002034                  L$DTYP::                ;DIAGNOSTIC TYPE
002034  000000                  .WORD   0
002036                  L$APT::                 ;APT EXPANSION
002036  000000                  .WORD   0
002040                  L$DTP::                 ;PTR. TO DISPATCH TABLE
002040  002124                  .WORD   L$DISPATCH
002042                  L$PRIO::                ;DIAGNOSTIC RUN PRIORITY
002042  000000                  .WORD   0
002044                  L$ENVI::                ;FLAGS DESCRIBE HOW IT WAS SETUP
002044  000000                  .WORD   0
002046                  L$EXP1::                ;EXPANSION WORD
```

```
002046  000000                          .WORD   0
002050                          L$MREV::                ;SVC REV AND EDIT #
002050      003                 .BYTE   C$REVISION
002051      003                 .BYTE   C$EDIT
002052                          L$EF::                  ;DIAG. EVENT FLAGS
002052  000000                  .WORD   0
002054  000000                  .WORD   0
002056                          L$SPC::
002056  000000                  .WORD   0
002060                          L$DEVP::                ; POINTER TO DEVICE TYPE LIST
002060  006354                  .WORD   L$DVTYP
002062                          L$REPP::                ;PTR. TO REPORT CODE
002062  000000                  .WORD   0
002064                          L$EXP4::
002064  000000                  .WORD   0
002066                          L$EXP5::
002066  000000                  .WORD   0
002070                          L$AUT::                 ;PTR. TO ADD UNIT CODE
002070  000000                  .WORD   0
002072                          L$DUT::                 ;PTR. TO DROP UNIT CODE
002074  000000                  .WORD   0
002074                          L$LUN::                 ;LUN FOR EXERCISERS TO FILL
002074  000000                  .WORD   0
002076                          L$DESP::                ;POINTER TO DIAG. DESCRIPTION
002076  006362                  .WORD   L$DESC
002100                          L$LOAD::                ;GENERATE SPECIAL AUTOLOAD EMT
002100  104035                  EMT     E$LOAD
002102                          L$ETP::                 ;POINTER TO ERRTBL
002102  000000                  .WORD   0
002104                          L$ICP::                 ;PTR. TO INIT CODE
002104  020652                  .WORD   L$INIT
002106                          L$CCP::                 ;PTR. TO CLEAN-UP CODE
002106  021350                  .WORD   L$CLEAN
002110                          L$ACP::                 ;PTR. TO AUTO CODE
002110  021346                  .WORD   L$AUTO
002112                          L$PRT::                 ;PTR. TO PROTECT TABLE
002112  020644                  .WORD   L$PROT
002114                          L$TEST::                ;TEST NUMBER
002114  000000                  .WORD   0
002116                          L$DLY::                 ;DELAY COUNT
002116  000000                  .WORD   0
002120                          L$HIME::                ;PTR. TO HIGH MEM
002120  000000                  .WORD   0
429
```

```
                                .SBTTL  DISPATCH TABLE

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

 002122  000075                         .WORD   61
 002124                         L$DISPATCH::
 002124  021514                         .WORD   T1
 002126  021612                         .WORD   T2
 002130  022000                         .WORD   T3
 002132  022142                         .WORD   T4
 002134  022302                         .WORD   T5
 002136  022444                         .WORD   T6
 002140  022774                         .WORD   T7
 002142  023270                         .WORD   T8
 002144  023442                         .WORD   T9
 002146  023602                         .WORD   T10
 002150  023772                         .WORD   T11
 002152  024152                         .WORD   T12
 002154  024334                         .WORD   T13
 002156  024510                         .WORD   T14
 002160  025034                         .WORD   T15
 002162  025360                         .WORD   T16
 002164  025540                         .WORD   T17
 002166  025732                         .WORD   T18
 002170  026230                         .WORD   T19
 002172  026526                         .WORD   T20
 002174  027044                         .WORD   T21
 002176  027362                         .WORD   T22
 002200  027634                         .WORD   T23
 002202  030102                         .WORD   T24
 002204  030322                         .WORD   T25
 002206  030514                         .WORD   T26
 002210  030624                         .WORD   T27
 002212  031016                         .WORD   T28
 002214  031154                         .WORD   T29
 002216  031322                         .WORD   T30
 002220  031446                         .WORD   T31
 002222  031600                         .WORD   T32
 002224  031736                         .WORD   T33
 002226  032136                         .WORD   T34
 002230  032302                         .WORD   T35
 002232  032562                         .WORD   T36
 002234  032720                         .WORD   T37
 002236  033142                         .WORD   T38
 002240  033324                         .WORD   T39
 002242  033454                         .WORD   T40
 002244  033732                         .WORD   T41
 002246  034032                         .WORD   T42
 002250  034320                         .WORD   T43
 002252  034424                         .WORD   T44
 002254  034636                         .WORD   T45
 002256  035110                         .WORD   T46
 002260  035206                         .WORD   T47
 002262  035324                         .WORD   T48
```

DISPATCH TABLE

```
002264  035502                          .WORD   T49
002266  035760                          .WORD   T50
002270  036232                          .WORD   T51
002272  036732                          .WORD   T52
002274  037702                          .WORD   T53
002276  040130                          .WORD   T54
002300  040364                          .WORD   T55
002302  040624                          .WORD   T56
002304  041156                          .WORD   T57
002306  041676                          .WORD   T58
002310  044004                          .WORD   T59
002312  044322                          .WORD   T60
002314  044614                          .WORD   T61
```

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```
                                .SBTTL  DEFAULT HARDWARE P-TABLE

                                ;++
                                ; THE DEFAULT HARDWARE P-TABLE CONTAINS DEFAULT VALUES OF
                                ; THE TEST-DEVICE PARAMETERS.  THE STRUCTURE OF THIS TABLE
                                ; IS IDENTICAL TO THE STRUCTURE OF THE HARDWARE P-TABLES.
                                ;--

002316  000004                          .WORD   L10000-L$HW/2
002320                          L$HW::
002320                          DFPTBL::
002320  176700                          .WORD 176700    ;RPCS1 BASE REGISTER ADDRESS
002322  000254                          .WORD 254       ;VECTOR ADDRESS
002324  000240                          .WORD 240       ;BR LEVEL 5 DEVICE
002326  000000                          .WORD 0         ;DRIVE NUMBER


002330                          L10000:
```

```
                                .SBTTL  SOFTWARE P-TABLE

                                ;++
                                ; THE SOFTWARE P-TABLE CONTAINS THE VALUES OF THE PROGRAM
                                ; PARAMETERS THAT CAN BE CHANGED BY THE OPERATOR.
                                ;--

002330  000005                          .WORD   L10001-L$SW/2
002332                          L$SW::
002332                          SFPTBL::
002332  000001                  SWTTST: .WORD   1               ;USED TO SELECT MASSBUS INTERFACE TEST;
                                                                ;DISABLED= 0, ENABLED= 1
002334  000001                  ERRDMP: .WORD   1               ;USED TO ENABLE THE RP07 ERROR LOG DUMP
002336  000000                  SELTRK: .WORD   0               ;USED TO SELECT A TRACK ADDRESS IN THE MICRO-
                                                                ;DIAGNOSTIC TEST
002340  000000                  TRAKAD: .WORD   0               ;USED TO GET THE USER TRACK ADDRESS
002342  000000                  SELRUN: .WORD   0               ;USED TO DETERMINE IF USER SELECTED A MICRO-
                                                                ;DIAGNOSTIC TEST

002344                          L10001:
```

```
                                .SBTTL  GLOBAL EQUATES SECTION


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


                                ;
                                ; 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                  IER==     20000
040000                  LOE==     40000
100000                  HOE==    100000
```

```
                                .SBTTL  RHXX REGISTERS

                                ;CONTROL AND STATUS REGISTER 1 (RPCS1)

000100                          IE    = 100                     ;INTERRUPT ENABLE (BIT #6)
000200                          RDY   = 200                     ;READY (BIT #7)
000400                          A16   = 400                     ;HIGH ORDER BUS ADDRESS BIT (BIT #8)
001000                          A17   =1000                     ;HIGH ORDER BUS ADDRESS BIT (BIT #9)
002000                          PSEL  =2000                     ;PORT SELECT (BIT #10)
020000                          MCPE  =20000                    ;MASSBUS PARITY ERROR (BIT #13)
040000                          TRE   =40000                    ;TRANSFER ERROR (BIT #14)
100000                          SC    =100000                   ;SPECIAL CONDITION (BIT #15)


                                ;WORD COUNT REGISTER (RPWC)
                                ;EACH BIT IS CALLED BY BIT NUMBER


                                ;BUS ADDRESS REGISTER (RPBA)
                                ;EACH BIT IS CALLED BY BIT NUMBER


                                ;CONTROL AND STATUS REGISTER 2 (RPCS2)

000001                          US1  =  1                       ;UNIT SELECT (BIT #0)
000002                          US2  =  2                       ;UNIT SELECT (BIT #1)
000004                          US4  =  4                       ;UNIT SELECT (BIT #2)
000010                          BAI  =  10                      ;BUS ADDRESS INCREMENT INHIBIT (BIT #3)
000020                          PAT  =  20                      ;MASSBUS PARITY INHIBIT (BIT #4)
000040                          CLR  =  40                      ;CLEAR (BIT #5)
000100                          IR   =  100                     ;INPUT READY (BIT #6)
000200                          OR   =  200                     ;OUTPUT READY (BIT #7)
000400                          MDPE =  400                     ;MASSBUS PARITY ERROR (BIT #8)
001000                          MXF  =  1000                    ;MISSED TRANSFER ERROR (BIT #9)
002000                          PGE  =  2000                    ;PROGRAM ERROR (BIT #10)
004000                          NEM  =  4000                    ;NON EXISTENT MEMORY (BIT #11)
010000                          NED  =  10000                   ;NON EXISTENT DRIVE (BIT #12)
020000                          UPE  =  20000                   ;UNIBUS PARITY ERROR
040000                          WCE  =  40000                   ;WRITE CHECK ERROR (BIT #14)
100000                          DLT  =  100000                  ;DATA LATE (BIT #15)


                                ;DATA BUFFER REGISTER (RPDB)
                                ;EACH BIT IS DEFINED BY BIT NUMBER

                                .SBTTL  RP07 REGISTERS

                                ;CONTROL AND STATUS 1 (#00)

000001                          GO  =  1                        ;GO BIT (BIT #0)
000002                          F1  =  2                        ;FUNCTION CODE BIT #1
000004                          F2  =  4                        ;FUNCTION CODE BIT #2
000010                          F3  =  10                       ;FUNCTION CODE BIT #3
000020                          F4  =  20                       ;FUNCTION CODE BIT #4
000040                          F5  =  40                       ;FUNCTION CODE BIT #5
004000                          DVA =  4000                     ;DEVICE AVAILABLE (BIT #11)

```

```
                                ;DRIVE STATUS REGISTER (RPDS <#01>)

000001                          OM  =  1                ;OFFSET MODE (BIT #0)
000002                          EWN =  2                ;EARLY WARNING (BIT #1)
000004                          ILEV=  4                ;INTERLEAVING AVAILABLE (BIT #2)
000100                          VV  =  100              ;VOLUME VALID (BIT #6)
000200                          DRY =  200              ;DATA READY (BIT #7)
000400                          DPR =  400              ;DRIVE PRESENT (BIT #8)
001000                          PGM =  1000             ;PROGRAMABLE (BIT #9)
002000                          LBT =  2000             ;LAST BLOCK TRANSFERRED (BIT #10)
004000                          WRL =  4000             ;WRITE LOCKED (BIT #11)
010000                          MOL =  10000            ;MEDIUM ON LINE (BIT #12)
020000                          PIP =  20000            ;POSITIONER IN PROGRESS (BIT #13)
040000                          ERR =  40000            ;COMPOSITE ERROR (BIT #14)
100000                          ATA =  100000           ;ATTENTION ACTIVE (BIT #15)


                                ;ERROR REGISTER #1 (RPER1 <#02>)

000001                          ILF =  1                ;ILLEGAL FUNCTION (BIT #0)
000002                          ILR =  2                ;ILLEGAL REGISTER (BIT #1)
000004                          RMR =  4                ;REGISTER MODIFICATION REFUSED (BIT #2)
000010                          PAR =  10               ;PARITY ERROR (BIT #3)
000020                          FER =  20               ;FORMAT ERROR (BIT #4)
000040                          WCF =  40               ;WRITE CLOCK FAIL (BIT #5)
000100                          ECH =  100              ;ECC HARD ERROR (BIT #6)
000200                          HCE =  200              ;HEADER COMPARE ERROR (BIT #7)
000400                          HCRC=  400              ;HEADER CRC ERROR (BIT #8)
001000                          AOE =  1000             ;ADDRESS OVERFLOW ERROR (BIT #9)
002000                          IAE =  2000             ;INVALID ADDRESS ERROR (BIT #10)
004000                          WLE =  4000             ;WRITE LOCK ERROR (BIT #11)
010000                          DTE =  10000            ;DRIVE TIMING ERROR (BIT #12)
020000                          OPI =  20000            ;OPERATION INCOMPLETE (BIT #13)
040000                          UNS =  40000            ;DRIVE UNSAFE (BIT #14)
100000                          DCK =  100000           ;DATA CHECK ERROR (BIT #15)


                                ;DIAGNOSTIC MAINTAINABLILTY REGISTER (RPMR1 <#03>)

100000                          DMD =  100000           ;DIAGNOSTIC MODE (BIT #15)


                                ;ATTENTION SUMMARY PSEUDO REGISTER (RPAS <#04>)

000001                          AT0 =  1                ;DEVICE 0 (BIT #0)
000002                          AT1 =  2                ;DEVICE 1 (BIT #1)
000004                          AT2 =  4                ;DEVICE 2 (BIT #2)
000010                          AT3 =  10               ;DEVICE 3 (BIT #3)
000020                          AT4 =  20               ;DEVICE 4 (BIT #4)
000040                          AT5 =  40               ;DEVICE 5 (BIT #5)
000100                          AT6 =  100              ;DEVICE 6 (BIT #6)
000200                          AT7 =  200              ;DEVICE 7 (BIT #7)


                                ;DESIRED SECTOR/TRACK ADDRESS REGISTER (RPDA <#05>)
                                ;EACH BIT IS CALLED BY BIT NUMBER
```

```
                                ;DRIVE TYPE REGISTER (RPDT <#06>)

000001                          DRT0 =  1               ;DRIVE TYPE NUMBER (BIT #0)
000002                          DRT1 =  2               ;DRIVE TYPE NUMBER (BIT #1)
000004                          DRT2 =  4               ;DRIVE TYPE NUMBER (BIT #2)
000010                          DRT3 =  10              ;DRIVE TYPE NUMBER (BIT #3)
000020                          DRT4 =  20              ;DRIVE TYPE NUMBER (BIT #4)
000040                          DRT5 =  40              ;DRIVE TYPE NUMBER (BIT #5)
000100                          DRT6 =  100             ;DRIVE TYPE NUMBER (BIT #6)
000200                          DRT7 =  200             ;DRIVE TYPE NUMBER (BIT #7)
000400                          DRT8 =  400             ;DRIVE TYPE NUMBER (BIT #8)
004000                          DRQ =  4000             ;DRIVE REQUEST REQUIRED (BIT #11)
020000                          MOH =  20000            ;MOVING HEAD TYPE DRIVE (BIT #13)
040000                          TAP =  40000            ;TAPE DRIVE (BIT #14)
100000                          NBA =  100000           ;NOT BLOCK ADDRESSED (BIT #15)


                                ;LOOK AHEAD REGISTER (RPLA <#07>)

000100                          SC1  =  100             ;SECTOR COUNT FIELD 1 (BIT #6)
000200                          SC2  =  200             ;SECTOR COUNT FIELD 2 (BIT #7)
000400                          SC4  =  400             ;SECTOR COUNT FIELD 4 (BIT #8)
001000                          SC8  =  1000            ;SECTOR COUNT FIELD 8 (BIT #9)
002000                          SC16 =  2000            ;SECTOR COUNT FIELD 16 (BIT #10)
004000                          SC32 =  4000            ;SECTOR COUNT FIELD 32 (BIT #11)
010000                          SC64 =  10000           ;SECTOR COUNT FIELD 64 (BIT #12)


                                ;RP07 SERIAL NUMBER REGISTER (RPSN <#10>)
                                ;EACH BIT IS CALLED BY BIT NUMBER


                                ;RP07 OFFSET REGISTER (RPOF <#11>)

000200                          OFFDIR  = 200           ;OFFSET DIRECTION (BIT #7)
002000                          HCI     = 2000          ;HEADER COMPARE CODE INHIBIT (BIT #10)
004000                          ECI     = 4000          ;ERROR CORRECTION CODE INHIBIT (BIT #11)
010000                          FMT     = 10000         ;16 BIT FORMAT (BIT #12)
040000                          MTD     = 40000         ;MOVE TRACK DESCRIPTOR (BIT #14)
100000                          CMOD    = 100000        ;COMMAND MODIFIER (BIT #15)


                                ;RP07 DESIRED CYLINDER ADDRESS (RPDC <#12>)
                                ;EACH BIT IS CALLED BY BIT NUMBER


                                ;RP07 CURRENT CYLINDER ADDRESS (RPCC <#13>)
                                ;EACH BIT IS CALLED BY BIT NUMBER


                                ;RP07 ERROR REGISTER 3 (RPER3 <#15>)

000002                          SCF     = 2             ;SYNC CLOCK FAILURE (BIT #1)
000004                          SBE     = 4             ;SYNC BYTE ERROR (BIT #2)
000010                          DPE     = 10            ;DATA PARITY ERROR (BIT #3)
```

```
                                SDF     = 20                    ;SERDES DATA FAILURE (BIT #4)
                                DCU     = 40                    ;DC UNSAFE (BIT #5)
                                IXU     = 100                   ;INDEX UNSAFE (BIT #6)
                                DVC     = 200                   ;DEVICE CHECK (BIT #7)
                                PHF     = 400                   ;8080 PROCESSOR HANDSHAKE FAILURE (BIT #8)
                                LCE     = 1000                  ;LOSS OF CYLINDER ERROR (BIT #9)
                                LBC     = 2000                  ;LOSS OF BIT CLOCK (BIT #10)
                                DSE     = 20000                 ;DEFECT SKIP ERROR (BIT #13)
                                SKI     = 40000                 ;SEEK INCOMPLETE (BIT #14)
                                BSE     = 100000                ;BAD SECTOR ERROR (BIT #15)


                                ;RP07 ERROR REGISTER #2 (RPER2 <#14>)
                                                                ;BITS 0 THROUGH 7 = READ ONLY BITS
000400                          WRU  =  400                     ;WRITE READY UNSAFE (BIT #8)
001000                          WOR  =  1000                    ;WRITE OVERRUN (BIT #9)
002000                          RWU1 =  2000                    ;READ/WRITE UNSAFE #1 (BIT #10)
004000                          RWU2 =  4000                    ;READ/WRITE UNSAFE #2 (BIT #11)
010000                          RWU3 =  10000                   ;READ/WRITE UNSAFE #3 (BIT #12)
020000                          CPU  =  20000                   ;CPU UNSAFE (BIT #13)
040000                          CPE  =  40000                   ;COMM PARITY ERROR (BIT #14)
100000                          PGE  =  100000                  ;PROGRAMMING ERROR


                                ;ECC POSITION REGISTER (RPEC1 <#16>)
                                ;EACH BIT IS DEFINED BY BIT NUMBER


                                ;ECC PATTERN REGISTER (RPEC2 <#17>)
                                ;EACH BIT IS DEFINED BY BIT NUMBER


                                .SBTTL  RP07 COMMAND DEFINITIONS

000005                          SEEK    =  5                    ;SEEK
000007                          RECAL   =  7                    ;RECALIBRATE
000011                          DRCLR   =  11                   ;DRIVE CLEAR
000013                          RELEASE =  13                   ;DRIVE RELEASE
000015                          NOP     =  15                   ;NO OPERATION
000021                          RIP     =  21                   ;READ IN PRESET (NO OPERATION)
000031                          SEARCH  =  31                   ;SEARCH
000035                          DIAG    =  35                   ;DIAGNOSTIC MODE
000051                          WCKD    =  51                   ;WRITE CHECK DATA
000053                          WCKHD   =  53                   ;WRITE CHECK HEADER AND DATE
000061                          WRDTA   =  61                   ;WRITE DATA
000063                          FORTRK  =  63                   ;FORMAT HEADER AND SD FOR ENTIRE TRACK
000065                          WRTD    =  65                   ;WRITE TRACK DESCRIPTOR
000071                          RDDTA   =  71                   ;READ DATA
000073                          RDHDTA  =  73                   ;READ HEADER AND DATA
000075                          RTD     =  75                   ;READ TRACK DESCRIPTOR
```

```
                                .SBTTL  GLOBAL DATA SECTION

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

002344  000001                 PATT1:: 000001
002346  177776                 PATT2:: 177776
002350  177777                 PATT3:: 177777
002352  000000                 PATT4:: 000000
002354  125252                 PATT5:: 125252
002356  052525                 PATT6:: 052525
002360  000070                 PATT7:: 000070
002362  030221                 PATT8:: 030221                  ;PATTERN 8 (WORST CASE)
002364  000002                 PATT9:: 000002

002366  000000                 TABADD:: .WORD  0               ;BUFFER POINTER
002370  000037                 ENDTRK:: .WORD  31.             ;LAST TRACK (RP07+)
002372  000000                 LASTRK:: .WORD  0               ;PROGRAM CONTROLLED LAST TRACK
002374  001165                 ENDCYL:: .WORD  629.            ;LAST CYLINDER, (RP07+)
002376  000000                 LASCYL:: .WORD  0               ;PROGRAM CONTROLLED LAST CYLINDER
002400  000000                 BITPOS:: .WORD  0               ;USED TO MASK THE CORRECT RPAS BIT POSITION
002402  000012                 ITCOUN:: .WORD  10.             ;ITERATION COUNTER
002404  000000                 ERRWD1::.WORD   0               ;ERROR MESSAGE INDEX #1
002406  000000                 ERRWD2::.WORD   0               ;ERROR MESSAGE INDEX #2
002410  000000                 BYTCNT::.WORD   0               ;USED TO INDICATE #OF WORDS TRANSFERRED
002412  000000                 NEGWRD:: .WORD  0               ;NEGATED WORD   COUNT FOR DRIVER
002414  000000                 DESTRK::.WORD   0               ;USED TO SELECT A DESIRED TRACK
002416  000000                 DESCYL::.WORD   0               ;USED TO SELECT A DESIRED CYLINDER
002420  000000                 FUNCTN::.WORD   0               ;USED TO SPECIFY A SELECTED FUNCTON
002422  000000                 ROUTDO::.WORD   0               ;USE THIS PARAMETER ('USER SELECTED' INDICATOR)
002424  000000                 SELNUM::.WORD   0               ;USED TO STORE THE USER MICRODIAGNOSTIC INPUT

002426  000000                 CLKSTA:: .WORD  0               ;CLOCK STATUS (NO CLOCK= 0,KW11-P= 1 OR KW11-L= -1
002430  000000                 FASTAT:: .WORD  0               ;FAILED STATUS (USED INTERNALLY BY PROGRAM)
002432  000000                 CSTORE:: .WORD  0               ;SAVE CARRY FROM PREVIOUS XFER
002434  000000                 PATCNT:: .WORD  0               ;# OF PATTERNS TO USE
002436  000000                 TEMP::   .WORD  0               ;TEMPORARY STORAGE FOR SCOPE LOOPS
002440  000000                 SNK::    .WORD  0               ;ADDRESS OF REGISTER UNDER TEST
002442  000000                 SRC::    .WORD  0               ;ADDRESS OF TESTING DATA PATTERN
002444  000000                 SRCTMP::.WORD   0               ;DATA PATTERN TEMPORARY STORAGE
002446  000000                 MASK::   .WORD  0               ;CONTAINS # OF BITS TO TEST
002450  000000                 MSK::    .WORD  0               ;CONTAINS BIT UNDER TEST
002452  000000                 RCVED:: .WORD   0               ;CONTAINS RECEIVED BAD DATA
002454  000000                 EXPT D::.WORD   0               ;CONTAINS EXPECTED GOOD DATA
002456  000000                 TESTRG::.WORD   0               ;CONTAINS ADDRESS OF REGISTER UNDER TEST
002460  000000                 ILOCK:: .WORD   0               ;USED TO INDICATE RPDB IR/OR POLLING
002462  000000                 INTFLG::.WORD   0               ;USED TO INDICATE THAT AN INTERRUPT HAS OCCURRED
002464  000000                 UNABLE::.WORD   0               ;USED TO CHECK FOR MANUAL INTERVENTION
002466  000000                 ERSTAT::.WORD   0               ;REPORTS PASS/FAIL STATUS TO CALLING MODULE
002470  000000                 FATOF:: .WORD   0               ;FUNCTION AT TIME OF FAILURE

002472  000000                 UNIT::   .WORD  0               ;USED TO SELECT A UNIT FOR TEST
002474  176700                 RPADR:: .WORD   176700          ;CONTAINS RPCS1 BASE ADDRESS
002476  000254  000240         RPVEC:. .WORD   254,5*32.       ;CONTAINS VECTOR ADDRESS & BR LEVEL
002502  000050                 RHEXT:: .WORD   50              ;CONTAINS RH70 OFFSET TO RPBAE
```

```
                                ;CONTAINS RHXX TYPE; RH11= 0, RH70= 1
                                ;DRIVE NUMBER
                                ;STORAGE FOR EACH S/N DIGIT

                                ;BASE ADDRESS USED FOR THE DRIVE
                                ;WORD COUNT REGISTER
                                ;BYTE ADDRESS REGISTER
                                ;DESIRED SECTOR/TRACK ADDRESS
                                ;RP07 STATUS REGISTER
                                ;RP07 DRIVE STATUS
                                ;RP07 ERROR REGISTER #1
                                ;RP07 ATTENTION SUMMARY PSEUDO REGISTER
                                ;RP07 LOOK AHEAD REGISTER
                                ;RP07 DATA BUFFER
                                ;RP07 MAINTENANCE REGISTER #1
                                ;DRIVE TYPE REGISTER
                                ;RP07 SERIAL NUMBER
                                ;RP07 OFFSET REGISTER
                                ;RP07 DESIRED CYLINDER
                                ;RP07 CURRENT CYLINDER
                                ;RP07 ERROR REGISTER #2
                                ;RP07 ERROR REGISTER #3
                                ;RP07 ERROR POSITION
                                ;RP07 ERROR PATTERN
                                ;RH70 REGISTER
                                ;RH70 REGISTER

                                ;ATTENTION BITS TABLE (ATABIT=8 BYTES)
                                        ;THIS TABLE CONTAINS THE CORRESPONDING BIT TO EACH DRIVES
                                        ;ATTENTION BIT

                                ;DRIVE 0
                                ;DRIVE 1
                                ;DRIVE 2
                                ;DRIVE 3
                                ;DRIVE 4
                                ;DRIVE 5
                                ;DRIVE 6
                                ;DRIVE 7

                                ; STORAGE FOR DEVICE REGISTERS
                                ;
                                ;SAVE REGISTERS HERE

                                ;SOFTWARE PSEUDO STACK
                                ;ASCII TEXT POINTER FILE
                                ;BUFFER USED FOR DATA TRANSFERS

                                ; MODULE CALLOUT DISPATCH TABLE
                                ;
                                ;           (BIT0 ERRWD1)
                                ;A02 MODULE (BIT1 ERRWD1)
                                ;A03 MODULE (BIT2 ERRWD1)
                                ;A04 MODULE (BIT3 ERRWD1)
                                ;A05 MODULE (BIT4 ERRWD1)
                                ;A06 MODULE (BIT5 ERRWD1)
                                ;A07 MODULE (BIT6 ERRWD1)
```

```
115 004076  011224                    J8          ;A08 MODULE (BIT7 ERRWD1)
116 004100  011231                    J9          ;A09 MODULE (BIT 8 ERRWD1)
117 004102  011236                    J10         ;A10 MODULE (BIT 9 ERRWD1)
118 004104  011243                    J11         ;A11 MODULE (BIT 10 ERRWD1)
119 004106  011250                    J12         ;A12 MODULE (BIT 11 ERRWD1)
120 004110  011255                    J13         ;A13 MODULE (BIT 12 ERRWD1)
121 004112  011262                    J14         ;A14 MODULE (BIT 13 ERRWD1)
122 004114  011267                    J15         ;A15 MODULE (BIT 14 ERRWD1)
123 004116  011274                    J16         ;A16 MODULE (BIT 15 ERRWD1)
124 004120  011301                    J17         ;A17 MODULE (BIT 0 ERRWD2)
125 004122  011132                    RH          ;RH CONTROLLER (BIT 1 ERRWD2)
126 004124  011151                    CA          ;CABLE (BIT 2 ERRWD2)
127 004126  011121                    DS          ;MASSBUS DISABLE SWITCH (BIT 3 ERRWD2)
128 004130  011074                    AD          ;DUAL DRIVE RESPONSE (BIT 4 ERRWD2)
129 004132  011306                    J20         ;A20 MODULE (BIT 5 ERRWD2)
130 004134  011313                    J21         ;A21 MODULE (BIT 6 ERRWD2)
131 004136  011320                    HDA         ;HDA CALLOUT (BIT 7 ERRWD2)
132 004140  011325                    TERM        ;TERMINATOR CALLOUT (BIT 8 ERRWD2)
133 004142  011341                    SENSOR      ;PHASE DETECTOR SENSOR (BIT 9 ERRWD2)
134 004144  011361                    BLOWER      ;BLOWER ASSY, (BIT 10 ERRWD2)
135 004146  011376                    PTRANS      ;POWER TRANSFORMER (BIT11 ERRWD2)
136 004150  011421                    M1RBRK      ;MOTOR / BRAKE ASSY'S (BIT 12 ERRWD2)
137 004152  011443                    K1RELA      ;RELAY K1 (BIT 13 ERRWD2)
138 004154  011455                    OPRPNL      ;OPERATOR'S PANEL (BIT 14 ERRWD2)
139 004156  011477                    DRVBLT      ;DRIVE BELT (BIT 15 ERRWD2)
140
141 004160  000002          TST03::   2           ;# OF PATTERNS USED IN THIS TEST
142 004162  002522                    RPCS2       ;REGISTER TO TEST
143 004164  000037                    000037      ;BIT MASK, BITS TO TEST = 1
144 004166  002344                    PATT1       ;PATTERN TO USE
145 004170  002346                    PATT2       ;PATTERN TO USE
146
147 004172  000002          TST04::   2           ;# OF PATTERNS USED IN THIS TEST
148 004174  002514                    RPWC        ;REGISTER TO TEST
149 004176  177777                    177777      ;BIT MASK, BITS TO TEST = 1
150 004200  002344                    PATT1       ;PATTERN TO USE
151 004202  002346                    PATT2       ;PATTERN TO USE
152
153 004204  000002          TST05::   2           ;# OF PATTERNS USED IN THIS TEST
154 004206  002516                    RPBA        ;REGISTER TO TEST
155 004210  177776                    177776      ;BIT MASK, BITS TO TEST = 1
156 004212  002364                    PATT9       ;PATTERN TO USE
157 004214  002346                    PATT2       ;PATTERN TO USE
158
159 004216  000003          TST08::   3           ;# OF PATTERNS IN USE IN THIS TEST
160 004220  002534                    RPDB        ;REGISTER UNDER TEST
161 004222  177777                    177777      ;BIT MASK, BITS TO TEST = 1
162 004224  002344                    PATT1       ;PATTERN TO USE
163 004226  002346                    PATT2       ;PATTERN TO USE
164 004230  002354                    PATT5       ;PATTERN TO USE
165
166 004232  000002          TST11::   2           ;# OF PATTERNS TO USE IN THIS TEST
167 004234  002564                    RPCS3       ;REGISTER TO TEST
168 004236  000117                    000117      ;BIT MASK, BITS TO TEST = 1
169 004240  002344                    PATT1       ;PATTERN TO USE
170 004242  002346                    PATT2       ;PATTERN TO USE
171
```

```
172 004244  000002          TST12:: 2               ;# OF PATTERNS TO USE IN THIS TEST
173 004246  002562                  RPBAE           ;REGISTER TO TEST
174 004250  000077                  000077          ;BIT MASK, BITS TO TEST = 1
175 004252  002344                  PATT1           ;PATTERN TO USE
176 004254  002346                  PATT2           ;PATTERN TO USE
177
178 004256  000003          TST28:: 3               ;# OF PATTERNS TO USE
179 004260  002520                  RPDA            ;REGISTER TO TEST
180 004262  177777                  177777          ;BIT MASK, BITS TO TEST = 1
181 004264  002344                  PATT1           ;PATTERN TO USE
182 004266  002346                  PATT2           ;PATTERN TO USE
183 004270  002350                  PATT3           ;PATTERN TO USE
184
185 004272  002512          TST33:: RPCS1           ;FILE OF REGISTERS
186 004274  002520                  RPDA            ;TO BE USED IN
187 004276  002544                  RPOF            ;THIS TEST
188 004300  002546                  RPDC            ;LAST REGISTER USED - THIS TEST
189
190 004302  000010          TST34:: 8.              ;# OF PATTERNS TO USE
191 004304  002536                  RPMR1           ;REGISTER TO TEST
192 004306  177777                  177777          ;BITS TO TEST
193 004310  002344                  PATT1           ;USE THIS PATTERN
194 004312  002346                  PATT2           ;USE THIS PATTERN
195 004314  002350                  PATT3           ;USE THIS PATTERN
196 004316  002354                  PATT5           ;USE THIS PATTERN
197 004320  002356                  PATT6           ;USE THIS PATTERN
198 004322  002360                  PATT7           ;USE THIS PATTERN
199 004324  002362                  PATT8           ;USE THIS PATTERN
200 004326  002364                  PATT9           ;USE THIS PATTERN
201
202 004330  002512          TST49:: RPCS1           ;FILE OF WRITABLE REGISTERS TO TEST
203 004332  002514                  RPWC
204 004334  002516                  RPBA
205 004336  002520                  RPDA
206 004340  002522                  RPCS2
207 004342  002536                  RPMR1
208 004344  002544                  RPOF
209 004346  002546                  RPDC
210 004350  002562                  RPBAE
211 004352  002564                  RPCS3
```

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                                .SBTTL  MODULE CALLOUT TABLE

                                        ;LAST ERROR CODE GUIDE REVISION: 3/15/81 (REV A)
                                        ;LAST CHANGE TO THIS SOURCE CODE: 4/22/81

004354  000000          EC.00:  0               ;NOT USED (00 ERROR CODE)
004356  000000                  0               ;NOT USED
004360  000000                  0               ;NOT USED (01 ERROR CODE)
004362  000000                  0               ;NOT USED
004364  000000                  0               ;NOT USED (02 ERROR CODE)
004366  000000                  0               ;NOT USED
004370  000000                  0               ;NOT USED (03 ERROR CODE)
004372  000000                  0               ;NOT USED
004374  000000                  0               ;NOT USED (04 ERROR CODE)
004376  000000                  0               ;NOT USED
004400  000000                  0               ;NOT USED (05 ERROR CODE)
004402  000000                  0               ;NOT USED
004404  000000                  0               ;NOT USED (06 ERROR CODE)
004406  000000                  0               ;NOT USED
004410  000000                  0               ;NOT USED (07 ERROR CODE)
004412  000000                  0               ;NOT USED
004414  000000                  0               ;NOT USED (08 ERROR CODE)
004416  000000                  0               ;NOT USED
004420  000000                  0               ;NOT USED (09 ERROR CODE)
004422  000000                  0               ;NOT USED
004424  000000                  0               ;NOT USED (0A ERROR CODE)
004426  000000                  0               ;NOT USED
004430  000000                  0               ;NOT USED (0B ERROR CODE)
004432  000000                  0               ;NOT USED
004434  000000                  0               ;NOT USED (0C ERROR CODE)
004436  000000                  0               ;NOT USED
004440  000000                  0               ;NOT USED (0D ERROR CODE)
004442  000000                  0               ;NOT USED
004444  000000                  0               ;NOT USED (0E ERROR CODE)
004446  000000                  0               ;NOT USED
004450  000000                  0               ;NOT USED (0F ERROR CODE)
004452  000000                  0               ;NOT USED
004454  000100                  BIT6            ;A7 MODULE (10 ERROR CODE)
004456  000000                  0               ;NO CALLOUT
004460  000100                  BIT6            ;A7 MODULE (11 ERROR CODE)
004462  000000                  0               ;NO CALLOUT
004464  000100                  BIT6            ;A7 MODULE (12 ERROR CODE)
004466  000000                  0               ;NO CALLOUT
004470  000100                  BIT6            ;A7 MODULE (13 ERROR CODE)
004472  000000                  0               ;NO CALLOUT
004474  000100                  BIT6            ;A7 MODULE (14 ERROR CODE)
004476  000000                  0               ;NO CALLOUT
004500  000100                  BIT6            ;A7 MODULE (15 ERROR CODE)
004502  000000                  0               ;NO CALLOUT
004504  000100                  BIT6            ;A7 MODULE (16 ERROR CODE)
004506  000000                  0               ;NOT USED
004510  000100                  BIT6            ;A7 MODULE (17 ERROR CODE)
004512  000000                  0               ;NO CALLOUT
004514  000100                  BIT6            ;A7 MODULE (18 ERROR CODE)
004516  000000                  0               ;NO CALLOUT
004520  000100                  BIT6            ;A7 MODULE (19 ERROR CODE)
004522  000000                  0               ;NO CALLOUT
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 58 004524  000100          BIT6                    ;A7 MODULE (1A ERROR CODE)
 59 004526  000000          0                       ;NO CALLOUT
 60 004530  000070          BIT3!BIT4!BIT5          ;A4,A5,A6 MODULES (1B ERROR CODE)
 61 004532  000200          BIT7                    ;HDA
 62 004534  000070          BIT3!BIT4!BIT5          ;A4, A5, A6 MODULES (1C ERROR CODE)
 63 004536  000200          BIT7                    ;HDA
 64 004540  000070          BIT3!BIT4!BIT5          ;A4, A5, A6 MODULES (1D ERROR CODE)
 65 004542  000200          BIT7                    ;HDA
 66 004544  000070          BIT3!BIT4!BIT5          ;A4, A5, A6 MODULES (1E ERROR CODE)
 67 004546  000200          BIT7                    ;HDA
 68 004550  177776          ^CBIT0!BIT1!BIT2        ;A4 - A16 MODULES (1F ERROR CODE)
 69 004552  000040          BIT5                    ;A20 MODULE
 70 004554  000100          BIT6                    ;A7 MODULE (20 ERROR CODE)
 71 004556  000000          0                       ;NO CALLOUT
 72 004560  000100          BIT6                    ;A7 MODULE (21 ERROR CODE)
 73 004562  000000          0                       ;NO CALLOUT
 74 004564  000100          BIT6                    ;A7 MODULE (22 ERROR CODE)
 75 004566  000000          0                       ;NO CALLOUT
 76 004570  000100          BIT6                    ;A7 MODULE (23 ERROR CODE)
 77 004572  000000          0                       ;NO CALLOUT
 78 004574  000100          BIT6                    ;A7 MODULE (24 ERROR CODE)
 79 004576  000000          0                       ;NO CALLOUT
 80 004600  000100          BIT6                    ;A7 MODULE (25 ERROR CODE)
 81 004602  000000          0                       ;NO CALLOUT
 82 004604  000100          BIT6                    ;A7 MODULE (26 ERROR CODE)
 83 004606  000000          0                       ;NO CALLOUT
 84 004610  000522          BIT1!BIT4!BIT6!BIT8     ;A2, A5, A7, A9 MODULES (28 ERROR CODE)
 85 004612  000000          0                       ;NO CALLOUT
 86 004614  000050          BIT3!BIT5               ;A4, A6 MODULE (28 ERROR CODE)
 87 004616  000000          0                       ;NO CALLOUT
 88 004620  000030          BIT3!BIT4               ;A4, A5 MODULE (29 ERROR CODE)
 89 004622  000000          0                       ;NO CALLOUT
 90 004624  000050          BIT3!BIT5               ;A4, A6 MODULES (2A ERROR CODE)
 91 004626  000000          0                       ;NO CALLOUT
 92 004630  000030          BIT3!BIT4               ;A4, A5 MODULE (2B ERROR CODE)
 93 004632  000000          0                       ;NO CALLOUT
 94 004634  000050          BIT3!BIT5               ;A4, A6 MODULE (2C ERROR CODE)
 95 004636  000000          0                       ;NO CALLOUT
 96 004640  000050          BIT3!BIT5               ;A4, A6 MODULE (2D ERROR CODE)
 97 004642  000000          0                       ;NO CALLOUT
 98 004644  000030          BIT3!BIT4               ;A4, A5 MODULE (2E ERROR CODE)
 99 004646  000000          0                       ;NO CALLOUT
100 004650  000030          BIT3!BIT4               ;A4, A5 MODULE (2F ERROR CODE)
101 004652  000000          0                       ;NO CALLOUT
102 004654  001400          BIT8!BIT9               ;A9, A10 MODULES (30 ERROR CODE)
103 004656  000000          0                       ;NO CALLOUT
104 004660  001000          BIT9                    ;A10 MODULE (31 ERROR CODE)
105 004662  000000          0                       ;NO CALLOUT
106 004664  001000          BIT9                    ;A10 MODULE (32 ERROR CODE)
107 004666  000000          0                       ;NO CALLOUT
108 004670  001400          BIT8!BIT9               ;A9,A10 MODULE (33 ERROR CODE)
109 004672  000000          0                       ;NO CALLOUT
110 004674  001000          BIT9                    ;A10 MODULE (34 ERROR CODE)
111 004676  000000          0                       ;NO CALLOUT
112 004700  001000          BIT9                    ;A10 ERROR CODE (35 ERROR CODE)
113 004702  000000          0                       ;NO CALLOUT
114 004704  001000          BIT9                    ;A10 MODULE (36 ERROR CODE)
```

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115 004706  000000    0                       ;NO CALLOUT
116 004710  001000    BIT9                    ;A10 MODULE (37 ERROR CODE)
117 004712  000000    0                       ;NO CALLOUT
118 004714  001000    BIT9                    ;A10 MODULE (38 ERROR CODE)
119 004716  000000    0                       ;NO CALLOUT
120 004720  001000    BIT9                    ;A10 MODULE (39 ERROR CODE)
121 004722  000000    0                       ;NO CALLOUT
122 004724  001000    BIT9                    ;A10 MODULE (3A ERROR CODE)
123 004726  000000    0                       ;NOT USED
124 004730  001000    BIT9                    ;A10 MODULE (3B ERROR CODE)
125 004732  000000    0                       ;NOT USED
126 004734  000100    BIT6                    ;A7 MODULE (3C ERROR CODE)
127 004736  000000    0                       ;NOT USED
128 004740  000100    BIT6                    ;A7 MODULE (3D ERROR CODE)
129 004742  000000    0                       ;NOT USED
130 004744  000100    BIT6                    ;A7 MODULE (3E ERROR CODE)
131 004746  000000    0                       ;NOT USED
132 004750  001102    BIT1!BIT6!BIT9          ;A2, A7, A10 MODULES (3F ERROR CODE)
133 004752  000000    0                       ;NOT USED
134 004754  000000    0                       ;NO CALLOUT (40 ERROR CODE)
135 004756  000000    0                       ;NO CALLOUT
136 004760  000102    BIT1!BIT6               ;A2, A7 MODULES (41 ERROR CODE)
137 004762  002000    BIT10                   ;BLOWER ASSY
138 004764  000343    BIT0!BIT1!BIT5!BIT6!BIT7;A1, A2, A6, A7, A8 MODULES (42 ERROR CODE)
139 004766  135200    BIT7!BIT9!BIT11!BIT12!BIT13!BIT15;HDA, PHASE DETECTOR, TRANSFORMER, MOTOR, K1, BELT
140 004770  000040    BIT5                    ;A6 MODULE (43 ERROR CODE)
141 004772  000200    BIT7                    ;HDA CALLOUT
142 004774  000070    BIT3!BIT4!BIT5          ;A4, A5, A6 MODULES (44 ERROR CODE)
143 004776  000200    BIT7                    ;HDA CALLOUT
144 005000  000070    BIT3!BIT4!BIT5          ;A4, A5, A6 (45 ERROR CODE)
145 005002  000200    BIT7                    ;HDA CALLOUT
146 005004  000070    BIT3!BIT4!BIT5          ;A4, A5, A6 MODULES (46 ERROR CODE)
147 005006  000200    BIT7                    ;HDA
148 005010  000070    BIT3!BIT4!BIT5          ;A4, A5, A6 MODULES (47 ERROR CODE)
149 005012  000200    BIT7                    ;HDA
150 005014  000030    BIT3!BIT4               ;A4, A5 MODULES (48 ERROR CODE)
151 005016  000000    0                       ;NO CALLOUT
152 005020  000030    BIT3!BIT4               ;A4, A5 MODULES (49 ERROR CODE)
153 005022  000000    0                       ;NO CALLOUT
154 005024  000070    BIT3!BIT4!BIT5          ;A4, A5, A6 MODULES (4A ERROR CODE)
155 005026  000200    BIT7                    ;HDA
156 005030  000032    BIT1!BIT3!BIT4          ;A2, A4, A5 MODULES (4B ERROR CODE)
157 005032  000000    0                       ;NO CALLOUT
158 005034  000020    BIT4                    ;A5 MODULE (4C ERROR CODE)
159 005036  000000    0                       ;NO CALLOUT
160 005040  000020    BIT4                    ;A5 MODULE (4D ERROR CODE)
161 005042  000000    0                       ;NO CALLOUT
162 005044  000053    BIT0!BIT1!BIT3!BIT5     ;A1, A2, A4, A6 MODULES (4E ERROR CODE)
163 005046  000000    0                       ;NO CALLOUT
164 005050  000012    BIT1!BIT3               ;A2, A4 MODULES (4F ERROR CODE)
165 005052  000000    0                       ;NOT USED
166 005054  000070    BIT3!BIT4!BIT5          ;A4, A5, A6 MODULES (50 ERROR CODE)
167 005056  000200    BIT7                    ;HDA
168 005060  000070    BIT3!BIT4!BIT5          ;A4, A5, A6 MODULES (51 ERROR CODE)
169 005062  000200    BIT7                    ;HDA
170 005064  000070    BIT3!BIT4!BIT5          ;A4, A5, A6 MODULES (52 ERROR CODE)
171 005066  000200    BIT7                    ;HDA
```

MODULE CALLOUT TABLE

```
172 005070  000050  BIT3!BIT5               ;A4, A6 MODULES (53 ERROR CODE)
173 005072  000000  0                       ;NO CALLOUT
174 005074  000012  BIT1!BIT3               ;A2, A4 MODULES (54 ERROR CODE)
175 005076  000000  0                       ;NOT USED
176 005100  000070  BIT3!BIT4!BIT5          ;A4, A5, A6 MODULES (55 ERROR CODE)
177 005102  000200  BIT7                    ;HDA
178 005104  000012  BIT1!BIT3               ;A2, A4 MODULES (56 ERROR CODE)
179 005106  000000  0                       ;NOT USED
180 005110  000030  BIT3!BIT4               ;A4, A5 MODULES (57 ERROR CODE)
181 005112  000000  0                       ;NO CALLOUT
182 005114  000030  BIT3!BIT4               ;A4, A5 MODULES (58 ERROR CODE)
183 005116  000000  0                       ;NO CALLOUT
184 005120  000030  BIT3!BIT4               ;A4, A5 MODULES (59 ERROR CODE)
185 005122  000000  0                       ;NO CALLOUT
186 005124  000030  BIT3!BIT4               ;A4, A5 MODULES (5A ERROR CODE)
187 005126  000000  0                       ;NO CALLOUT
188 005130  000030  BIT3!BIT4               ;A4, A5 MODULES (5B ERROR CODE)
189 005132  000000  0                       ;NO CALLOUT
190 005134  000030  BIT3!BIT4               ;A4, A5 MODULES (5C ERROR CODE)
191 005136  000000  0                       ;NO CALLOUT
192 005140  000030  BIT3!BIT4               ;A4, A5 MODULES (5D ERROR CODE)
193 005142  000000  0                       ;NO CALLOUT
194 005144  000030  BIT3!BIT4               ;A4, A5 MODULES (5E ERROR CODE)
195 005146  000000  0                       ;NO CALLOUT
196 005150  000030  BIT3!BIT4               ;A4, A5 MODULES (5F ERROR CODE)
197 005152  000000  0                       ;NO CALLOUT
198 005154  000330  BIT3!BIT4!BIT6!BIT7     ;A4, A5, A7, A8  MODULES (60 ERROR CODE)
199 005156  040000  BIT14                   ;OPERATOR'S PANEL
200 005160  000070  BIT3!BIT4!BIT5          ;A4, A5, A6 MODULES (61 ERROR CODE)
201 005162  000200  BIT7                    ;HDA
202 005164  000050  BIT3!BIT5               ;A4, A6 MODULES (62 ERROR CODE)
203 005166  000000  0                       ;NO CALLOUT
204 005170  000020  BIT4                    ;A5 MODULE (63 ERROR CODE)
205 005172  000000  0                       ;NOT USED
206 005174  004570  BIT3!BIT4!BIT5!BIT6!BIT8!BIT11;A4, A5, A6, A7, A9, A12 MODULES  (64 ERROR CODE)
207 005176  000200  BIT7                    ;HDA
208 005200  004550  BIT3!BIT5!BIT6!BIT8!BIT11;A4, A6, A7, A9, A12 MODULES (65 ERROR CODE)
209 005202  000000  0                       ;NO CALLOUT
210 005204  000070  BIT3!BIT4!BIT5          ;A4, A5, A6 MODULES (66 ERROR CODE)
211 005206  000000  0                       ;NO CALLOUT
212 005210  000040  BIT5                    ;A6 MODULES (67 ERROP CODE)
213 005212  000000  0                       ;NO CALLOUT
214 005214  000050  BIT3!BIT5               ;A4, A6 MODULES (68 ERROR CODE)
215 005216  000000  0                       ;NO CALLOUT
216 005220  000200  BIT7                    ;A8 MODULE (69 ERROR CODE)
217 005222  000000  0                       ;NOT USED
218 005224  004200  BIT7!BIT11              ;A8, A12 MODULES (6A ERROR CODE)
219 005226  000004  BIT2                    ;MASSBUS CABLE
220 005230  000000  0                       ;NOT USED (6B ERROR CODE)
221 005232  000000  0                       ;NOT USED
222 005234  000160  BIT4!BIT5!BIT6          ;A5, A6, A7 MODULES (6C ERROR CODE)
223 005236  000000  0                       ;NO CALLOUT
224 005240  000160  BIT4!BIT5!BIT6          ;A5, A6, A7 MODULE (6D ERROR CODE)
225 005242  000000  0                       ;NO CALLOUT
226 005244  000060  BIT4!BIT5               ;A5, A6 MODULE (6E ERROR CODE)
227 005246  000000  0                       ;NO CALLOUT
228 005250  000060  BIT4!BIT5               ;A5, A6 MODULE (6F ERROR CODE)
```

MODULE CALLOUT TABLE

```
229 005252  000000  0                          ;NO CALLOUT
230 005254  000130  BIT3!BIT4!BIT6             ;A4, A5, A7 MODULES (70 ERROR CODE)
231 005256  000000  0                          ;NO CALLOUT
232 005260  000010  BIT3                       ;A4 MODULE (71 ERROR CODE)
233 005262  000000  0                          ;NO CALLOUT
234 005264  000012  BIT1!BIT3                  ;A2,A4 MODULE (72 ERROR CODE)
235 005266  000000  0                          ;NO CALLOUT
236 005270  000012  BIT1!BIT3                  ;A2,A4 MODULE (73 ERROR CODE)
237 005272  000000  0                          ;NO CALLOUT
238 005274  000020  BIT4                       ;A5 MODULE (74 ERROR CODE)
239 005276  000000  0                          ;NO CALLOUT
240 005300  000020  BIT4                       ;A5 MODULE (75 ERROR CODE)
241 005302  000000  0                          ;NO CALLOUT
242 005304  000020  BIT4                       ;A5 MODULE (76 ERROR CODE)
243 005306  000000  0                          ;NO CALLOUT
244 005310  000020  BIT4                       ;A5 MODULE (77 ERROR CODE)
245 005312  000000  0                          ;NO CALLOUT
246 005314  000020  BIT4                       ;A5 MODULE (78 ERROR CODE)
247 005316  000000  0                          ;NO CALLOUT
248 005320  000020  BIT4                       ;A5 MODULE (79 ERROR CODE)
249 005322  000000  0                          ;NO CALLOUT
250 005324  000020  BIT4                       ;A5 MODULE (7A ERROR CODE)
251 005326  000000  0                          ;NO CALLOUT
252 005330  000020  BIT4                       ;A5 MODULE (7B ERROR CODE)
253 005332  000000  0                          ;NO CALLOUT
254 005334  000020  BIT4                       ;A5 MODULE (7C ERROR CODE)
255 005336  000000  0                          ;NO CALLOUT
256 005340  000020  BIT4                       ;A5 MODULE (7D ERROR CODE)
257 005342  000000  0                          ;NO CALLOUT
258 005344  165700  BIT6!BIT7!BIT8!BIT9!BIT11!BIT13!BIT14!BIT15;A7, A8, A9, A10, A12, A14, A15, A16 (7E
259 005346  000201  BIT0!BIT7                  ;A17,HDA CALLOUT (7E ERROR CODE)
260 005350  016200  BIT7!BIT10!BIT11!BIT12     ;A8, A11, A12, A13 (7F ERROR CODE)
261 005352  000000  0                          ;NO CALLOUT
262 005354  000100  BIT6                       ;A7 MODULE (80 ERROR CODE)
263 005356  001000  BIT9                       ;PHASE DETECTOR
264 005360  001600  BIT7!BIT8!BIT9             ;A8, A9, A10 MODULE (81 ERROR CODE)
265 005362  000000  0                          ;NO CALLOUT
266 005364  001400  BIT8!BIT9                  ;A9, A10 MODULES (82 ERROR CODE)
267 005366  000000  0                          ;NO CALLOUT
268 005370  001700  BIT6!BIT7!BIT8!BIT9        ;A7, A8, A9, A10 MODULES (83 ERROR CODE)
269 005372  000000  0                          ;NO CALLOUT
270 005374  025600  BIT7!BIT8!BIT9!BIT11!BIT13;A8, A9, A10, A12, A14 MODULES (84 ERROR CODE)
271 005376  000000  0                          ;NO CALLOUT
272 005400  001400  BIT8!BIT9                  ;A9, A10 MODULES (85 ERROR CODE)
273 005402  000000  0                          ;NO CALLOUT
274 005404  001400  BIT8!BIT9                  ;A9, A10 MODULES (86 ERROR CODE)
275 005406  000000  0                          ;NO CALLOUT
276 005410  000600  BIT7!BIT8                  ;A8, A9 MODULES (87 ERROR CODE)
277 005412  000000  0                          ;NO CALLOUT
278 005414  000000  0                          ;NO CALLOUT (88 ERROR CODE)
279 005416  000000  0                          ;NO CALLOUT
280 005420  000200  BIT7                       ;A8 MODULE (89 ERROR CODE)
281 005422  000000  0                          ;NOT USED
282 005424  000240  BIT5!BIT7                  ;A6, A8 MODULE (8A ERROR CODE)
283 005426  000000  0                          ;NO CALLOUT
284 005430  000020  BIT4                       ;A5 MODULE (8B ERROR CODE)
285 005432  000000  0                          ;NO CALLOUT
```

MODULE CALLOUT TABLE

```
286 005434  000020    BIT4                    ;A5 MODULE (8C ERROR CODE)
287 005436  000000    0                       ;NO CALLOUT
288 005440  000020    BIT4                    ;A5 MODULE (8D ERROR CODE)
289 005442  000000    0                       ;NO CALLOUT
290 005444  165200    BIT7!BIT9!BIT11!BIT13!BIT14!BIT15;A8, A10, A12, A14, A15, A16 MODULE (8E ERROR CODE)
291 005446  000200    BIT7                    ;HDA
292 005450  001400    BIT8!BIT9               ;A9, A10 MODULES (8F ERROR CODE)
293 005452  000000    0                       ;NO CALLOUT
294 005454  004000    BIT11                   ;A12 MODULE (90 ERROR CODE)
295 005456  000000    0                       ;NO CALLOUT
296 005460  004200    BIT7!BIT11              ;A8, A12 MODULES (91 ERROR CODE)
297 005462  000000    0                       ;NO CALLOUT
298 005464  004000    BIT11                   ;A12 MODULE (92 ERROR CODE)
299 005466  000000    0                       ;NO CALLOUT
300 005470  004200    BIT7!BIT11              ;A8, A12 MODULES (93 ERROR CODE)
301 005472  000000    0                       ;NO CALLOUT
302 005474  004000    BIT11                   ;A12 MODULE (94 ERROR CODE)
303 005476  000000    0                       ;NO CALLOUT
304 005500  004300    BIT6!BIT7!BIT11         ;A7, A8, A12 MODULES (95 ERROR CODE)
305 005502  000000    0                       ;NO CALLOUT
306 005504  004000    BIT11                   ;A12 MODULE (96 ERROR CODE)
307 005506  000000    0                       ;NO CALLOUT
308 005510  004000    BIT11                   ;A12 MODULE (97 ERROR CODE)
309 005512  000000    0                       ;NO CALLOUT
310 005514  004200    BIT7!BIT11              ;A8, A12 MODULES (98 ERROR CODE)
311 005516  000000    0                       ;NO CALLOUT
312 005520  004200    BIT7!BIT11              ;A8, A12 MODULES (99 ERROR CODE)
313 005522  000000    0                       ;NO CALLOUT
314 005524  004200    BIT7!BIT11              ;A8, A12 MODULES (9A ERROR CODE)
315 005526  000000    0                       ;NO CALLOUT
316 005530  004200    BIT7!BIT11              ;A8, A12 MODULES (9B ERROR CODE)
317 005532  000000    0                       ;NO CALLOUT
318 005534  004200    BIT7!BIT11              ;A8, A12 MODULES (9C ERROR CODE)
319 005536  000000    0                       ;NO CALLOUT
320 005540  004000    BIT11                   ;A12 MODULE (9D ERROR CODE)
321 005542  000000    0                       ;NO CALLOUT
322 005544  004000    BIT11                   ;A12 MODULE (9E ERROR CODE)
323 005546  000000    0                       ;NO CALLOUT
324 005550  004000    BIT11                   ;A12 MODULE (9F ERROR CODE)
325 005552  000000    0                       ;NO CALLOUT
326 005554  004000    BIT11                   ;A12 MODULE (A0 ERROR CODE)
327 005556  000000    0                       ;NO CALLOUT
328 005560  004000    BIT11                   ;A12 MODULE (A1 ERROR CODE)
329 005562  000000    0                       ;NO CALLOUT
330 005564  004000    BIT11                   ;A12 MODULE (A2 ERROR CODE)
331 005566  000000    0                       ;NO CALLOUT
332 005570  004000    BIT11                   ;A12 MODULE (A3 ERROR CODE)
333 005572  000000    0                       ;NO CALLOUT
334 005574  004000    BIT11                   ;A12 MODULE (A4 ERROR CODE)
335 005576  000000    0                       ;NO CALLOUT
336 005600  004200    BIT7!BIT11              ;A8, A12 MODULES (A5 ERROR CODE)
337 005602  000000    0                       ;NO CALLOUT
338 005604  004200    BIT7!BIT11              ;A8, A12 MODULES (A6 ERROR CODE)
339 005606  000000    0                       ;NO CALLOUT
340 005610  004000    BIT11                   ;A12 MODULE (A7 ERROR CODE)
341 005612  000000    0                       ;NO CALLOUT
342 005614  004000    BIT11                   ;A12 MODULE (A8 ERROR CODE)
```

MODULE CALLOUT TABLE

```
343 005616  000000                0                       ;NO CALLOUT
344 005620  004000                BIT11                   ;A12 MODULE (A9 ERROR CODE)
345 005622  000000                0                       ;NO CALLOUT
346 005624  004000                BIT11                   ;A12 MODULE (AA ERROR CODE)
347 005626  000000                0                       ;NO CALLOUT
348 005630  004000                BIT11                   ;A12 MODULE (AB ERROR CODE)
349 005632  000000                0                       ;NO CALLOUT
350 005634  004000                BIT11                   ;A12 MODULE (AC ERROR CODE)
351 005636  000000                0                       ;NO CALLOUT
352 005640  004000                BIT11                   ;A12 MODULE (AD ERROR CODE)
353 005642  000000                0                       ;NO CALLOUT
354 005644  004000                BIT11                   ;A12 MODULE (AE ERROR CODE)
355 005646  000000                0                       ;NO CALLOUT
356 005650  004000                BIT11                   ;A12 MODULE (AF ERROR CODE)
357 005652  000000                0                       ;NO CALLOUT
358 005654  004000                BIT11                   ;A12 MODULE (B0 ERROR CODE)
359 005656  000000                0                       ;NO CALLOUT
360 005660  004000                BIT11                   ;A12 MODULE (B1 ERROR CODE)
361 005662  000000                0                       ;NO CALLOUT
362 005664  004000                BIT11                   ;A12 MODULE (B2 ERROR CODE)
363 005666  000000                0                       ;NO CALLOUT
364 005670  004000                BIT11                   ;A12 MODULE (B3 ERROR CODE)
365 005672  000000                0                       ;NO CALLOUT
366 005674  004000                BIT11                   ;A12 MODULE (B4 ERROR CODE)
367 005676  000000                0                       ;NO CALLOUT
368 005700  004000                BIT11                   ;A12 MODULE (B5 ERROR CODE)
369 005702  000000                0                       ;NO CALLOUT
370 005704  004000                BIT11                   ;A12 MODULE (B6 ERROR CODE)
371 005706  000000                0                       ;NO CALLOUT
372 005710  004000                BIT11                   ;A12 MODULE (B7 ERROR CODE)
373 005712  000000                0                       ;NO CALLOUT
374 005714  004000                BIT11                   ;A12 MODULE (B8 ERROR CODE)
375 005716  000000                0                       ;NO CALLOUT
376 005720  004300                BIT6!BIT7!BIT11         ;A7, A8, A12 MODULE (B9 ERROR CODE)
377 005722  000000                0                       ;NO CALLOUT
378 005724  004200                BIT7!BIT11              ;A8, A12 MODULES (BA ERROR CODE)
379 005726  000000                0                       ;NO CALLOUT
380 005730  000000                0                       ;NO CALLOUT (BB ERROR CODE)
381 005732  000000                0                       ;NO CALLOUT
382 005734  000000                0                       ;NO CALLOUT (BC ERROR CODE)
383 005736  000000                0                       ;NO CALLOUT
384 005740  000000                0                       ;NO CALLOUT (BD ERROR CODE)
385 005742  000000                0                       ;NO CALLOUT
386 005744  004000                BIT11                   ;A12 MODULE (BE ERROR CODE)
387 005746  000000                0                       ;NO CALLOUT
388 005750  004000                BIT11                   ;A12 MODULE (BF ERROR CODE)
389 005752  000000                0                       ;NO CALLOUT
390 005754  000020                BIT4                    ;A5 MODULE (C0 ERROR CODE)
391 005756  000000                0                       ;NO CALLOUT
392 005760  000020                BIT4                    ;A5 MODULE (C1 ERROR CODE)
393 005762  000000                0                       ;NO CALLOUT
394 005764  000030                BIT3!BIT4               ;A4, A5 MODULES (C2 ERROR CODE)
395 005766  000000                0                       ;NO CALLOUT
396 005770  000020                BIT4                    ;A5 MODULE (C3 ERROR CODE)
397 005772  000000                0                       ;NO CALLOUT
398 005774  000020                BIT4                    ;A5 MODULE (C4 ERROR CODE)
399 005776  000000                0                       ;NO CALLOUT
```

MODULE CALLOUT TABLE

```
400 006000  000060          BIT4!BIT5               ;A5, A6 MODULES (C5 ERROR CODE)
401 006002  000000          0                       ;NO CALLOUT
402 006004  000020          BIT4                    ;A5 MODULE (C6 ERROR CODE)
403 006006  000000          0                       ;NO CALLOUT
404 006010  000000          0                       ;NOT USED (C7 ERROR CODE)
405 006012  000000          0                       ;NOT USED
406 006014  000000          0                       ;NOT USED (C8 ERROR CODE)
407 006016  000000          0                       ;NOT USED
408 006020  000000          0                       ;NOT USED (C9 ERROR CODE)
409 006022  000000          0                       ;NOT USED
410 006024  000000          0                       ;NOT USED (CA ERROR CODE)
411 006026  000000          0                       ;NOT USED
412 006030  000000          0                       ;NOT USED (CB ERROR CODE)
413 006032  000000          0                       ;NOT USED
414 006034  000000          0                       ;NOT USED (CC ERROR CODE)
415 006036  000000          0                       ;NOT USED
416 006040  000000          0                       ;NOT USED (CD ERROR CODE)
417 006042  000000          0                       ;NOT USED
418 006044  000000          0                       ;NOT USED (CE ERROR CODE)
419 006046  000000          0                       ;NOT USED
420 006050  000000          0                       ;NOT USED (CF ERROR CODE)
421 006052  000000          0                       ;NOT USED
422 006054  001400          BIT8!BIT9               ;A9, A10 MODULE (D0 ERROR CODE)
423 006056  000000          0                       ;NO CALLOUT
424 006060  021400          BIT8!BIT9!BIT13         ;A9, A10, A14 MODULES (D1 ERROR CODE)
425 006062  000000          0                       ;NO CALLOUT
426 006064  001000          BIT9                    ;A10 MODULE (D2 ERROR CODE)
427 006066  000000          0                       ;NO CALLOUT
428 006070  005400          BIT8!BIT9!BIT11         ;A9, A10, A12 MODULES (D3 ERROR CODE)
429 006072  000000          0                       ;NO CALLOUT
430 006074  021000          BIT9!BIT13              ;A10, A14 MODULES (D4 ERROR CODE)
431 006076  000000          0                       ;NO CALLOUT
432 006100  025400          BIT8!BIT9!BIT11!BIT13   ;A9, A10, A12, A14 MODULES (D5 ERROR CODE)
433 006102  000000          0                       ;NO CALLOUT
434 006104  061000          BIT9!BIT13!BIT14        ;A10, A14, A15 MODULES (D6 ERROR CODE)
435 006106  000001          BIT0                    ;A17 MODULE
436 006110  000000          0                       ;NOT USED (D7 ERROR CODE)
437 006112  000000          0                       ;NOT USED
438 006114  001000          BIT9                    ;A10 MODULE (D8 ERROR CODE)
439 006116  000000          0                       ;NO CALLOUT
440 006120  000000          0                       ;NOT USED (D9 ERROR CODE)
441 006122  000000          0                       ;NOT USED
442 006124  004400          BIT8!BIT11              ;A9, A12 MODULE (DA ERROR CODE)
443 006126  000000          0                       ;NO CALLOUT
444 006130  000000          0                       ;NOT USED (DB ERROR CODE)
445 006132  000000          0                       ;NOT USED
446 006134  060000          BIT13!BIT14             ;A14, A15 MODULES (DC ERROR CODE)
447 006136  000000          0                       ;NO CALLOUT
448 006140  061000          BIT9!BIT13!BIT14        ;A10, A14, A15 MODULES (DD ERROR CODE)
449 006142  000000          0                       ;NO CALLOUT
450 006144  020000          BIT13                   ;A14 MODULE (DE ERROR CODE)
451 006146  000000          0                       ;NO CALLOUT
452 006150  020000          BIT13                   ;A14 MODULE (DF ERROR CODE)
453 006152  000000          0                       ;NO CALLOUT
454 006154  020000          BIT13                   ;A14 MODULE (E0 ERROR CODE)
455 006156  000000          0                       ;NO CALLOUT
456 006160  020000          BIT13                   ;A14 MODULE (E1 ERROR CODE)
```

MODULE CALLOUT TABLE

```
457 006162  000000    0                       ;NOT USED
458 006164  020000    BIT13                   ;A14 MODULE (E2 ERROR CODE)
459 006166  000000    0                       ;NO CALLOUT
460 006170  020000    BIT13                   ;A14 MODULE (E3 ERROR CODE)
461 006172  000000    0                       ;NO CALLOUT
462 006174  020000    BIT13                   ;A14 MODULE (E4 ERROR CODE)
463 006176  000000    0                       ;NO CALLOUT
464 006200  000000    0                       ;NOT USED (E5 ERROR CODE)
465 006202  000000    0                       ;NOT USED
466 006204  160000    BIT13!BIT14!BIT15       ;A14, A15, A16 MODULE (E6 ERROR CODE)
467 006206  000000    0                       ;OPEN
468 006210  040000    BIT14                   ;A15 MODULE (E7 ERROR CODE)
469 006212  000000    0                       ;OPEN
470 006214  141000    BIT9!BIT14!BIT15        ;A10, A14, A15 MODULES (E8 ERROR CODE)
471 006216  000000    0                       ;NO CALLOUT
472 006220  001000    BIT9                    ;A10 MODULE (E9 ERROR CODE)
473 006222  000000    0                       ;NO CALLOUT
474 006224  000600    BIT7!BIT8               ;A8, A9 MODULES (EA ERROR CODE)
475 006226  000000    0                       ;NO CALLOUT
476 006230  000000    0                       ;NO CALLOUT (EB ERROR CODE)
477 006232  000000    0                       ;NO CALLOUT
478 006234  000000    0                       ;NO CALLOUT (EC ERROR CODE)
479 006236  000000    0                       ;NO CALLOUT
480 006240  000100    BIT6                    ;A7 MODULE (ED ERROR CODE)
481 006242  000000    0                       ;NO CALLOUT
482 006244  000000    0                       ;NO CALLOUT (EE ERROR CODE)
483 006246  000000    0                       ;NO CALLOUT
484 006250  000000    0                       ;NO CALLOUT (EF ERROR CODE)
485 006252  000000    0                       ;NO CALLOUT
486 006254  100000    BIT15                   ;A16 MODULE (F0 ERROR CODE)
487 006256  000000    0                       ;NO CALLOUT
488 006260  100200    BIT7!BIT15              ;A8, A16 MODULE (F1 ERROR CODE)
489 006262  000201    BIT0!BIT7               ;A17, HDA CALLOUT
490 006264  100000    BIT15                   ;A16 MODULE (F2 ERROR CODE)
491 006266  000200    BIT7                    ;HDA CALLOUT
492 006270  100000    BIT15                   ;A16 MODULE (F3 ERROR CODE)
493 006272  000200    BIT7                    ;HDA CAL OUT
494 006274  100000    BIT15                   ;A16 MODULE (F4 ERROR CODE)
495 006276  000200    BIT7                    ;HDA CALLOUT
496 006300  100000    BIT15                   ;A16 MODULE (F5 ERROR CODE)
497 006302  000000    0                       ;NOT USED
498 006304  141000    BIT9!BIT14!BIT15        ;A10, A15, A16 MODULE (F6 ERROR CODE)
499 006306  000201    BIT0!BIT7               ;A17, HDA CALLOUT
500 006310  100000    BIT15                   ;A16 MODULE (F7 ERROR CODE)
501 006312  000201    BIT0!BIT7               ;A17, HDA CALLOUT
502 006314  100000    BIT15                   ;A16 MODULE (F8 ERROR CODE)
503 006316  000000    0                       ;NO CALLOUT
504 006320  100000    BIT15                   ;A16 MODULE (F9 ERROR CODE)
505 006322  000000    0                       ;NO CALLOUT
506 006324  000000    0                       ;NOT USED (FA ERROR CODE)
507 006326  000000    0                       ;NOT USED
508 006330  000000    0                       ;NOT USED (FB ERROR CODE)
509 006332  000000    0                       ;NOT USED
510 006334  000000    0                       ;NOT USED (FC ERROR CODE)
511 006336  000000    0                       ;NOT USED
512 006340  000000    0                       ;NOT USED (FD ERROR CODE)
513 006342  000000    0                       ;NOT USED
```

MODULE CALLOUT TABLE

```
514 006344  000000                    0                    ;NOT USED (FE ERROR CODE)
515 006346  000000                    0                    ;NOT USED
516 006350  000000                    0                    ;NOT USED (FF ERROR CODE)
517 006352  000000                    0                    ;NOT USED
518
```

```
                        .SBTTL  GLOBAL TEXT SECTION

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

                        ; NAMES OF DEVICES SUPPORTED BY PROGRAM
                        ;
006354                  L$DVTYP::
006354  122  120  060           .ASCIZ  /RP07/
                                .EVEN

                        ; TEST DESCRIPTION
                        ;
006362                  L$DESC::
006362  122  120  060           .ASCIZ  /RP07 FRONT END-HOST ISOLATOR/
                                .EVEN

                        ; FORMAT STATEMENTS USED IN PRINT CALLS
                        ;
006420  045  116  000   CRLF::  .ASCIZ  /%N/
006423  045  116  045   DSNMSG:: .ASCIZ /%N%ADRIVE %O1%A, PG/
006447  045  124  000   SNDIGT:: .ASCIZ /%T/
006452  045  101  124   MSGMOL:: .ASCIZ /%ATEST %D2%A. BYPASSED, DRIVE OFFLINE%N/
006522  045  101  124   MSGWLO:: .ASCIZ /%ATEST %D2%A. BYPASSED, DRIVE WRITE LOCKED%N/
006577  045  116  045   MESG10::.ASCIZ  /%N%ADRIVE %O1%A, WAITING FOR 'MOL' TO SET (DRIVE OFFLINE)/
006671  045  116  045   MESG11::.ASCIZ  /%N%ADRIVE %O1%A, WAITING FOR 'DRY' TO SET (DRV NOT READY)/
006763  045  116  045   MESG12::.ASCIZ  /%N%ATO REFORMAT FE CYLINDER, TRACK #0 UPON PROGRAM COMPLETION./
007062  045  116  045   MESG15::.ASCIZ  /%N%AREFORMATTING FE CYLINDER, TRACK #0. USE THE FORMAT PROGRAM/

007161  045  101  122   FRMT00::.ASCIZ  /%AREGISTER UNDER TEST: %O6/
007214  045  116  045   FRMT01::.ASCIZ  /%N%AEXPECTED DATA: %O6%A    RECEIVED DATA: %O6/
007273  045  101  106   FLST00::.ASCIZ  /%AFAULT LIST: /
007312  045  124  000   FLST01::.ASCIZ  /%T/
007315  045  101  052   FRMT02::.ASCIZ  /%A** THERE IS ALSO A POSSIBILITY OF A HDA FAILURE **%N/
007404  045  116  045   FRMT03::.ASCIZ  /%N%ADRIVE %O1%A, /
007426  045  101  115   FRMT04::.ASCIZ  /%AMICRO-CODE TEST #: %T%T%T%T%A (HEX)/
007474  045  101  040   FRMT05::.ASCIZ  /%A        ERROR CODE: %T%T%T%T%A (HEX)%N/
007545  045  101  106   FRMT06::.ASCIZ  /%AFAILING FUNCTION: %T/
007574  045  116  045   FRMT07::.ASCIZ  /%N%ASEEKS TOO LONG: %D3/

007624  045  116  045   FRMT10::.ASCIZ  /%N%ASEEK OVERSHOOTS: %D3/
007655  045  116  045   FRMT11::.ASCIZ  /%N%ASOFT SEEK OVERSHOOTS: %D3/
007717  045  116  045   FRMT12::.ASCIZ  /%N%AGUARD-BAND DETECTED SKI'S  %D3/
007756  045  116  045   FRMT13::.ASCIZ  /%N%AINDEX ERRORS: %D3/
010004  045  116  045   FRMT14::.ASCIZ  /%N%APLO UNSAFES: %D3/
010031  045  116  045   FRMT15::.ASCIZ  /%N%AFAILED RECAL ATTEMPTS: %D3/
010070  045  116  045   FRMT16::.ASCIZ  /%N%A(HEX) ERROR LOG ENTRIES, IF PRESENT, ARE AS FOLLOWS:/
010161  045  124  045   FRMT17::.ASCIZ  /%T%T%T%T%A      /

010202  045  116  045   FRMT20::.ASCIZ  /%N%A8080 REV. LEVEL IS: %D3%N%A2901 REV. LEVEL IS: %D3/
010271  045  116  045   FRMT23::.ASCIZ  /%N%AROUTINE NO. (2 CHAR "HEX" INPUT) /
```

```
     74
     75 010337      045      116      045  FRMT40::.ASCIZ  /%N%ADRIVE   RPCS1   RPWC    RPBA    RPDA    RPCS2   RPDS/
     76 010430      045      116      045  FRMT41::.ASCIZ  /%N%O6%A  %O6%A  %O6%A  %O6%A  %O6%A  %O6%A  %O6/
     77
     78 010510      045      116      045  FRMT50::.ASCIZ  /%N%ARPER1   RPAS    RPLA    RPDB    RPMR1   RPDT    RPSN/
     79 010601      045      116      045  FRMT51::.ASCIZ  /%N%O6%A  %O6%A  %O6%A  %O6%A  %O6%A  %O6%A  %O6/
     80
     81 010661      045      116      045  FRMT60::.ASCIZ  /%N%ARPOF    RPDC    RPCC    RPER2   RPER3   RPEC1   RPEC2/
     82 010753      045      116      045  FRMT61::.ASCIZ  /%N%O6%A  %O6%A  %O6%A  %O6%A  %O6%A  %O6%A  %O6%N/
     83
     84 011035      045      101      122  FRMT70::.ASCIZ  /%ARPBAE   RPCS3/
     85 011055      045      116      045  FRMT71::.ASCIZ  /%N%O6%A  %O6%N/
     86
     97
```

```
                                        .SBTTL  GLOBAL ASCII MESSAGE SECTION

011074  104  125  101  AD::     .ASCIZ  /DUAL DRIVE RESPONSE /
011121  101  061  062  DS::     .ASCIZ  /A12-S01 /              ;MASSBUS DISABLE SWITCH
011132  122  110  040  RH::     .ASCIZ  /RH CONTROLLER /
011151  103  101  102  CA::     .ASCIZ  /CABLES /
011161  101  060  061  J1::     .ASCIZ  /A01 /
011166  101  060  062  J2::     .ASCIZ  /A02 /
011173  101  060  063  J3::     .ASCIZ  /A03 /
011200  101  060  064  J4::     .ASCIZ  /A04 /
011205  101  060  065  J5::     .ASCIZ  /A05 /
011212  101  060  066  J6::     .ASCIZ  /A06 /
011217  101  060  067  J7::     .ASCIZ  /A07 /
011224  101  060  070  J8::     .ASCIZ  /A08 /
011231  101  060  071  J9::     .ASCIZ  /A09 /
011236  101  061  060  J10::    .ASCIZ  /A10 /
011243  101  061  061  J11::    .ASCIZ  /A11 /
011250  101  061  062  J12::    .ASCIZ  /A12 /
011255  101  061  063  J13::    .ASCIZ  /A13 /
011262  101  061  064  J14::    .ASCIZ  /A14 /
011267  101  061  065  J15::    .ASCIZ  /A15 /
011274  101  061  066  J16::    .ASCIZ  /A16 /
011301  101  061  067  J17::    .ASCIZ  /A17 /
011306  101  062  060  J20::    .ASCIZ  /A20 /
011313  101  062  061  J21::    .ASCIZ  /A21 /

011320  110  104  101  HDA::    .ASCIZ  /HDA /
011325  124  105  122  TERM::   .ASCIZ  /TERMINATOR /
011341  063  040  120  SENSOR:: .ASCIZ /3 PHASE SENSOR /
011361  102  114  117  BLOWER:: .ASCIZ /BLOWER ASSY /
011376  120  117  127  PTRANS:: .ASCIZ /POWER TRANSFORMER /
011421  115  117  124  MTRBRK:: .ASCIZ /MOTOR-BRAKE ASSY /
011443  122  105  114  K1RELA:: .ASCIZ /RELAY-K1 /
011455  117  120  105  OPRPNL:: .ASCIZ /OPERATOR'S PANEL /
011477  115  117  124  DRVBLT:: .ASCIZ /MOTOR BELT, MOTOR SPRING /

011531  122  105  101  READTD:: .ASCIZ /READ TD'S/
011543  127  122  124  WTCKHD:: .ASCIZ /WRT CHK HDR & DATA/
011566  127  122  111  WTCKD::  .ASCIZ  /WRITE CHECK DATA/

011607  120  114  101  MESG13::.ASCIZ  /PLACE INTERFACE SWITCH A12-S01 IN DOWN POSITION/
011667  120  114  101  MESG14::.ASCIZ  /PLACE INTERFACE SWITCH A12-S01 IN  UP  POSITION/

011747  103  117  115  EM1::    .ASCIZ  /COMPOSITE ERROR SET WHEN NOT EXPECTED/
012015  104  122  111  EM2::    .ASCIZ  /DRIVE HUNG, DRY NOT SET IN TIME/
012055  104  122  111  EM3::    .ASCIZ  /DRIVE WRITE LOCKED/
012100  104  122  111  EM4::    .ASCIZ  /DRIVE OFFLINE/
012116  122  120  103  EM5::    .ASCIZ  /RPCS2:OR FAILED TO SET IN TIME/
012155  122  120  103  EM6::    .ASCIZ  /RPCS2:OR FAILED  TO CLEAR IN TIME/
012217  104  122  111  EM7::    .ASCIZ  /DRIVE SHOULD BE WRITE ENABLED AND ON LINE!/

012272  122  110  040  EM11::   .ASCIZ  /RH CONTROLLER DIDN'T RESPOND (NO SSYNC)/
012342  102  111  124  EM12::   .ASCIZ  /BIT(S) UNDER TEST DIDN'T CHANGE STATE/
012410  122  120  103  EM13::   .ASCIZ  /RPCS2: CLR DIDN'T FUNCTION PROPERLY/
012454  122  105  107  EM14::   .ASCIZ  /REG CONTENTS DON'T MATCH EXPECTED DATA/
012523  122  105  107  EM15::   .ASCIZ  /REG DIDN'T CLEAR WHEN EXPECTED/
012562  123  103  040  EM16::   .ASCIZ  /SC OR TRE SET WHEN NOT EXPECTED/
```

```
                                EM17::  .ASCIZ  /RPCS2:IR FAILED TO SET IN TIME/
                                
                                EM20::  .ASCIZ  /RPCS1:MCPE DIDN'T SET WHEN EXPECTED/
                                EM21::  .ASCIZ  /RPCS1:SC OR TRE DIDN'T SET WHEN EXPECTED/
                                EM22::  .ASCIZ  /BIT(S) UNDER TEST DIDN'T SET WHEN EXPECTED/
                                EM23::  .ASCIZ  /BIT(S) UNDER TEST DIDN'T CLEAR WHEN EXPECTED/
                                EM24::  .ASCIZ  /RH INTERRUPTED AT WRONG PRIORITY/
                                EM25::  .ASCIZ  /RH GENERATED FALSE INTERRUPT/
                                EM26::  .ASCIZ  /RH DIDN'T INTERRUPT WHEN EXPECTED/
                                EM27::  .ASCIZ  /DRIVE NOT PRESENT, TEST INVALID/
                                
                                EM30::  .ASCIZ  /COMMAND EXECUTION INCORRECT/
                                EM31::  .ASCIZ  /DATA LINE(S) STUCK LOW/
                                EM32::  .ASCIZ  /FAILED TO SEEK PROPERLY/
                                EM33::  .ASCIZ  /DETECTED ERROR DURING DATA TRANSFER/
                                EM34::  .ASCIZ  /FAILED TO CORRECTLY DETECT A WRITE CHECK ERROR/
                                EM35::  .ASCIZ  /FAILED AN RP07 INTERNAL MICRODIAGNOSTIC TEST/
                                EM36::  .ASCIZ  /RHXX REGISTER SELECTION FAILURE/
                                EM37::  .ASCIZ  /DATA RECEIVED DOESN'T MATCH EXPECTED DATA/
                                
                                EM40::  .ASCIZ  /DETECTED ERROR DURING WRITE DATA OPERATION/
                                EM41::  .ASCIZ  /DETECTED ERROR DURING FORMAT OPERATION/
                                EM42::  .ASCIZ  /DETECTED A PERMANENT ERROR/
                                EM43::  .ASCIZ  /INTERNAL RP07 DIAGNOSTIC TIME-OUT/
                                
                                        .EVEN
                                
                                .SBTTL  GLOBAL ERROR REPORT SECTION
                                
                                ;++
                                ; THE GLOBAL ERROR REPORT SECTION CONTAINS THE PRINTB AND PRINTX CALLS
                                ; THAT ARE USED IN MORE THAN ONE TEST.  IT ALSO INCLUDES THE ASCII MESSAGES
                                ; THAT ARE USED BY THE PRINTB AND PRINTX CALLS..
                                ;--
                                
014172                          ERR0::
014172  004737  017326                  JSR     PC,SAVRPR       ;GET THE REGISTER SNAPSHOT NOW
014176  004737  020532                  JSR     PC,DECODE       ;DECODE THE BIT MASK FOR THE ERROR!
014202  013746  002456                  MOV     TESTRG,-(SP)
014206  012746  007161                  MOV     #FRMT00,-(SP)
014212  012746  000002                  MOV     #2,-(SP)
014216  010600                          MOV     SP,R0
014220  104414                          TRAP    C$PNTB
014222  062706  000006                  ADD     #6,SP
014226  013746  002452                  MOV     RCVED,-(SP)
014232  013746  002454                  MOV     EXPTED,-(SP)
014236  012746  007214                  MOV     #FRMT01,-(SP)
014242  012746  000003                  MOV     #3,-(SP)
014246  010600                          MOV     SP,R0
014250  104414                          TRAP    C$PNTB
014252  062706  000010                  ADD     #10,SP
014256  004737  016212                  JSR     PC,DMPREG       ;DO THE REGISTER DUMP NOW
014262  004737  016556                  JSR     PC,FAULTS       ;REPORT THE FAULT LIST
                                                                ;CR-LF
014266  012746  006420                  MOV     #CRLF,-(SP)
014272  012746  000001                  MOV     #1,-(SP)
014276  010600                          MOV     SP,R0
```

```
        014300  104414                          TRAP    C$PNTB
        014302  062706  000004                  ADD     #4,SP
    105 014306                          L10002:
        014306  104423                          TRAP    C$MSG
    106
    107 014310                          ERR1::
    108 014310  004737  017326                  JSR     PC,SAVRPR       ;GET THE REGISTER SNAPSHOT NOW
    109 014314  010446                          MOV     R4,-(SP)        ;PUT THE ROUTINE NUMBER ON THE STACK
    110 014316  004737  015416                  JSR     PC,OCTHEX       ;AND CONVERT TO HEX
    111
    112 014322  012746  002660                  MOV     #PSTACK+6,-(SP)
        014326  012746  002656                  MOV     #PSTACK+4,-(SP)
        014332  012746  002654                  MOV     #PSTACK+2,-(SP)
        014336  012746  002652                  MOV     #PSTACK,-(SP)
        014342  012746  007426                  MOV     #FRMT04,-(SP)
        014346  012746  000005                  MOV     #5,-(SP)
        014352  010600                          MOV     SP,R0
        014354  104414                          TRAP    C$PNTB
        014356  062706  000014                  ADD     #14,SP
    113 014362  017746  166164                  MOV     @RPER2,-(SP)    ;GET THE CONTENTS OF RPER2 ON THE STACK
    114 014366  042716  177400                  BIC     #177400,(SP)    ;AND ELIMINATE THE HIGH ORDER BITS
    115 014372  004737  015416                  JSR     PC,OCTHEX       ;NOW CONVERT TO HEX
    116
    117 014376  012746  002660                  MOV     #PSTACK+6,-(SP)
        014402  012746  002656                  MOV     #PSTACK+4,-(SP)
        014406  012746  002654                  MOV     #PSTACK+2,-(SP)
        014412  012746  002652                  MOV     #PSTACK,-(SP)
        014416  012746  007474                  MOV     #FRMT05,-(SP)
        014422  012746  000005                  MOV     #5,-(SP)
        014426  010600                          MOV     SP,R0
        014430  104414                          TRAP    C$PNTB
        014432  062706  000014                  ADD     #14,SP
    118 014436  004737  016212                  JSR     PC,DMPREG       ;DUMP THE REGISTERS NOW
    119 014442  004737  016132                  JSR     PC,CALMOD       ;REPORT THE MODULE LIST
    120 014446  004737  020532                  JSR     PC,DECODE       ;DECODE THE MASK BITS FOR A MODULE CALLOUT
    121 014452  004737  016556                  JSR     PC,FAULTS       ;AND REPORT THE FIND
    122                                                                 ;CR-LF
    123 014456  012746  006420                  MOV     #CRLF,-(SP)
        014462  012746  000001                  MOV     #1,-(SP)
        014466  010600                          MOV     SP,R0
        014470  104414                          TRAP    C$PNTB
        014472  062706  000004                  ADD     #4,SP
    124 014476                          L10003:
        014476  104423                          TRAP    C$MSG
    125
    126 014500                          ERR2::
    127 014500  004737  020532                  JSR     PC,DECODE               ;DECODE THE MESSAGE
    128 014504  013746  002506                  MOV     DRVNO,-(SP)
        014510  012746  007404                  MOV     #FRMT03,-(SP)
        014514  012746  000002                  MOV     #2,-(SP)
        014520  010600                          MOV     SP,R0
        014522  104414                          TRAP    C$PNTB
        014524  062706  000006                  ADD     #6,SP
    129 014530  013746  002470                  MOV     FATOF,-(SP)
        014534  012746  007545                  MOV     #FRMT06,-(SP)
        014540  012746  000002                  MOV     #2,-(SP)
        014544  010600                          MOV     SP,R0
```

```
        014546  104414                          TRAP    C$PNTB
        014550  062706  000006                  ADD     #6,SP
    130 014554  013746  002452                  MOV     RCVED,-(SP)
        014560  013746  002454                  MOV     EXPTED,-(SP)
        014564  012746  007214                  MOV     #FRMT01,-(SP)
        014570  012746  000003                  MOV     #3,-(SP)
        014574  010600                          MOV     SP,R0
        014576  104414                          TRAP    C$PNTB
        014600  062706  000010                  ADD     #10,SP
    131                                                         ;CR-LF
    132 014604  012746  006420                  MOV     #CRLF,-(SP)
        014610  012746  000001                  MOV     #1,-(SP)
        014614  010600                          MOV     SP,R0
        014616  104414                          TRAP    C$PNTB
        014620  062706  000004                  ADD     #4,SP
    133 014624  004737  016556                  JSR     PC,FAULTS       ;REPORT THE FAULT LIST
    134                                                         ;CR-LF
    135 014630  012746  006420                  MOV     #CRLF,-(SP)
        014634  012746  000001                  MOV     #1,-(SP)
        014640  010600                          MOV     SP,R0
        014642  104414                          TRAP    C$PNTB
        014644  062706  000004                  ADD     #4,SP
    136 014650                          L10004:
        014650  104423                          TRAP    C$MSG
    137
    138 014652                          ERR3::
    139 014652  004737  016212                  JSR     PC,DMPREG       ;JUST DUMP THE REGISTERS
    140                                                         ;CR-LF
    141 014656  012746  006420                  MOV     #CRLF,-(SP)
        014662  012746  000001                  MOV     #1,-(SP)
        014666  010600                          MOV     SP,R0
        014670  104414                          TRAP    C$PNTB
        014672  062706  000004                  ADD     #4,SP
    142 014676                          L10005:
        014676  104423                          TRAP    C$MSG
    143
```

```
                                        .SBTTL  GLOBAL SUBROUTINES SECTION

                                        ;AUTO SIZE FOR RH70 CONTROLLER AND DETERMINE IF IT IS JUMPERED FOR 22 OR
                                        ;32 REGISTERS
                                        ;CALL
                                        ;       JSR     PC,SIZE70       ;CALL ROUTINE
                                        ;
                                        ;R5 MUST CONTAIN POINTER TO NEW RPCS1 BASE ADDRESS

014700  005037  002502          SIZE70: CLR     RHEXT           ;CLEAR RPBAE OFFSET
014704  005037  002504                  CLR     RHTYPE          ;CLEAR RHXX TYPE REGISTER (RH11)
014710  013746  000004                  MOV     ERRVEC,-(SP)    ;SAVE CONTENTS OF ERROR VECTOR
014714  012737  014764  000004          MOV     #2$,ERRVEC      ;SETUP 'TRAP' RETURN ADDRESS
014722  011500                          MOV     (R5),R0         ;GET RPCS1 ADDRESS
014724  062700  000050                  ADD     #50,R0          ;GET REGISTER OFFSET FOR RH70
014730  012702  000012                  MOV     #10.,R2         ;GET NUMBER OF REGISTERS TO CHECK
014734  005720                          TST     (R0)+           ;TRAP IF NOT A VALID RPBAE
014736  005720                          TST     (R0)+           ;TRAP IF NOT A VALID RPCS3
014740  012737  000050  002502          MOV     #50,RHEXT       ;LOAD OFFSET FOR RPBAE (22 REGISTER RH)
014746  005720                  1$:     TST     (R0)+           ;TRAP IF NOT A VALID REGISTER
014750  005302                          DEC     R2              ;DONE WITH ALL 32 REGISTERS ?
014752  001375                          BNE     1$              ;BR IF NO
014754  012737  000074  002502          MOV     #74,RHEXT       ;LOAD OFFSET FOR RPBAE (32 REGISTER RH)
014762  000403                          BR      3$
014764  012716  014772          2$:     MOV     #3$,(SP)        ;SETUP RETURN ADDRESS
014770  000002                          RTI

014772  011500                  3$:     MOV     (R5),R0         ;GET RPCS1 REGISTER
014774  013702  002502                  MOV     RHEXT,R2        ;GET RPBAE REGISTER OFFSET
015000  001415                          BEQ     4$              ;BR IF NONE
015002  060002                          ADD     R0,R2           ;GET RPBAE REGISTER
015004  052710  001400                  BIS     #A17!A16,(R0)   ;SET EXTENDED ADDRESS BITS IN RPCS1
015010  022712  000003                  CMP     #3,(R2)         ;ARE THE EXTENDED BITS SET IN RPBAE ?
015014  001007                          BNE     4$              ;BR IF NO
015016  005012                          CLR     (R2)            ;CLEAR EXTENDED ADDRESS BITS IN RPBAE
015020  011046                          MOV     (R0),-(SP)      ;SAVE RPCS1 REG CONTENTS
015022  042726  176377                  BIC     #^C<A17!A16>,(SP)+      ;ARE THE EXTEND BITS CLEAR IN RPCS1 ?
015026  001002                          BNE     4$              ;BR IF NO
015030  005237  002504                  INC     RHTYPE          ;SET RHXX TYPE REGISTER (RH70)
015034  012637  000004          4$:     MOV     (SP)+,ERRVEC    ;RESTORE CONTENTS OF ERROR VECTOR
015040  000207                          RTS     PC
```

```
                                .SBTTL  DISK DRIVER AND SUPPORT ROUTINES

                                ;;*****************************************************************************
                                ;THIS MODULE IS USED ANYTIME A DIAGNOSTIC COMMAND HAS JUST BEEN ISSUED BY
                                ;THE MODULE "DRIVER".  IT POLLS THE CORRECT ATTENTION BIT IN THE PSEUDO
                                ;REGISTER AND USES A 'WATCHDOG TIMER' TO VERIFY THAT THE BIT DOES EVENTUALLY
                                ;SET.  IF IT DOES NOT, AN ERROR MESSAGE IS PRODUCED REPORTING A MICRO-
                                ;DIAGNOSTIC TIMEOUT.
                                ;;*****************************************************************************

015042  010146                  RPARDY: MOV     R1,-(SP)        ;SAVE R1
015044  010446                          MOV     R4,-(SP)        ;SAVE R4
015046  012701  000062                  MOV     #50.,R1         ;GET AN OVERALL ITERATION COUNT
015052  033777  002400  165450  1$:     BIT     BITPOS,@RPAS    ;DONE??
015060  001012                          BNE     2$              ;IF SET, YES
015062  004737  017000                  JSR     PC,WAIT         ;USE THE WATCHDOG TIMER
015066  005301                          DEC     R1              ;ONE LESS CYCLE TO-GO
015070  003370                          BGT     1$              ;IF NOT ZERO, KEEP WATCHING
015072  017704  165440                  MOV     @RPMR1,R4       ;GET CONTENTS OF RPMR1
015076  104456                          TRAP    C$ERHRD
015100  000621                          .WORD   401
015102  014130                          .WORD   EM43
015104  014310                          .WORD   ERR1
015106  013777  002400  165414  2$:     MOV     BITPOS,@RPAS    ;RESET THE ATTENTION BIT TO 0
015114  012604                          MOV     (SP)+,R4        ;RESTORE R4
015116  012601                          MOV     (SP)+,R1        ;RESTORE R1
015120  000207                          RTS     PC              ;TAKE THE RETURN

                                ;;*****************************************************************************
                                ;THIS MODULE IS CALLED BY THE DRIVER WHEN EVER A NON-DATA COMMAND HAS
                                ;JUST BEEN ISSUED.  (EXCEPT A DIAGNOSTIC COMMAND.)  IT POLLS FOR RPDS:
                                ;DRY.  THE FUNCTION IS NOT TIMED USING A WATCHDOG TIMER, BUT SUPERVISOR
                                ;'BREAKS' ARE SUPPORTED.
                                ;;*****************************************************************************

015122                          READY:
015122  104422                          TRAP    C$BRK
015124  105777  165374                  TSTB    @RPDS           ;READY TRUE?
015130  100374                          BPL     READY           ;NO, SO WAIT SOME MORE
015132  000207                          RTS     PC              ;TAKE THE RETURN

                                ;;*****************************************************************************
                                ;THIS MODULE IS CALLED BY THE DRIVER ANYTIME A DATA COMMAND HAS JUST BEEN
                                ;ISSUED.  IT POLLS FOR CONTROLLER READY.  THE FUNCTION IS NOT TIMED USING
                                ;A WATCHDOG TIMER, BUT SUPERVISOR 'BREAKS' ARE SUPPORTED.
                                ;;*****************************************************************************

015134                          CREADY:
015134  104422                          TRAP    C$BRK
015136  105777  165350                  TSTB    @RPCS1          ;CONTROLLER READY?
015142  100374                          BPL     CREADY          ;IF 0, NO...WAIT SOME MORE
015144  000207                          RTS     PC              ;IT'S 1, RETURN
```

```
                                ;;*****************************************************************************
                                ;THIS MODULE DOES THE ACTUAL DISK 'DRIVING'.  INPUTS TO THE MODULE
                                ;INCLUDE THE FOLLOWING TAGS:  NEGWRD, DESCYL, DESTRK, TABADD, FUNCTN.
                                ;NEGWRD = THE BYTE COUNT TO BE NEGATED, DESCYL =  THE DESIRED CYLINDER
                                ;ADDRESS, DESTRK = THE DESIRED TRACK / SECTOR ADDRESS, TABADD = THE STARTING
                                ;ADDRESS OF THE TRANSFER BUFFER, FUNCTN = THE COMMAND TO BE EXECUTED.
                                ;CALL TO THE MODULE IS: JSR PC,DRIVER.
                                ;BUFFERS ARE LOADED/UNLOADED VIA LINKAGE PROVIDED BY TABADD.
                                ;;*****************************************************************************

015146  005437  002412        DRIVER: NEG     NEGWRD          ;NEGATE THE WORD COUNT ONLY ONCE!
015152  004737  015122                JSR     PC,READY        ;POLL FOR DRIVE READY!
015156  022737  000035  002420        CMP     #DIAG,FUNCTN    ;DIAGNOSTIC COMMAND??
015164  001414                        BEQ     1$              ;IF EQUAL, SKIP NEXT CODE
015166  013777  002412  165320        MOV     NEGWRD,@RPWC    ;WORD COUNT ---> RP REGISTER
015174  013777  002416  165344        MOV     DESCYL,@RPDC    ;GET THE CYLINDER ADDRESS TO THE DEVICE REGISTER
015202  013777  002414  165310        MOV     DESTRK,@RPDA    ;TRACK/SEC ---> RP REGISTER
015210  013777  002366  165300        MOV     TABADD,@RPBA    ;LOAD THE TRANSFER ADDRESS
015216  013777  002420  165266  1$:   MOV     FUNCTN,@RPCS1   ;GET THE COMMAND TO EXECUTE
015224  023727  002420  000035        CMP     FUNCTN,#DIAG    ;IS THIS A DATA COMMAND?
015232  101004                        BHI     2$              ;IF > THAN A DIAGNOSTIC COMMAND, YES
015234  001406                        BEQ     3$              ;IF =, IT GETS HANDLED UNIQUELY
015236  004737  015122                JSR     PC,READY        ;POLL FOR DRIVE READY
015242  000405                        BR      4$              ;AND SKIP NEXT POLL OPERATION
015244  004737  015134        2$:     JSR     PC,CREADY       ;POLL FOR CONTROLLER READY
015250  000402                        BR      4$              ;NOW RETURN
015252  004737  015042        3$:     JSR     PC,RPARDY       ;LOOK FOR ATTENTION NOW
015256  000207                4$:     RTS     PC              ;NOW RETURN

                                ;;*****************************************************************************
                                ;THIS MODULE IS USED TO INITIATE THE DIAGNOSTIC MONITOR IN THE RP-07.
                                ;IT IS DEPENDENT UPON 'DRIVER' FOR COMPLETION.
                                ;SIDE AFFECTS INCLUDE THHE FACT THAT THE DRIVE WILL BE IN 'DIAGNOSTIC
                                ;MODE' WHEN THIS MODULE COMPLETES.  THE DRIVE WILL BE UNABLE TO ACCEPT
                                ;COMMANDS OTHER THAN DRIVE CLEAR, AND DIAGNOSTIC COMMANDS.
                                ;;*****************************************************************************

015260  004737  016662        DIAGST::JSR     PC,SEIZE        ;GET THE DRIVE'S ATTENTION!
015264  012777  177000  165244        MOV     #177000,@RPMR1  ;SET UP THE "HANDSHAKE"
015272  012737  000035  002420        MOV     #DIAG,FUNCTN    ;CREATE THE DIAGNOSTIC COMMAND
015300  004737  015146                JSR     PC,DRIVER       ;ISSUE THE COMMAND
015304  004737  016662                JSR     PC,SEIZE        ;RESET COMPOSITE ERROR (SETS WHEN FE IS WRITTEN INTO RMPR1)
015310  000207                        RTS     PC              ;AND RETURN TO MAIN
```

```

                                            ;;*********************************************************************
                                            ;THIS MODULE IS USED TO TURN OFF THE RP-07 DIAGNOSTIC MONITOR.  IT IS
                                            ;DEPENDENT UPON 'DRIVER' FOR ITS COMPLETION. IT WILL CLEAR ANY ERRORS
                                            ;WHICH SET AS A RESULT OF A DIAGNOSTIC ROUTINE EXECUTION.  THERE ARE
                                            ;NO OTHER SIDE-EFFECTS.
                                            ;;*********************************************************************

 015312  012737  040011  002420   DIAGEN: MOV     #TRE!DRCLR,FUNCTN;SET UP FOR A CONTROLLER-DRIVE CLEAR COMMAND
 015320  004737  015146                   JSR     PC,DRIVER       ;ISSUE THE COMMAND
 015324  012777  177400  165204           MOV     #177400,@RPMR1  ;TERMINATE THE SESSION
 015332  012737  000035  002420           MOV     #DIAG,FUNCTN    ;AND SET UP THE COMMAND
 015340  004737  015146                   JSR     PC,DRIVER       ;ISSUE THE COMMAND NOW!!
 015344  005077  165166                   CLR     @RPMR1          ;RESET THE DIAGNOSTIC MODE BIT
 015350  000207                           RTS     PC              ;RETURN TO MAIN

                                            ;;*********************************************************************
                                            ;THIS MODULE RECEIVES INPUT FROM R4.  OUTPUT GOES TO RPMR1.  IT IS
                                            ;DEPENDENT UPON 'DRIVER' FOR COMPLETION.  THIS ROUTINE SHOULD NOT
                                            ;BE EXECUTED UNTIL THE DIAGNOSTIC MONITOR HAS BEEN TURNED ON THROUGH
                                            ;THE EXECUTION OF 'DIAGST'.
                                            ;;*********************************************************************

 015352  010477  165160           DIAGLD: MOV     R4,@RPMR1       ;NOW SET THE DIAGNOSTIC NUMBER
 015356  052777  100000  165152           BIS     #BIT15,@RPMR1   ;AND SET DMD = 1
 015364  012737  000035  002420           MOV     #DIAG,FUNCTN    ;AND SET UP FOR A DIAGNOSTIC COMMAND
 015372  004737  015146                   JSR     PC,DRIVER       ;ISSUE THE COMMAND NOW!
 015376  000207                           RTS     PC              ;RETURN TO CALLER!

                                  .SBTTL  PROGRAM UTILITIES

                                            ;;*********************************************************************
                                            ;THIS MODULE CLEARS THE DRIVE ERROR STATUS THROUGH A CONTROLLER CLEAR.
                                            ;IT SAVES THE STATUS OF THE MAINTENANCE REGISTER (RPMR1), AND RESTORES
                                            ;IT WHEN THE RESET PROCESS IS COMPLETE.
                                            ;;*********************************************************************

 015400  017746  165132           DRVCLR: MOV     @RPMR1,-(SP)    ;SAVE CONTENTS OF RPMR1
 015404  004737  016662                   JSR     PC,SEIZE        ;NOW RESET THE DRIVE
 015410  012677  165122                   MOV     (SP)+,@RPMR1    ;RESTORE THE MAINTENANCE REGISTER
 015414  000207                           RTS     PC              ;AND RETURN TO CALLER

                                            ;;*********************************************************************
                                            ;THIS MODULE IS PART OF THE I/O SUPPORT.  IT CONVERTS OCTAL TO ASCII
                                            ;HEX.  IT RECEIVES ITS INPUT FROM THE TOP OF THE STACK.  IT'S OUTPUT
                                            ;IS PLACED IN PSTACK - PSTACK + 6.
                                            ;;*********************************************************************

 015416  010146                   OCTHEX: MOV     R1,-(SP)        ;SAVE R1
 015420  010246                           MOV     R2,-(SP)        ;SAVE R2
 015422  012700  002652                   MOV     #PSTACK,R0      ;SET UP THE BUFFER ADDRESS
 015426  012702  000004                   MOV     #4,R2           ;GET THE ITERATION VALUES
 015432  012701  000004           1$:     MOV     #4,R1           ;AND DUPLICATE FOR TWO LOOPS
 015436  005010                           CLR     (R0)            ;INITIALIZE THE BUFFER
 015440  006310                   2$:     ASL     (R0)            ;MOVE THE PREVIOUS BIT(S) OVER
 015442  000241                           CLC                     ;CARRY = 0
 015444  006366  000006                   ASL     6(SP)           ;ROTATE A BIT FROM THE TEST VALUE
```

```
 58 015450  103002                        BCC     3$              ;IF ZERO, SKIP NEXT INSTRUCTION
 59 015452  052710  000001                BIS     #BIT0,(R0)      ;MARK THE BIT AS BEING SET
 60 015456  005301                3$:     DEC     R1              ;ONE LESS ITERATION TO GO
 61 015460  003367                        BGT     2$              ;BUT NOT DONE UNTIL = 0!
 62 015462  005720                        TST     (R0)+           ;NEXT BUFFER LOCATION
 63 015464  005302                        DEC     R2              ;ONE LESS ITERATION TO-GO
 64 015466  003361                        BGT     1$              ;IF NOT ZERO, KEEP GOING!
 65 015470  012702  000004                MOV     #4,R2           ;GET THE NEW ITERATION COUNT
 66 015474  012700  002652                MOV     #PSTACK,R0      ;AND GET THE BUFFER ADDRESS AGAIN
 67 015500  005710                4$:     TST     (R0)            ;CONTENTS ZERO?
 68 015502  003004                        BGT     5$              ;IF NOT, SKIP NEXT
 69 015504  005020                        CLR     (R0)+           ;SET THIS CHARACTER = NULL
 70 015506  005302                        DEC     R2              ;ONE LESS CHARACTER TO GO
 71 015510  003373                        BGT     4$              ;IF NOT ZERO, KEEP GOING
 72 015512  000412                        BR      8$              ;DONE, RETURN!
 73 015514  021027  000011        5$:     CMP     (R0),#11        ;ALPHA OR NUMERIC CHARACTER?
 74 015520  101003                        BHI     6$              ;IF > 11, ALPHA!
 75 015522  062720  000060                ADD     #60,(R0)+       ;MAKE NUMERIC ASCII
 76 015526  000402                        BR      7$              ;AND GO-ON
 77 015530  062720  000067        6$:     ADD     #55.,(R0)+      ;MAKE HEX ASCII
 78 015534  005302                7$:     DEC     R2              ;ONE LESS ITERATION TO-GO
 79 015536  003366                        BGT     5$              ;ONE LESS ITERATION, IF NOT ZERO
 80 015540  012602                8$:     MOV     (SP)+,R2        ;RESTORE R2
 81 015542  012601                        MOV     (SP)+,R1        ;AND R1
 82 015544  012616                        MOV     (SP)+,(SP)      ;MOVE STACK OVER INPUT VALUE
 83 015546  000207                        RTS     PC              ;AND RETURN
 84
 85                                ;;*****************************************************************************
 86                                ;DETERMINE IF THERE IS A CLOCK ON SYSTEM. START THE CLOCK. "CLKSTA" WILL
 87                                ;INDICATE THE CLOCK TYPE.
 88                                ;        0= NO CLOCK
 89                                ;       +1= KW11-P
 90                                ;       -1= KW11-L
 91                                ;THIS ROUTINE WILL ALSO SETUP "TICKMS" (TIME PER CLOCK TICK IN MILLISECONDS)
 92                                ;AND "TICKUS" (TIME PER CLOCK TICK IN MICROSECONDS) AS PER LINE FREQUENCY.
 93                                ;CALL
 94                                ;       JSR     PC,ST.CLK       ;START THE CLOCK
 95                                ;       RETURN
 96                                ;;*****************************************************************************
 97
 98 015550  005037  002426        ST.CLK: CLR     CLKSTA          ;ASSUME "NO CLOCK"
 99 015554  005037  015750                CLR     HERTZ           ;ASSUME "UNKNOWN" HERTZ
100                                                               ;IS THERE A P-CLOCK PRESENT ?
101 015560  012700  000120                MOV     #'P,R0
    015564  104462                        TRAP    C$CLCK
    015566  010005                        MOV     R0,R5
102                                                               ;GO TO 1$ IF NO
103 015570  103031                        BCC     1$
104
105                                ;SET P-CLOCK P-TABLE & START P-CLOCK
106
107 015572  010537  015724                MOV     R5,PCLKTB       ;SAVE P-CLOCK TABLE ADDRESS
108 015576  011537  015726                MOV     (R5),PKCS       ;GET 'CSR' ADDRESS
109 015602  011537  015730                MOV     (R5),PKB        ;MAKE PKB ADDRESS BY
110 015606  062737  000002  015730        ADD     #2,PKB          ;ADDING 2
111 015614  012537  015732                MOV     (R5)+,PKC       ;MAKE PKC ADDRESS BY
112 015620  062737  000004  015732        ADD     #4,PKC          ;ADDING 4
```

```
                                                TST     (R5)+           ;SKIP OVER 'BR LEVEL'
                                                MOV     (R5)+,PKV       ;GET 'VECTOR' ADDRESS
                                                MOV     (R5)+,HERTZ     ;GET 'HERTZ' LINE FREQUENCY
                                                MOV     #1,CLKSTA       ;SET P-CLOCK FLAG
                                                JSR     PC,ST.PCLK      ;START P-CLOCK AS A WATCH DOG TIMER
                                                RTS     PC
                                        1$:                             ;IS THERE A L-CLOCK PRESENT ?
                                                MOV     #'L,R0
                                                TRAP    C$CLCK
                                                MOV     R0,R5
                                                                        ;GO TO 2$ IF NO
                                                BCC     2$

                                                ;SET L-CLOCK P-TABLE, START L-CLOCK

                                                MOV     R5,LCLKTB       ;SAVE L-CLOCK TABLE ADDRESS
                                                MOV     (R5)+,LKS       ;GET 'CSR' ADDRESS
                                                TST     (R5)+           ;SKIP OVER 'BR LEVEL'
                                                MOV     (R5)+,LKV       ;GET 'VECTOR' ADDRESS
                                                MOV     (R5)+,HERTZ     ;GET 'HERTZ' LINE FREQUENCY
                                                MOV     #-1,CLKSTA      ;L-CLOCK FLAG
                                                JSR     PC,ST.LCLK      ;START L-CLOCK AS A WATCH DOG TIMER
                                        2$:     RTS     PC

                                        ;KW11-P CLOCK TABLE, CSR REG, PKB REG, PKC REC & VEC ADR

                                        PCLKTB: .WORD   0               ;P-CLK TBL ADR

                                        PKCS:   .WORD   172540          ;CONTROL & STATUS
                                        PKB:    .WORD   172542          ;COUNT SET BFR
                                        PKC:    .WORD   172544          ;COUNTER
                                        PKV:    .WORD   104,106         ;VECTOR

                                        ;KW11-L CLOCK TABLE, CSR REG & VEC ADR

                                        LCLKTB: .WORD   0               ;L-CLK TBL ADR

                                        LKS:    .WORD   177546          ;CONTROL & STATUS
                                        LKV:    .WORD   100,102         ;VECTOR

                                        HERTZ:  .WORD   0               ;60 HZ. OR 50 HZ. LINE FREQUENCY

                                        ST.PCLK:                        ;SETUP VECTOR FOR P-CLOCK
                                                MOV     #PRI06,-(SP)
                                                MOV     #KWSRV,-(SP)
                                                MOV     PKV,-(SP)
                                                MOV     #3,-(SP)
                                                TRAP    C$SVEC
                                                ADD     #10,SP
                                                MOV     #1,@PKB         ;COUNT ONE TICK
                                                MOV     #115,@PKCS      ;"INT.EN.",COUNT DOWN", "MODE 1 (REPEAT)",
                                                                        ;"LINE FREQ", AND "RUN"
                                        1$:     RTS     PC              ;RETURN

                                        ST.LCLK:                        ;SETUP VECTOR FOR L-CLOCK
                                                MOV     #PRI06,-(SP)
                                                MOV     #KWSRV,-(SP)
```

```
        016026  013746  015744                 MOV     LKV,-(SP)
        016032  012746  000003                 MOV     #3,-(SP)
        016036  104437                         TRAP    C$SVEC
        016040  062706  000010                 ADD     #10,SP
    162 016044  012777  000100  177670         MOV     #100,@LKS       ;START THE KW11-L
    163 016052  000207                 1$:     RTS     PC              ;RETURN
    164
    165                                ;THIS ROUTINE IS USED TO STOP THE SYSTEM CLOCK
    166                                ;CALL
    167                                ;       JSR     PC,STOPCK       ;CALL ROUTINE
    168
    169 016054  005737  002426         STOPCK: TST     CLKSTA          ;IS THERE A CLOCK AVAILABLE ?
    170 016060  001410                         BEQ     2$              ;BR IF NO
    171 016062  100404                         BMI     1$              ;BR IF L-CLOCK
    172 016064  042777  000101  177634         BIC     #101,@PKCS      ;STOP THE P-CLOCK
    173 016072  000403                         BR      2$
    174 016074  042777  000100  177640 1$:     BIC     #100,@LKS       ;STOP THE L-CLOCK
    175 016102  000207                 2$:     RTS     PC
    176
    177                                ;KW11 CLOCK INTERRUPT SERVICE ROUTINE
    178
    180 016104  012746  000024         KWSRV:  MOV     #20.,-(SP)      ;ASSUME 20.0 MSEC
    181 016110  023727  015750  000062         CMP     HERTZ,#50.      ;IS IT 50 HERTZ LINE FREQUENCY ?
    182 016116  001402                         BEQ     1$              ;BR IF YES
    183 016120  012716  000020                 MOV     #16.,(SP)       ;MUST BE 60HZ, 16.667 MSEC
    184 016124  162637  016776         1$:     SUB     (SP)+,WATIME    ;SUBTRACT TIME PER TICK IN MILLISECONDS
    185 016130                         L10006:
        016130  000002                         RTI
    186
    187                                ;;**************************************************************************
    188                                ;THIS MODULE IS USED TO DECODE THE CONTENTS OF RPER2 AND PRODUCE A MODULE
    189                                ;FAULT LIST BASED ON THE CONTENTS OF RPER2.  INPUT IS FROM RPER2 (LOW BYTE)
    190                                ;OUTPUT IS TO ERRWD1 AND ERRWD2.  TABLE LOOKUP IS DONE STARTING AT EC.00.
    191                                ;;**************************************************************************
    192
    193 016132  010146                 CALMOD: MOV     R1,-(SP)        ;SAVE R1
    194 016134  010246                         MOV     R2,-(SP)        ;SAVE R2
    195 016136  017702  164410                 MOV     @RPER2,R2       ;GET THE CONTENTS OF RPER2
    196 016142  012701  004354                 MOV     #EC.00,R1       ;GET THE TOP OF THE CALLOUT LIST
    197 016146  042702  177400                 BIC     #177400,R2      ;STRIP THE HIGH BYTE INFORMATION
    198 016152  001005                         BNE     1$              ;IF NOT ZERO, IT'S VALID
    199 016154  005037  002404                 CLR     ERRWD1          ;SET THE CALLOUT LIST TO 0
    200 016160  005037  002406                 CLR     ERRWD2          ;FOR BOTH (THIS ERROR CODE IS BAD)
    201 016164  000407                         BR      2$              ;NOW TAKE THE RETURN
    202 016166  022121                 1$:     CMP     (R1)+,(R1)+     ;MOVE THROUGH THE LIST
    203 016170  005302                         DEC     R2              ;ONE LESS ENTRY TO GO
    204 016172  003375                         BGT     1$              ;DO UNTIL R2 = 0
    205 016174  012137  002404                 MOV     (R1)+,ERRWD1    ;LOAD THE MODULE CALLOUT FOR THIS CODE
    206 016200  011137  002406                 MOV     (R1),ERRWD2     ;FOR BOTH MASKS
    207 016204  012602                 2$:     MOV     (SP)+,R2        ;RESTORE R2
    208 016206  012601                         MOV     (SP)+,R1        ;RESTORE R1
    209 016210  000207                         RTS     PC              ;AND RETURN TO CALLER
    210
    211                                ;;**************************************************************************
    212                                ;THIS MODULE IS PART OF THE I/O SUPPORT.  IT IS USED TO DUMP THE RP-07
    213                                ;REGISTERS AS PART OF AN ERROR MESSAGE.  INPUT TO THIS MODULE IS FROM
    214                                ;REG - REG+52.  OUTPUT IS TO THE USED SPECIFIED PRINTING DEVICE.
```

```
    215                                   ;;************************************************************************
    216
    217 016212                            DMPREG:                                 ;PRINT 'DRIVE  RPCS1  RPWC   RPBA   RPDA   RPCS2  RPDS'
    218 016212  012746  010337                    MOV     #FRMT40,-(SP)
        016216  012746  000001                    MOV     #1,-(SP)
        016222  010600                            MOV     SP,R0
        016224  104415                            TRAP    C$PNTX
        016226  062706  000004                    ADD     #4,SP
    219 016232  013746  002610                    MOV     REG+12,-(SP)
        016236  013746  002606                    MOV     REG+10,-(SP)
        016242  013746  002604                    MOV     REG+6,-(SP)
        016246  013746  002602                    MOV     REG+4,-(SP)
        016252  013746  002600                    MOV     REG+2,-(SP)
        016256  013746  002576                    MOV     REG,-(SP)
        016262  013746  002506                    MOV     DRVNO,-(SP)
        016266  012746  010430                    MOV     #FRMT41,-(SP)
        016272  012746  000010                    MOV     #10,-(SP)
        016276  010600                            MOV     SP,R0
        016300  104415                            TRAP    C$PNTX
        016302  062706  000022                    ADD     #22,SP
    220                                                                           ;PRINT 'RPER1  RPAS   RPLA   RPDB   RPMR1  RPDT   RPSN'
    221 016306  012746  010510                    MOV     #FRMT50,-(SP)
        016312  012746  000001                    MOV     #1,-(SP)
        016316  010600                            MOV     SP,R0
        016320  104415                            TRAP    C$PNTX
        016322  062706  000004                    ADD     #4,SP
    222 016326  013746  002626                    MOV     REG+30,-(SP)
        016332  013746  002624                    MOV     REG+26,-(SP)
        016336  013746  002622                    MOV     REG+24,-(SP)
        016342  013746  002620                    MOV     REG+22,-(SP)
        016346  013746  002616                    MOV     REG+20,-(SP)
        016352  013746  002614                    MOV     REG+16,-(SP)
        016356  013746  002612                    MOV     REG+14,-(SP)
        016362  012746  010601                    MOV     #FRMT51,-(SP)
        016366  012746  000010                    MOV     #10,-(SP)
        016372  010600                            MOV     SP,R0
        016374  104415                            TRAP    C$PNTX
        016376  062706  000022                    ADD     #22,SP
    223                                                                           ;PRINT 'RPOF   RPDC   RPCC   RPER2  RPER3  RPEC1  RPEC2'
    224 016402  012746  010661                    MOV     #FRMT60,-(SP)
        016406  012746  000001                    MOV     #1,-(SP)
        016412  010600                            MOV     SP,R0
        016414  104415                            TRAP    C$PNTX
        016416  062706  000004                    ADD     #4,SP
    225 016422  013746  002644                    MOV     REG+46,-(SP)
        016426  013746  002642                    MOV     REG+44,-(SP)
        016432  013746  002640                    MOV     REG+42,-(SP)
        016436  013746  002636                    MOV     REG+40,-(SP)
        016442  013746  002634                    MOV     REG+36,-(SP)
        016446  013746  002632                    MOV     REG+34,-(SP)
        016452  013746  002630                    MOV     REG+32,-(SP)
        016456  012746  010753                    MOV     #FRMT61,-(SP)
        016462  012746  000010                    MOV     #10,-(SP)
        016466  010600                            MOV     SP,R0
        016470  104415                            TRAP    C$PNTX
        016472  062706  000022                    ADD     #22,SP
    226 016476  005737  002504                    TST     RHTYPE                  ;IS IT RH70 CONTROLLER ?
```

```
    227 016502  001424                        BEQ     1$              ;BR IF NO
    228                                                               ;PRINT 'RPBAE  RPCS3'
    229 016504  012746  011035                MOV     #FRMT70,-(SP)
        016510  012746  000001                MOV     #1,-(SP)
        016514  010600                        MOV     SP,R0
        016516  104415                        TRAP    C$PNTX
        016520  062706  000004                ADD     #4,SP
    230 016524  013746  002650                MOV     REG+52,-(SP)
        016530  013746  002646                MOV     REG+50,-(SP)
        016534  012746  011055                MOV     #FRMT71,-(SP)
        016540  012746  000003                MOV     #3,-(SP)
        016544  010600                        MOV     SP,R0
        016546  104415                        TRAP    C$PNTX
        016550  062706  000010                ADD     #10,SP
    231 016554  000207              1$:       RTS     PC
```

```
                        ;;*****************************************************************************
                        ;THIS MODULE IS USED TO PRINT THE MODULE FAULT LIST TO THE USER.  IT
                        ;IS PART OF THE I/O SUPPORT USED WHEN AN ERROR MESSAGE IS PRODUCED.
                        ;INPUT IS SET UP BY 'DECODE' SO THAT R2 IS THE LIST POINTER.  OUTPUT IS
                        ;TO THE USER SPECIFIED PRINTING DEVICE.
                        ;;*****************************************************************************

016556                  FAULTS:
016556  012746  007273          MOV     #FLST00,-(SP)
016562  012746  000001          MOV     #1,-(SP)
016566  010600                  MOV     SP,R0
016570  104414                  TRAP    C$PNTB
016572  062706  000004          ADD     #4,SP
016576  010146                  MOV     R1,-(SP)        ;;PUSH R1 ON STACK
016600  012701  000015          MOV     #13.,R1         ;GET THE ITERATION COUNT
016604                  1$:
016604  012246                  MOV     (R2)+,-(SP)
016606  012746  007312          MOV     #FLST01,-(SP)
016612  012746  000002          MOV     #2,-(SP)
016616  010600                  MOV     SP,R0
016620  104414                  TRAP    C$PNTB
016622  062706  000006          ADD     #6,SP
016626  005712                  TST     (R2)            ;MORE DATA?
016630  001402                  BEQ     2$              ;IF ZERO, NO!
016632  005301                  DEC     R1              ;ONE LESS ITERATION TO-GO
016634  003363                  BGT     1$              ;DO UNTIL = 0, OR (R2) = 0
016636                  2$:                             ;CR-LF
016636  012746  006420          MOV     #CRLF,-(SP)
016642  012746  000001          MOV     #1,-(SP)
016646  010600                  MOV     SP,R0
016650  104414                  TRAP    C$PNTB
016652  062706  000004          ADD     #4,SP
016656  012601                  MOV     (SP)+,R1        ;;POP STACK INTO R1
016660  000207                  RTS     PC              ;AND RETURN TO CALLER
```

```
                                ;;*****************************************************************************
                                ;THIS MODULE DOES THE SEIZE OPERATION IN THE EVENT THAT
                                ;A GIVEN DRIVE IS DUAL PORTED.
                                ;CALL IS JSR PC, SEIZE
                                ;THERE ARE NO SIDE EFFECTS
                                ;;*****************************************************************************

016662  052777  000040  163632  SEIZE:  BIS     #CLR,@RPCS2     ;START OUT WITH A CLEARED CONTROLLER
016670  013777  002506  163624          MOV     DRVNO,@RPCS2    ;RELOAD THE DRIVE NUMBER
016676  105777  163622                  TSTB    @RPDS           ;IS THIS DRIVE SEIZED BY ANOTHER PORT?
016702  100424                          BMI     3$              ;NO, JUST TAKE RETURN
016704  005077  163614                  CLR     @RPDS           ;ISSUE A DRIVE REQUEST
016710  010246                          MOV     R2,-(SP)        ;SAVE R2
016712  012702  000012                  MOV     #10.,R2         ;LOAD R2 WITH AN OVERALL ITERATION COUNT
016716  105777  163602          1$:     TSTB    @RPDS           ;NOW WAIT FOR THE OTHER PORT TO RELEASE
016722  100410                          BMI     2$              ;NOT YET IF RPDS:DRY = 0
016724  004737  017000                  JSR     PC,WAIT
016730  005302                          DEC     R2              ;AND REDUCE THE ITERATION COUNT
016732  001371                          BNE     1$              ;LOOK AGAIN FOR DRIVE PRESENT
016734  104455                          TRAP    C$ERDF
016736  000001                          .WORD   1
016740  013266                          .WORD   EM27
016742  000000                          .WORD   0
016744  112777  000377  163556  2$:     MOVB    #377,@RPAS      ;CLEAR ANY UNWANTED ATTENTION BITS
016752  012602                          MOV     (SP)+,R2        ;RESTORE R2
016754  000207                  3$:     RTS     PC              ;AND TAKE RETURN

                                ;;*****************************************************************************
                                ;THIS MODULE IS USED TO WAIT FOR THE SPECIFIED TIMF IN MILLISECONDS
                                ;CALL
                                ;       MOV     #NUMBER,-(SP)   ;NUMBER IN MILLISECONDS TO WAIT
                                ;       JSR     PC,WAITMS       ;CALL WAIT ROUTINE
                                ;
                                ;NOTE: THE SHORTEST WAIT CANNOT BE LESS THAN 16.66MS
                                ;
                                ;;*****************************************************************************

016756  016637  000002  016776  WAITMS: MOV     2(SP),WATIME    ;GET WAIT TIME IN MILLISECONDS
016764  005737  016776          1$:     TST     WATIME          ;DONE WITH WAIT YET ?
016770  003375                          BGT     1$              ;BR IF NO
016772  012616                          MOV     (SP)+,(SP)      ;ADJUST RETURN ADDRESS ON STACK
016774  000207                          RTS     PC              ;NOW RETURN TO MAIN

016776  000000                  WATIME: .WORD   0               ;WAIT TIME GOES HERE

                                ;;*****************************************************************************
                                ;THIS MODULE IS USED TO STALL IN LOOPS WHICH MUST WAIT FOR THE
                                ;RP07 MICROPROCESSORS.  THE WAIT IS A FIXED TIME PERIOD, AND
                                ;CANNOT BE CHANGED DYNAMICALLY.  THERE ARE NO SIDE EFFECTS.
                                ;;*****************************************************************************

017000                          WAIT:
017000  012727  000372                  MOV     #250.,(PC)+
017004  000000                          .WORD   0
017006  013727  002116                  MOV     L$DLY,(PC)+
017012  000000                          .WORD   0
```

```
        017014  005367  177772                 DEC     -6(PC)
        017020  001375                         BNE     .-4
        017022  005367  177756                 DEC     -22(PC)
        017026  001367                         BNE     .-20
     51 017030  000207                         RTS     PC              ;NOW RETURN TO MAIN
     52
     53                                 ;;*************************************************************************
     54                                 ;THIS MODULE DOES SOME OF THE ERROR CHECKING WHICH MUST OCCUR AS A
     55                                 ;RESULT OF ANY DATA TRANSFER.  THE MODULE CHECKS SC, TRE, AND MCPE IN
     56                                 ;RPCS1, AND CHECKS ERR IN RPDS.  IF ERRORS ARE DETECTED, "ERSTAT" IS
     57                                 ;SET TO -1, OTHERWISE "ERSTAT" = 0.  THERE ARE NO OTHER SIDE EFFECTS.
     58                                 ;;*************************************************************************
     59
     60 017032  005037  002466          ERRCK:  CLR     ERSTAT          ;START OUT WITHOUT ERRORS!
     61 017036  032777  040000  163460          BIT     #ERR,@RPDS      ;COMPOSITE ERROR?
     62 017044  001415                         BEQ     1$              ;NOT IF 0!
     63 017046  013737  002524  002456         MOV     RPDS,TESTRG     ;GET THE FAILING REGISTER
     64 017054  017737  163444  002452         MOV     @RPDS,RCVED     ;AND THE FAILING DATA
     65 017062  013737  002452  002454         MOV     RCVED,EXPTED    ;NOW FORM THE EXPECTED DATA
     66 017070  042737  040000  002454         BIC     #ERR,EXPTED     ;BY CLEARING THE CORRECT BIT
     67 017076  000420                         BR      2$              ;NOW, GO-ON
     68 017100  032777  160000  163404  1$:    BIT     #SC!TRE!MCPE,@RPCS1;DID WE GET ANY ERRORS?
     69 017106  001417                         BEQ     3$              ;IF ZERO, NO!
     70 017110  013737  002512  002456         MOV     RPCS1,TESTRG    ;GET THE FAILING REGISTER
     71 017116  017737  163370  002452         MOV     @RPCS1,RCVED    ;AND THE FAILING DATA
     72 017124  013737  002452  002454         MOV     RCVED,EXPTED    ;NOW FORM THE EXPECTED DATA
     73 017132  042737  160000  002454         BIC     #SC!TRE!MCPE,EXPTED;BY CLEARING THE CORRECT BITS!
     74 017140  012737  177777  002466  2$:    MOV     #-1,ERSTAT      ;SHOW THE ERROR STATUS
     75 017146  000207                  3$:    RTS     PC              ;RETURN TO MAIN
     76
     77                                 ;;*************************************************************************
     78                                 ;THIS MODULE DOES THE DATA LOGGING IN THE EVENT OF A DATA BUFFER
     79                                 ;MISCOMPARE.  THE ADDRESS "RPDB" IS LOADED INTO "TESTRG", THE
     80                                 ;CORRECTED CONTENTS OF "RPBA" ARE USED TO POINT TO THE EXPECTED DATA IN "EXPTED",
     81                                 ;AND THE CONTENTS OF "RPDB" ARE LOADED INTO THE RECEIVED DATA "RCVED".
     82                                 ;THERE ARE NO OTHER SIDE EFFECTS.
     83                                 ;;*************************************************************************
     84
     85 017150  010246                  LOCATE: MOV     R2,-(SP)        ;SAVE R2
     86 017152  017702  163340                  MOV     @RPBA,R2        ;GET THE ADDRESS OF THE EXPECTED DATA
     87 017156  162702  000002                  SUB     #2,R2           ;AND CORRECT IT
     88 017162  005737  002504                  TST     RHTYPE          ;WHICH CONTROLLER??
     89 017166  001422                         BEQ     3$              ;IT'S AN RH11 IF 0!
     90 017170  032777  004000  163366         BIT     #BIT11,@RPCS3   ;IS IT AN EVEN WORD TRANSFER?
     91 017176  001402                         BEQ     1$              ;NO, IT IS NOT, IF 0!
     92 017200  162702  000004                 SUB     #4,R2           ;CORRECT IT!
     93 017204  032777  002000  163352  1$:    BIT     #BIT10,@RPCS3   ;IS IT A DOUBLE WORD TRANSFER?
     94 017212  001402                         BEQ     2$              ;IF ZERO, NO!!
     95 017214  162702  000002                 SUB     #2,R2           ;CORRECT FOR A DOUBLE WORD TRANSFER
     96 017220  032777  010000  163336  2$:    BIT     #BIT12,@RPCS3   ;IS IT AN ODD WORD TRANSFER?
     97 017226  001402                         BEQ     3$              ;IF ZERO, NO!
     98 017230  162702  000002                 SUB     #2,R2           ;CORRECT FOR ODD WORD
     99 017234  011237  002454          3$:    MOV     (R2),EXPTED     ;GET THE ACTUAL DATA
    100 017240  017737  163270  002452         MOV     @RPDB,RCVED     ;AND FAILING DATA
    101 017246  012602                         MOV     (SP)+,R2        ;NOW RESTORE R2
    102 017250  000207                         RTS     PC              ;AND RETURN TO MAIN
    103
```

```
                                ;;*****************************************************************************
                                ;THIS MODULE IS USED FOR AN ERROR LOG DUMP.  IT IS FED BY R1, WHICH
                                ;INITIALLY IS N - 1 FOR THE ROUTINE TO BE SELECTED.  R4 IS USED FOR
                                ;THE DUMP ROUTINE, AND R1, AFTER BEING INCREMENTED IS USED AS THE
                                ;LOW BYTE ARGUMENT IN R4.  THIS MODULE IS CALLED BY THE TEST WHICH
                                ;DUMPS THE RP07 ERROR LOG.
                                ;;*****************************************************************************

017252  040104                  NEXLOC: BIC     R1,R4           ;TAKE THE PREVIOUS ARGUMENT FROM R4
017254  005201                          INC     R1              ;GET THE NEXT RAM ADDRESS
017256  050104                          BIS     R1,R4           ;NOW LOAD THE ARGUMENT INTO R4
017260  004737  015352                  JSR     PC,DIAGLD       ;R4 IS USED TO LOAD THE DIAGNOSTIC ROUTINE
017264  000207                          RTS     PC              ;NOW TAKE THE RETURN
```

```
                                        ;;*****************************************************************************
                                        ;THIS MODULE CONTROLS SPIRAL READS OR WRITES.  IT INCREMENTS THE DESIRED
                                        ;TRACK ADDRESS UNTIL IT IS READY TO OVERFLOW INTO AN ILLEGAL ADDRESS.
                                        ;WHEN THIS IS READY TO HAPPEN, THE DESIRED TRACK IS SET TO ZERO, AND THE
                                        ;DESIRED CYLINDER ADDRESS IS INCREMENTED.  THE TERMINAL STATE IS REACHED
                                        ;WHEN THE DESIRED CYLINDER IS ABOUT TO OVERFLOW, AND THE DESIRED TRACK IS
                                        ;ALSO ABOUT TO OVERFLOW.  WHEN THIS HAPPENS, THE DESIRED TRACK ADDRESS
                                        ;IS RESET TO 0.  THE CALLING MODULE MUST DETECT WHEN THIS CONDITION
                                        ;OCCURS.  VARIABLES: DESCYL, AND DESTRK ARE AFFECTED BY THIS MODULE.
                                        ;THIS MODULE IS AFFECTED BY THE VALUE IN "LASTRK", WHICH REPRESENTS
                                        ;THE LAST USER TRACK, AND BY LASCYL, WHICH REPRESENTS THE LAST USER
                                        ;CYLINDER ADDRESS ON THE DRIVE.  LASCYL DOES NOT INCLUDE ANY DIAGNOSTIC
                                        ;FE CYLINDER ADDRESSING.
                                        ;;*****************************************************************************

017266  123737  002415  002372  SPIRAL: CMPB    DESTRK+1,LASTRK ;TRACK COUNT AT MAX?
017274  103003                          BHIS    1$              ;IF HIGHER OR SAME, YES!
017276  105237  002415                  INCB    DESTRK+1        ;NEXT TRACK PLEASE...
017302  000410                          BR      3$              ;AND RETURN
017304  023737  002416  002376  1$:     CMP     DESCYL,LASCYL   ;LAST CYLINDER ADDRESS?
017312  101002                          BHI     2$              ;YES, WE ARE ABOUT TO OVERFLOW!!
017314  005237  002416                  INC     DESCYL          ;NEXT CYLINDER ADDRESS PLEASE....
017320  105037  002415          2$:     CLRB    DESTRK+1        ;RESET THE TRACK ADDRESS TO 0
017324  000207                  3$:     RTS     PC              ;NAD TAKE THE RETURN

                                        ;;*****************************************************************************
                                        ;THIS MODULE CREATES AN IMAGE OF THE RP REGISTERS.
                                        ;IT IS USED TO SAVE THE REGISTERS FOR AN ERROR DUMP AFTER
                                        ;AN ERROR IS DETECTED.  CALL IS JSR PC,SAVRPR
                                        ;THE OUTPUT OF THIS MODULE LOADS A BUFFER CALLED "REG"
                                        ;;*****************************************************************************

017326  010046                  SAVRPR: MOV     R0,-(SP)
017330  010146                          MOV     R1,-(SP)
017332  012700  002512                  MOV     #RPCS1,R0       ;AND THE TRANSFER ADDRESSES
017336  012701  002576                  MOV     #REG,R1         ;OF THE SOURCE AND REG BUFFERS
017342  013021                  1$:     MOV     @(R0)+,(R1)+    ;NOW LOG THE DATA
017344  022700  002562                  CMP     #RPBAE,R0       ;ARE WE AT THE LIMIT?
017350  101374                          BHI     1$              ;DO UNTIL ALL RHXX REGISTERS ARE LOGGED
017352  005737  002504                  TST     RHTYPE
017356  001402                          BEQ     2$
017360  013021                          MOV     @(R0)+,(R1)+    ;GET THE CONTENTS OF RPBAE
017362  013021                          MOV     @(R0)+,(R1)+    ;GET THE CONTENTS OF RPCS3
017364  012601                  2$:     MOV     (SP)+,R1
017366  012600                          MOV     (SP)+,R0
017370  000207                          RTS     PC              ;RETURN TO MAIN FOR ERROR REPORT

                                        ;;*****************************************************************************
                                        ;THE FOLLOWING THREE MODULES ARE USED TO FORM UP EXPECTED VS RECEIVED DATA
                                        ;FOR TWO TYPES OF CASES.  THE FIRST IS WHEN THE PROGRAM TRIES TO SET A BIT
                                        ;AND THE BIT FAILS TO SET, AND THE SECOND IS WHEN THE BIT FAILS TO CLEAR.
                                        ;THE FORMER CASE IS HANDLED BY "BISEXP" AND THE LATTER BY "BICEXP".
                                        ;BOTH "BISEXP" AND "BICEXP" CALL "REGSET" TO PERFORM SOME PRELIMINARY
                                        ;DATA SETUP.  BOTH MODULES "BISEXP" AND "BICEXP" AFFECT THE FOLLOWING:
                                        ;"TESTRG", "EXPTED", "RCVED".
                                        ;;*****************************************************************************
```

```
                                BISEXP::MOV     @(SP),R2        ;GET THE POINTER TO THE FAILING REG.
                                        JSR     PC,REGSET       ;GO LOAD RESULTS
                                        ADD     #2,(SP)         ;MOVE THE POINTER TO GET THE BIT MASK
                                        BIS     @(SP),EXPTED    ;SET EXPECTED BIT WHICH FAILED
                                        ADD     #2,(SP)         ;MOVE THE POINTER FOR A RETURN
                                        RTS     PC              ;RETURN

                                BICEXP::MOV     @(SP),R2        ;GET THE POINTER TO THE FAILING REG.
                                        JSR     PC,REGSET       ;GO LOAD RESULTS
                                        ADD     #2,(SP)         ;MOVE THE POINTER TO GET THE MASK
                                        BIC     @(SP),EXPTED    ;CLEAR EXPECTED BIT WHICH FAILED
                                        ADD     #2,(SP)         ;MOVE THE POINTER TO TAKE A RETURN
                                        RTS     PC              ;NOW TAKE THE RETURN

                                REGSET: MOV     (R2),TESTRG     ;GET THE FAILING REGISTER
                                        MOV     (R2),R2         ;GET THE FAILING REGISTER
                                        MOV     (R2),RCVED      ;NOW GET ITS CONTENTS
                                        MOV     RCVED,EXPTED    ;AND FORM EXPECTED DATA
                                        RTS     PC              ;RETURN

                ;;*******************************************************************************
                ;THIS MODULE ISSUES A CONTROLLER CLEAR AND CHECKS THE REGISTER POINTED
                ;TO BY THE STACK WHEN THE MODULE WAS ORIGINALLY CALLED.  THE REGISTER
                ;IS CHECKED AGAINST LOCATION "MSK".  THE BITS IN MSK = 0 FOR THOSE BITS
                ;WHICH SHOULD HAVE CLEARED AFTER A CONTROLLER CLEAR.  IF THE BITS UNDER TEST
                ;DID NOT CLEAR, AN ERROR MESSAGE IS DISPATCHED BY THIS MODULE, REPORTING
                ;THE FAILING REGISTER, FAILING DATA, AND EXPECTED DATA.  THE RETURN
                ;ADDRESS IS MOVED OVER THE REGISTER UNDER TEST, AND CONTROLL IS AGAIN
                ;PASSED TO THE CALLING MODULE.  THIS MODULE AFFECTS: "TESTRG", "EXPTED",
                ;"RCVED".
                ;;*******************************************************************************

                RESET:  COM     MSK             ;INVERT THE BIT MASK, BITS TO TEST=1
                        MOV     R2,-(SP)        ;SAVE R2
                        MOV     @2(SP),R2       ;FORM ADDRESS OF REGISTER UNDER TEST
                        MOV     (R2),R2         ;GOT IT NOW!
                        BIS     #CLR,@RPCS2     ;SET RPCS2:CLR=1
                        BIT     MSK,(R2)        ;LOOK FOR BIT(S) UNTER TEST TO CLEAR
                        BEQ     1$              ;IF OK, SKIP ERROR DISPATCH
                        MOV     R2,TESTRG       ;LOAD THE FAILING ADDRESS
                        MOV     (R2),EXPTED     ;AND GET THE FAILING DATA
                        MOV     (R2),RCVED      ;AND SAVE IT
                        BIC     MSK,EXPTED      ;NOW FORM THE EXPECTED DATA
                        TRAP    C$ERHRD
                        .WORD   5
                        .WORD   EM15
                        .WORD   ERR0
                1$:     COM     MSK             ;BITS TO TEST=0
                        MOV     (SP)+,R2        ;RESTORE R2
                        ADD     #2,(SP)         ;MOVE RETURN ADDRESS OVER DATA FIELD
                        RTS     PC              ;RETURN
```

```
                        ;;*****************************************************************************
                        ;THIS MODULE, WITH EXTERNALLY SET-UP LINKAGE, WRITES THE REGISTER-UNDER
                        ;TEST TO A ZERO.  IF THE BITS UNDER TEST DO NOT CLEAR AS EXPECTED, AN
                        ;ERROR MESSAGE IS DISPATCHED IN THIS MODULE.  CONTPOL IS DETERMINED BY:
                        ;"ILOCK"; WHICH DETERMINES IF THE DEVICE MUST BE POLLED, IE "IR" OR "OR"
                        ;= 1 AND "MSK" WHICH CONTAINS THE BITS-UNDER-TEST = 0.  WHEN THE
                        ;MODULE IS CALLED, "SNK" SHOULD EQUAL THE ADDRESS OF THE REGISTER UNDER TEST.
                        ;THE OUTPUT OF THIS MODULE IS IN THREE VARIABLES: "TESTRG", "EXPTED", AND
                        ;"RCVED".
                        ;;*****************************************************************************

017572  005737  002460          LDZERO: TST     ILOCK           ;POLLED MODE?
017576  001402                          BEQ     1$              ;NOT IF ZERO
017600  004737  017672                  JSR     PC,IRLOCK       ;POLL AND WAIT FOR IR TO SET
017604  005077  162630          1$:     CLR     @SNK            ;WRITE 0'S TO THE REGISTER UNDER TEST
017610  005737  002460                  TST     ILOCK           ;POLLED MODE?
017614  001402                          BEQ     2$              ;NOT IF ZERO
017616  004737  017706                  JSR     PC,ORLOCK       ;OK, POLL FOR OR TO SET
017622  017737  162612  002452  2$:     MOV     @SNK,RCVED      ;GET THE TEST RESULTS
017630  043737  002450  002452          BIC     MSK,RCVED       ;STRIP OUT THE UNWANTED BITS
017636  013737  002450  002454          MOV     MSK,EXPTED      ;GET THE BIT MASK
017644  005137  002454                  COM     EXPTED          ;BITS-TO-TEST = 1
017650  033737  002454  002452          BIT     EXPTED,RCVED    ;NOW DO THE DATA COMPARISON
017656  001404                          BEQ     4$              ;BITS TO TEST = 0, OK!
017660  104456                          TRAP    C$ERHRD
017662  000006                          .WORD   6
017664  012523                          .WORD   EM15
017666  014172                          .WORD   ERR0
017670  000207                  4$:     RTS     PC              ;RETURN TO MAIN

                        ;;*****************************************************************************
                        ;THIS MODULE POLLS "IR" TO EQUAL A ONE AT SOME TIME.  THE ACTUAL TESTING
                        ;OF "IR" AGAINST A WATCHDOG TIMER IS NOT DONE HERE, BUT A SUPERVISOR CALL
                        ;IS ISSUED IN CASE "IR" NEVER SETS, AND THE DIAGNOSTIC HANGS.  THE DIAGNOSTIC
                        ;WILL RESPOND TO A CONTROL C WHILE IN THIS MODULE.
                        ;;*****************************************************************************

017672                  IRLOCK:
017672  104422                  TRAP    C$BRK
017674  032777  000100  162620          BIT     #IR,@RPCS2      ;POLL IR IN RPCS2
017702  001773                          BEQ     IRLOCK          ;AND WAIT FOR IT!
017704  000207                          RTS     PC              ;NOW RETURN TO CALLING SUBROUTINE

                        ;;*****************************************************************************
                        ;THIS MODULE POLLS "OR" AND WAITS FOR IT TO SET.  THE ACTUAL TESTING
                        ;OF "OR" AGAINST A WATCHDOG TIMER IS NOT DONE HERE, BUT A SUPERVISOR CALL
                        ;IS ISSUED IN CASE "OR NEVER SETS, AND THE DIAGNOSTIC HANGS.  THE DIAGNOSTIC
                        ;WILL RESPOND TO A CONTROL C WHILE IN THIS MODULE.
                        ;;*****************************************************************************

017706                  ORLOCK:
017706  104422                  TRAP    C$BRK
017710  032777  000200  162604          BIT     #OR,@RPCS2      ;POLL OR IN RPCS2
017716  001773                          BEQ     ORLOCK          ;AND WAIT FOR IT!
017720  000207                          RTS     PC              ;NOW RETURN TO CALLING SUBROUTINE
```

```
                                ;;*****************************************************************************
                                ;THIS MODULE, ONCE THE DRIVE HAS BEEN SEIZED, DOES A PRELOAD OF THE DRIVE.
                                ;A PRELOAD IS AN OPERATION WHEREIN THE DRIVE IS SET UP THROUGH USE OF A READ
                                ;IN PRESET COMMAND, AND SETTING FORMAT 16 = 1.  THERE ARE NO SIDE EFFECTS.
                                ;;*****************************************************************************

017722  004737  016662          PRELOD: JSR     PC,SEIZE        ;GET THE DRIVE'S ATTENTION
017726  012777  000021  162556          MOV     #RIP,@RPCS1     ;ISSUE A READ IN PRESET COMMAND
017734  052777  010000  162602          BIS     #FMT,@RPOF      ;16 BITS/WORD
017742  000207                          RTS     PC              ;RETURN

                                ;;*****************************************************************************
                                ;THIS MODULE DOES THE PARAMETER SETUP FOR "FLOAT", "LDZERO" AND "CONSET".
                                ;IT GETS ITS INPUT FROM A TABLE POINTED TO BY THE STACK WHEN THE
                                ;MODULE IS INITIALLY CALLED.  THIS TABLE CONTAINS THE DATA STRUCTURE
                                ;USED BY SOME TESTS.  CONTAINED WITHIN THE DATA STRUCTURES ARE
                                ;THE FOLLOWING:  1) THE REGISTER UNDER TEST, 2) THE BITS UNDER TEST, 3)
                                ;THE DATA PATTERNS TO USE, 4) THE NUMBER OF PATTERNS TO USE.
                                ;THE OUTPUT OF THIS MODULE IS IN: "MSK"; WHICH CONTAINS THE COMPLIMENTED
                                ;FORM OF THE BITS UNDER TEST, "PATCNT" WHICH CONTAINS THE NUMBER OF PATTERNS
                                ;TO USE, "MASK" WHICH CONTAINS THE NUMBER OF BITS TO TEST, "SRC"; WHICH
                                ;CONTAINS THE ADDRESS OF THE DATA PATTERN TO USE, "SNK"; WHICH CONTAINS
                                ;THE ADDRESS OF THE REGISTER TO TEST, "SCRTMP": WHICH IS LOADED FOR A
                                ;POSSIBLE ERROR CONDITION, "CSTORE" WHICH CONTAINS THE CARRY BIT FROM THE
                                ;LAST OPERATION (INITIALLY SET TO 0, INDICATING THE FIRST OPERATION).
                                ;;*****************************************************************************

017744  010246                  SETUP:  MOV     R2,-(SP)        ;SAVE R2
017746  005037  002432                  CLR     CSTORE          ;CLEAN CARRY STORE
017752  017602  000002                  MOV     @2(SP),R2       ;GET TABLE ADDRESS
017756  012237  002434                  MOV     (R2)+,PATCNT    ;GET THE # OF PATTERNS TO RUN
017762  013237  002440                  MOV     @(R2)+,SNK      ;ADDRESS:REGISTER TO TEST
017766  013737  002440  002456          MOV     SNK,TESTRG      ;ADDRESS = REGISTER UNDER TEST
017774  012237  002446                  MOV     (R2)+,MASK      ;BITS TO TEST
020000  011237  002442                  MOV     (R2),SRC        ;TEST PATTERN
020004  017737  162432  002444          MOV     @SRC,SRCTMP     ;BUFFER TO DIDDLE THE BITS
020012  013737  002446  002450          MOV     MASK,MSK        ;GET THE BITS TO STRIP OUT
020020  005137  002450                  COM     MSK             ;DON'T CARE BITS = 1
020024  012602                          MOV     (SP)+,R2        ;RESTORE R2
020026  062716  000002                  ADD     #2,(SP)         ;MODIFY RETURN OVER DATA FIELD
020032  000207                          RTS     PC              ;RETURN

                                ;;*****************************************************************************
                                ;THIS MODULE GENERATES A BIT WHICH IS FLOATED THROUGH A SELECTED REGISTER
                                ;UNDER TEST.  IT IS SETUP THROUGH THE MODULE "SETUP".  IF ERRORS ARE DETECTED,
                                ;IT WILL DISPATCH AN APPROPRIATE ERROR MESSAGE.  THIS MODULE EFFECTS THE
                                ;FOLLOWING VARIABLES:  "MASK", "CSTORE", "SRCTMP", "RCVED", "EXPTED".
                                ;;*****************************************************************************

020034  013746  002444          FLOAT:  MOV     SRCTMP,-(SP)    ;PUT PATTERN ON STACK
020040  063716  002432                  ADD     CSTORE,(SP)     ;ADD CARRY FROM LAST ROTATE
020044  043716  002450                  BIC     MSK,(SP)        ;CLEAR OUT UNWANTED BITS
020050  011637  002454                  MOV     (SP),EXPTED     ;GET THE EXPECTED DATA
020054  005737  002460                  TST     ILOCK           ;SHOULD WE POLL IR/OR??
020060  001402                          BEQ     1$              ;NO, JUST DO THE LOAD FUNCTION
020062  004737  017672                  JSR     PC,IRLOCK       ;GO-AHEAD AND POLL FOR IR = 1
```

```
 58 020066  011677  162346          1$:     MOV     (SP),@SNK       ;WRITE DATA TO REG UNDER TEST
 59 020072  005737  002460                  TST     ILOCK           ;SHOULD WE POLL FOR OR = 1?
 60 020076  001402                          BEQ     2$              ;NO, JUST GET RESULTS
 61 020100  004737  017706                  JSR     PC,ORLOCK       ;OK, POLL FOR OR = 1
 62 020104  017746  162330          2$:     MOV     @SNK,-(SP)      ;GET THE RESULTS
 63 020110  043716  002450                  BIC     MSK,(SP)        ;STRIP UNWANTED DATA
 64 020114  011637  002452                  MOV     (SP),RCVED      ;AND SAVE FOR POSSIBLE ERROR REPORT
 65 020120  022626                          CMP     (SP)+,(SP)+     ;LOOK FOR MATCH
 66 020122  001411                          BEQ     5$              ;IF MATCH, SKIP ERROR DISPATCH
 67 020124  062716  000002                  ADD     #2,(SP)         ;ERROR, MODIFY RETURN FOR ERROR LOOP
 68 020130  005037  002446                  CLR     MASK            ;MASK = 0 FOR PREMATURE EXIT
 69 020134  104456                          TRAP    C$ERHRD
    020136  000007                          .WORD   7
    020140  012454                          .WORD   EM14
    020142  014172                          .WORD   ERR0
 70 020144  000207          4$:     RTS     PC                      ;RETURN
 71 020146  000241          5$:     CLC                             ;CARRY = 0
 72 020150  006137  002446                  ROL     MASK            ;REDUCE THE ITERATION COUNT BY ONE
 73 020154  000241                          CLC                     ;CARRY = 0
 74 020156  006137  002444                  ROL     SRCTMP          ;ROTATE PATTERN
 75 020162  103403                          BCS     6$              ;OBSERVE & SAVE CARRY
 76 020164  005037  002432                  CLR     CSTORE          ;CARRY=0
 77 020170  000765                          BR      4$              ;RETURN
 78 020172  012737  000001  002432  6$:     MOV     #1,CSTORE       ;CARRY = 1
 79 020200  000761                          BR      4$              ;RETURN
 80
 81                                 ;;*************************************************************************
 82                                 ;THIS MODULE DOES SOME DATA COMPARISON.  IF THE DATA DOES NOT MATCH,
 83                                 ;AN ERROR MESSAGE AND APPROPRIATE DATA ARE REPORTED.  VARIABLES AFFECTED ARE:
 84                                 ;"PSTACK", "TESTRG", "RCVED", "EXPTED".
 85                                 ;;*************************************************************************
 86
 87 020202  010246          COMPAR: MOV     R2,-(SP)        ;SAVE R2
 88 020204  012702  002652          MOV     #PSTACK,R2      ;GET THE SOFTWARE PSTACK ADDRESS
 89 020210  017612  000002          MOV     @2(SP),(R2)     ;GET THE ADDRESS OF THE DATA PATTERN TO RUN
 90 020214  013242                  MOV     @(R2)+,-(R2)    ;NOW GET THE DATA PATTERN TO USE
 91 020216  043712  002450          BIC     MSK,(R2)        ;THROW OUT UNUSED DATA
 92 020222  011237  002454          MOV     (R2),EXPTED     ;AND SAVE EXPECTED RESULTS FOR POSSIBLE ERROR
 93 020226  005737  002460          TST     ILOCK           ;POLL IR/OR MODE?
 94 020232  001402                  BEQ     1$              ;NO, JUST GO-ON
 95 020234  004737  017672          JSR     PC,IRLOCK       ;WAIT FOR IR TO SET, IT REALLY WILL!
 96 020240  012277  162174  1$:     MOV     (R2)+,@SNK      ;WRITE DATA TO THE REGISTER
 97 020244  005737  002460          TST     ILOCK           ;POLL IR/OR MODE?
 98 020250  001402                  BEQ     2$              ;NOT IF ZERO
 99 020252  004737  017706          JSR     PC,ORLOCK       ;WAIT FOR OR TO SET, IT REALLY WILL!
100 020256  017712  162156  2$:     MOV     @SNK,(R2)       ;GET THE RESULTS
101 020262  043712  002450          BIC     MSK,(R2)        ;IGNORE UNUSED DATA
102 020266  013737  002440  002456  MOV     SNK,TESTRG      ;SAVE REGISTER UNDER TEST
103 020274  011237  002452          MOV     (R2),RCVED      ;AND THE REGISTER DATA
104 020300  021242                  CMP     (R2),-(R2)      ;CHECK RESULTS
105 020302  001406                  BEQ     4$              ;OK, SKIP ERROR REPORT
106 020304  104456                  TRAP    C$ERHRD
    020306  000004                  .WORD   4
    020310  012454                  .WORD   EM14
    020312  014172                  .WORD   ERR0
107 020314  005037  002402          CLR     ITCOUN          ;SET ITERATIONS TO 0
108 020320  012602          4$:     MOV     (SP)+,R2        ;RESTORE R2
```

```
    109 020322  062716  000002                  ADD     #2,(SP)         ;MOVE RETURN OVER DATA INPUT
    110 020326  000207                          RTS     PC              ;NOW RETURN TO MAIN
    111
    112                                 ;;**************************************************************************
    113                                 ;THIS MODULE IS USED TO CONTINUE A SETUP PROCEDURE BETWEEN SUBTESTS
    114                                 ;WITHIN A DIAGNOSTIC TEST.  IT AFFECTS THE FOLLOWING VARIABLES:  "PATCNT",
    115                                 ;"CSTORE", "MASK", "SRCTMP", "SRC".
    116                                 ;;**************************************************************************
    117
    118 020330  005337  002434          CONSET: DEC     PATCNT          ;ONE LESS PATTERN TO GO
    119 020334  100415                          BMI     1$              ;UNDERFLOW, WE'RE FINISHED!
    120 020336  005037  002432                  CLR     CSTORE          ;CLEAR CARR, STORE
    121 020342  062737  000002  002442          ADD     #2,SRC          ;GET NEXT PATTERN
    122 020350  013737  002450  002446          MOV     MSK,MASK        ;RELOAD # OF BITS TO TEST
    123 020356  005137  002446                  COM     MASK            ;CORRECT THE INVERSION (BITS TESTED=1)
    124 020362  017737  162054  002444          MOV     @SRC,SRCTMP     ;LOAD THE BUFFER FOR BIT MANIPULATION
    125 020370  000207                  1$:     RTS     PC              ;RETURN
```

```
                                ;;*****************************************************************************
                                ;THIS MODULE IS USED IN THE EVENT OF A POWER FAIL.  IT WAITS FOR DRIVE
                                ;READY TO SET BEFORE RETURNING TO THE MAIN CODE.  IT MAINTAINS A TIMER
                                ;WHICH PERIODICALLY INFORMS THE USER THAT DRIVE READY HAS NOT YET SET, AND
                                ;THE PROGRAM IS WAITING FOR IT TO SET BEFORE CONTINUING THE TESTS.
                                ;;*****************************************************************************

 020372  010146                 WATDRY: MOV     R1,-(SP)        ;SAVE R1
 020374  012701  000062         1$:     MOV     #50.,R1         ;GET AN ITERATION COUNT
 020400  013777  002506  162114         MOV     DRVNO,@RPCS2    ;LOAD THE UNIT UNDER TEST
 020406  032777  010000  162110 2$:     BIT     #MOL,@RPDS      ;MEDIUM ON LINE?
 020414  001017                         BNE     3$              ;IF = 1, YES
 020416  004737  017000                 JSR     PC,WAIT         ;STALL FOR A WHILE
 020422  005301                         DEC     R1              ;ONE LESS ITERATION TO-GO
 020424  003370                         BGT     2$              ;DO UNTIL R1 = 0
 020426  013746  002506                 MOV     DRVNO,-(SP)
 020432  012746  006577                 MOV     #MESG10,-(SP)
 020436  012746  000002                 MOV     #2,-(SP)
 020442  010600                         MOV     SP,R0
 020444  104417                         TRAP    C$PNTF
 020446  062706  000006                 ADD     #6,SP
 020452  000750                         BR      1$              ;AND LOOP

 020454  012701  000062         3$:     MOV     #50.,R1         ;GET AN ITERATION COUNT
 020460  032777  000200  162036 4$:     BIT     #DRY,@RPDS      ;IS DRIVE READY SET?
 020466  001017                         BNE     5$              ;YES, GO-ON
 020470  004737  017000                 JSR     PC,WAIT         ;STALL FOR A WHILE
 020474  005301                         DEC     R1              ;ONE LESS ITERATION TO-GO
 020476  003370                         BGT     4$              ;DO UNTIL R1 = 0
 020500  013746  002506                 MOV     DRVNO,-(SP)
 020504  012746  006671                 MOV     #MESG11,-(SP)
 020510  012746  000002                 MOV     #2,-(SP)
 020514  010600                         MOV     SP,R0
 020516  104417                         TRAP    C$PNTF
 020520  062706  000006                 ADD     #6,SP
 020524  000753                         BR      3$              ;AND LOOP

 020526  012601                 5$:     MOV     (SP)+,R1        ;RESTORE R1
 020530  000207                         RTS     PC              ;EXIT
```

```
                                ;;*****************************************************************************
                                ;THIS MODULE DECODES TWO VARIABLES: "ERRWD1" AND "ERRWD2".  CONTAINED
                                ;WITHIN THESE TWO VARIABLES ARE BITS WHICH REPRESENT THE VARIOUS MODULES
                                ;WHICH ARE TO BE CALLED OUT FOR DIAGNOSTIC TEST FAILURES.  AFTER THE
                                ;DECODING IS DONE, THE MODULE CREATED AN ASCII DISPATCH TABLE WHICH
                                ;POINTS TO THE VARIOUS ASCII MESSAGES REPRESENTING THE ACTUAL MODULE CALLOUT.
                                ;;*****************************************************************************

020532  012700  002404        DECODL: MOV     #ERRWD1,R0      ;GET THE FIRST ERROR WORD STATUS
020536  012702  004060                MOV     #MCUTAB,R2      ;GET THE MODULE CALL OUT INDEX FILE
020542  012703  002676                MOV     #MCUTXT,R3      ;NOW GET THE OUTPUT POINTER FILE
020546  012705  000002                MOV     #2,R5           ;WE'RE DOING 2 ERROR WORD MASKS!
020552  012704  000015                MOV     #13.,R4         ;AND WE'RE CREATING 13. MESSAGE FILES!
020556  012701  000001        1$:     MOV     #BIT0,R1        ;FORM THE INITIAL BIT MASK
020562  030110                2$:     BIT     R1,(R0)         ;IS THIS BIT "ON"??
020564  001402                        BEQ     3$              ;NO, DON'T DO ANYTHING NOW!
020566  011223                        MOV     (R2),(R3)+      ;GET THIS MESSAGE!
020570  005304                        DEC     R4              ;ONE LESS MESSAGE TO GET!
020572  005722                3$:     TST     (R2)+           ;NEXT INPUT MESSAGE PLEASE...
020574  006301                        ASL     R1              ;MOV MASK OVER FOR NEXT FIND...
020576  001371                        BNE     2$              ;KEEP GOING IF NOT ZERO
020600  005305                        DEC     R5              ;NEXT ERROR WORD STATUS ?
020602  001402                        BEQ     4$              ;IF ZERO, DONE WITH SEARCH
020604  005720                        TST     (R0)+           ;NEXT ERROR WORD PLEASE..
020606  000763                        BR      1$              ;NOW SCAN THIS WORD!
020610  005704                4$:     TST     R4              ;DID WE LOAD 7 MESSAGES?
020612  001403                        BEQ     6$              ;YES, JUST LOAD POINTER AND RETURN
020614  005023                5$:     CLR     (R3)+           ;CREATE THE NULL MESSAGE FILE
020616  005304                        DEC     R4              ;DONE?
020620  003375                        BGT     5$              ;NOT IF > 0!
020622  012702  002676        6$:     MOV     #MCUTXT,R2      ;LOAD THE OUTPUT POINTER NOW, WE'RE DONE!
020626  000207                        RTS     PC              ;TAKE THE RETURN

                                ;;*****************************************************************************
                                ;THIS IS A SIMPLE INTERRUPT ROUTINE WHICH TALLYS THE NUMBER OF INTERRUPTS
                                ;RECEIVED FOR ANY SELECTED OPERATION.
                                ;;*****************************************************************************
020630                          INTSRV::
020630  005237  002462                INC     INTFLG          ;COUNT THIS INTERRUPT
020634                          L10007:
020634  000002                        RTI
```

```
                                .SBTTL  REPORT CODING SECTION

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

020636                          L$RPT::

020636  000167                          .WORD   J$JMP
020640  000000                          .WORD   L10010-2-.

                                        .EVEN

020642                          L10010:
020642  104425                          TRAP    C$RPT
```

```
                                .SBTTL  PROTECTION TABLE

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

020644                          L$PROT::
020644  000000                          0               ;P-TABLE OFFSET OF CSR
020646  177777                          -1              ;NOT A MASSBUS DEVICE
020650  000006                          6               ;P-TABLE OFFSET DRIVE #
```

```
                                .SBTTL  INITIALIZE SECTION

                                ;++
                                ; THE INITIALIZE SECTION CONTAINS THE CODING THAT IS PERFORMED
                                ; AT THE BEGINNING OF EACH PASS.
                                ;--

020652                          L$INIT::
                                                        ;RESET THE WORLD
020652  104433                          TRAP    C$RESET
                                                        ;POWER UP SEQUENCE ?
020654  012700  000034                  MOV     #EF.PWR,R0
020660  104447                          TRAP    C$REFG
                                                        ;GO TO 5$ IF YES
020662  103504                          BCS     5$
                                                        ;CONTINUE COMMAND ?
020664  012700  000036                  MOV     #EF.CON,R0
020670  104447                          TRAP    C$REFG
                                                        ;GO TO 1$ IF NO, ELSE
020672  103002                          BCC     1$
                                                        ;EXIT INIT
020674  104432                          TRAP    C$EXIT
020676  000446                          .WORD   L10012-.
020700                          1$:                     ;'STA', 'RES' OR 'NEW PASS' ?
020700  012700  000035                  MOV     #EF.NEW,R0
020704  104447                          TRAP    C$REFG
                                                        ;GO TO 2$ IF NO, MUST BE NEW 'SUB-PASS'
020706  103015                          BCC     2$
020710  005037  002422                  CLR     ROUTDO          ;ALLOW A NEW USER SELECTED MICRO DIAGNOSTIC SELECTION
                                                        ;CR-LF
020714  012746  006420                  MOV     #CRLF,-(SP)
020720  012746  000001                  MOV     #1,-(SP)
020724  010600                          MOV     SP,R0
020726  104417                          TRAP    C$PNTF
020730  062706  000004                  ADD     #4,SP
020734  012737  177777  002472          MOV     #-1,UNIT        ;RESET UNIT COUNT
020742  005237  002472          2$:     INC     UNIT            ;GET NEXT UNIT NUMBER FOR TESTING
020746  012702  000024                  MOV     #20.,R2         ;RH/RP REGISTER COUNT
020752  012703  002512                  MOV     #RPCS1,R3       ;DATA SINK
                                                        ;GET UNIT FROM HARDWARE P-TABLE
020756  013700  002472                  MOV     UNIT,R0
020762  104442                          TRAP    C$GPHRD
020764  010005                          MOV     R0,R5
020766  103365                          BCC     2$
020770  011346                          MOV     (R3),-(SP)      ;SAVE R3
020772  011546                          MOV     (R5),-(SP)      ;AND THE BASE ADDRESS
020774  166616  000002                  SUB     2(SP),(SP)      ;DERIVE NEW ADDRESS
021000  061623                  3$:     ADD     (SP),(R3)+      ;LOG IT IN NEW TABLE
021002  005302                          DEC     R2              ;COUNT LOGGING
021004  001375                          BNE     3$              ;R2 NOT ZERO, CONTINUE LOGGING
021006  004737  014700                  JSR     PC,SIZE70       ;SEE IF RH70 IS PRESENT
021012  005737  002504                  TST     RHTYPE          ;IS IT AN RH70 ?
021016  001406                          BEQ     4$              ;BR IF NO
021020  013702  002502                  MOV     RHEXT,R2        ;GET RPBAE OFFSET
021024  061502                          ADD     (R5),R2         ;ADD BASE ADDRESS TO OFFSET
021026  010223                          MOV     R2,(R3)+        ;SAVE NEW RPBAE
021030  005722                          TST     (R2)+           ;ADD 2
```

```
                                                MOV     R2,(R3)         ;SAVE NEW RPCS3
                                                
                                        4$:     CMP     (SP)+,(SP)+     ;RESTORE STACK
                                                MOV     (R5)+,RPADR     ;SAVE RPCS1 BASE ADDRESS
                                                MOV     (R5)+,RPVEC     ;SAVE INTERUPT VECTOR ADDRESS
                                                MOV     (R5)+,RPVEC+2   ;SAVE INTERUPT PRIORITY
                                                MOV     (R5),DRVNO      ;SETUP DRIVE NUMBER FOR UNIT N
                                                MOV     ENDTRK,LASTRK   ;SET UP THE LAST USABLE TRACK
                                                MOV     ENDCYL,LASCYL   ;AND THE LAST USABLE CYLINDER
                                                BR      6$
                                                
                                        5$:     JSR     PC,WATDRY       ;PWR FAIL, WAIT FOR THE DRIVE TO GO READY
                                        6$:     CLR     ERRWD1          ;NO ERROR STATUS BITS
                                                CLR     ERRWD2          ;FOR BOTH MASKS
                                                CLR     ILOCK           ;START WITHOUT IR/OR INTERLOCK
                                                CLR     INTFLG          ;RESET THE INTERRUPT COUNTER
                                                CLR     UNABLE          ;INSURE THAT UNIT IS ENABLED
                                                CLR     ERSTAT          ;NO FAIL STATUS
                                                CLR     FUNCTN          ;START UP WITH NO FUNCTION CODE
                                                MOV     #CLR,@RPCS2     ;MASSBUS INIT TO CLEAR IMPENDING INTERRUPTS
                                                MOV     DRVNO,R1        ;GET THE DRIVE NUMBER
                                                MOV     R1,@RPCS2       ;SELECT DRIVE
                                                CLR     BITPOS          ;CLEAR ATTENTION BIT POSITION WORD
                                                MOVB    ATABIT(R1),BITPOS       ;GET ATA BIT POSITION FOR THIS DRIVE
                                                JSR     PC,ST.CLK       ;START THE CLOCK
                                                MOV     #2000.,-(SP)    ;WAIT 2000. MS
                                                JSR     PC,WAITMS
                                                
                                                ;PRINT DRIVE SERIAL NUMBER
                                                
                                                MOV     #4,R1           ;4 DIGITS
                                                MOV     DRVNO,-(SP)
                                                MOV     #DSNMSG,-(SP)
                                                MOV     #2,-(SP)
                                                MOV     SP,R0
                                                TRAP    C$PNTF
                                                ADD     #6,SP
                                                MOV     @RPSN,-(SP)     ;FETCH S/N
                                        7$:     CLR     R2              ;ZERO OUTPUT
                                                ROL     (SP)            ;PUT NEXT DIGIT INTO R2
                                                ROL     R2
                                                ROL     (SP)
                                                ROL     R2
                                                ROL     (SP)
                                                ROL     R2
                                                ROL     (SP)
                                                ROL     R2
                                                ADD     #'0,R2          ;MAKE RESULT ASCII
                                                MOV     R2,DRVSN        ;SAVE R2 FOR PRINT
                                                MOV     #DRVSN,-(SP)
                                                MOV     #SNDIGT,-(SP)
                                                MOV     #2,-(SP)
                                                MOV     SP,R0
                                                TRAP    C$PNTF
                                                ADD     #6,SP
                                                DEC     R1              ;COUNT DOWN DIGIT
                                                BGT     7$              ;NEXT DIGIT
```

```
     98 021316  005726                          TST     (SP)+           ;RESTORE STACK
     99                                                                 ;CR-LF
    100 021320  012746  006420                   MOV     #CRLF,-(SP)
        021324  012746  000001                   MOV     #1,-(SP)
        021330  010600                           MOV     SP,R0
        021332  104417                           TRAP    C$PNTF
        021334  062706  000004                   ADD     #4,SP
    101
    125
    126 021340  104432                           TRAP    C$EXIT
        021342  000002                           .WORD   L10012-.
    127
    139                                          .EVEN
    140
    141 021344                          L10012:
        021344  104411                           TRAP    C$INIT
```

```
                                .SBTTL  AUTODROP SECTION

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

021346                          L$AUTO::

021346                          L10013:
021346  104461                         TRAP    C$AUTO
```

```
                                .SBTTL  CLEANUP CODING SECTION

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

021350                          L$CLEAN::
021350  005037  002404                  CLR     ERRWD1          ;AND ANY LEFT-OVER ERROR STATUS
021354  005037  002406                  CLR     ERRWD2          ;FOR BOTH MASKS!
021360  005037  002466                  CLR     ERSTAT          ;SET FOR PASS STATUS
021364  005037  002430                  CLR     FASTAT          ;ENSURE THAT 'INTERNAL' FAILED STATUS = 0
021370  005037  002464                  CLR     UNABLE          ;INSURE THAT UNIT IS ENABLED
021374  022737  000035  002420          CMP     #DIAG,FUNCTN    ;WAS LAST COMMAND A DIAGNOSTIC COMMAND?
021402  001002                  BNE     1$              ;IF SO, TAKE THE BRANCH
021404  004737  015312                  JSR     PC,DIAGEN       ;AND ENSURE THAT THE UNIT ISN'T IN DIAGNOSTIC MODE
021410                          1$:                     ;SET PRIORITY TO 7
021410  012700  000340                  MOV     #PRI07,R0
021414  104441                  TRAP    C$SPRI
021416  004737  016054                  JSR     PC,STOPCK       ;STOP CLOCK
021422  012777  000040  161072          MOV     #CLR,@RPCS2     ;MASSBUS INIT TO CLEAR IMPENDING INTERRUPTS
021430  013777  002506  161064          MOV     DRVNO,@RPCS2    ;GET DRIVE NUMBER
021436  005737  002426                  TST     CLKSTA          ;RELEASE APPROPRIATE CLOCK VECTOR
021442  001410                  BEQ     3$              ;NO CLOCK, SKIP
021444  100404                  BMI     2$              ;L-CLK
                                                        ;P-CLK VECTOR RELEASE
021446  013700  015734                  MOV     PKV,R0
021452  104436                  TRAP    C$CVEC
021454  000403                  BR      3$
                                                        ;L-CLK VECTOR RELEASE
021456                          2$.
021456  013700  015744                  MOV     LKV,R0
021462  104436                  TRAP    C$CVEC
021464                          3$:                     ;RP07 VECTOR RELEASE
021464  013700  002476                  MOV     RPVEC,R0
021470  104436                  TRAP    C$CVEC


021472  104432                  TRAP    C$EXIT
021474  000002                  .WORD   L10014-.


                                .EVEN


021476                          L10014:
021476  104412                  TRAP    C$CLEAN
```

```
                        .SBTTL  DROP UNIT SECTION

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

021500                  L$DU::

021500  000167                  .WORD   J$JMP
021502  000000                  .WORD   L10015-2-.

                                .EVEN

021504                  L10015:
021504  104453                  TRAP    C$DU
```

```
                                .SBTTL  ADD UNIT SECTION

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

021506                          L$AU::

021506  000167                          .WORD   J$JMP
021510  000000                          .WORD   L10016-2-.

                                        .EVEN

021512                          L10016:
021512  104452                          TRAP    C$AU
```

```
      2                               .SBTTL  HARDWARE TESTS
```

```
                                        .SBTTL  TEST 1  UNIT UNDER TEST
                                        ;%      TEST 01  UNIT UNDER TEST
                                        ;%      :  GET CSR ADDRESS AND ACCESS THE CONTROLLER
                                        ;%      :  IF DEVICE DOESN'T RESPND
                                        ;%      :  :  THEN
                                        ;%      :  :  OUTPUT ERROR MESSAGE (NO SSYNC, DEVICE NOT PRESENT)
                                        ;%      :  ENDIF
                                        ;%      END TEST 01
021514                                  T1::
021514  012737  000012  002402                  MOV     #10.,ITCOUN     ;LOAD THE OVERALL ITERATION COUNTER
021522                                  1$:
021522  012746  000240                          MOV     #240,-(SP)
021526  012746  021564                          MOV     #2$,-(SP)
021532  012746  000004                          MOV     #4,-(SP)
021536  012746  000003                          MOV     #3,-(SP)
021542  104437                                  TRAP    C$SVEC
021544  062706  000010                          ADD     #10,SP
021550  005777  160736                          TST     @RPCS1          ;ACCESS THE CONTROLLER
021554  012700  000004                          MOV     #4,R0
021560  104436                                  TRAP    C$CVEC
021562  000407                                  BR      3$
021564  022626                  2$:             CMP     (SP)+,(SP)+     ;RESTORE THE STACK, DEVICE DIDN'T RESPOND
021566  104456                                  TRAP    C$ERHRD
021570  000001                                  .WORD   1
021572  012272                                  .WORD   EM11
021574  000000                                  .WORD   0
021576  005037  002402                  3$:     CLR     ITCOUN          ;SET ITERATIONS TO 0
021602  005337  002402                          DEC     ITCOUN          ;ONE LESS ITERATION TO GO
021606  003345                                  BGT     1$              ;KEEP GOING UNTIL = 0!
021610                                  L10017:
021610  104401                                  TRAP    C$ETST
```

```
                                        .SBTTL  TEST 2  RP CLEAR TEST
                                        ;
                                        ;%      TEST 02  RPCLEAR TEST
                                        ;%      :  WRITE RPBA = #-2
                                        ;%      :  GET CONTENTS OF RPBA AND STORE THEM
                                        ;%      :  IF RPBA = 0
                                        ;%      :  :  THEN
                                        ;%      :  :  OUTPUT ERROR MESSAGE (RPBA DIDN'T SET)
                                        ;%      :  :  ELSE
                                        ;%      :  :  SET RPCS2:  CLR (BIT 05) = 1
                                        ;%      :  ENDIF
                                        ;%      :  COMPARE RPBA WITH STORED VALUE
                                        ;%      :  IF RPBA DID NOT CHANGE
                                        ;%      :  :  THEN
                                        ;%      :  :  OUTPUT ERROR MESSAGE (DEVICE CLEAR DID NOT FUNCTION)
                                        ;%      :  ENDIF
                                        ;%      END TEST 02
                                        ;
021612                                  T2::
021612  012737  000012  002402                  MOV     #10.,ITCOUN     ;LOAD THE OVERALL ITERATION COUNT
021620                                  1$:
021620  104404                                TRAP    C$BSEG
021622  013777  002346  160666                MOV     PATT2,@RPBA     ;LOAD UP RPBA WITH ALL ONES
021630  005777  160662                        TST     @RPBA           ;SEE IF ANY BIT SET
021634  001024                                BNE     2$              ;IF ANY BITS SET, TAKE BRANCH
021636  013737  002516  002456                MOV     RPBA,TESTRG     ;SAVE THE ADDRESS OF THE REGISTER UNDER TEST
021644  017737  160646  002452                MOV     @RPBA,RCVED     ;AND ITS CONTENTS
021652  013737  002346  002454                MOV     PATT2,EXPTED    ;NOW GET THE EXPECTED RESULTS
021660  005037  002404                        CLR     ERRWD1          ;NO RP07 MODULE CALLOUT
021664  012737  000002  002406                MOV     #BIT1,ERRWD2    ;JUST CALLOUT THE CONTROLLER
021672  104456                                TRAP    C$ERHRD
021674  000002                                .WORD   2
021676  012776                                .WORD   EM22
021700  014172                                .WORD   ERRO
021702  005037  0024C2                        CLR     ITCOUN          ;ITERATIONS = 0
021706                                  2$:
021706                                  10000$:
021706  104405                                TRAP    C$ESEG
021710  104404                                TRAP    C$BSEG
021712  017746  160600                        MOV     @RPBA,-(SP)     ;SAVE RPBA FOR COMPARISON
021716  052777  000040  160576                BIS     #CLR,@RPCS2     ;ISSUE DEVICE CLEAR
021724  027726  160566                        CMP     @RPBA,(SP)+     ;COMPARE PRESENT RPBA STATE WITH RPBA LAST STATE
021730  001016                                BNE     3$              ;TAKE BRANCH IF A CHANGE OCCURRED
021732  005037  002454                        CLR     EXPTED          ;FORM THE EXPECTED DATA
021736  013737  002516  002456                MOV     RPBA,TESTRG     ;GET ADDRESS OF FAILING REGISTER
021744  017737  160546  002452                MOV     @RPBA,RCVED     ;AND THE CONTENTS OF RPBA
021752  104456                                TRAP    C$ERHRD
021754  000003                                .WORD   3
021756  012410                                .WORD   EM13
021760  014172                                .WORD   ERRO
021762  00503?  002402                        CLR     ITCOUN          ;ITERATIONS = 0
021766                                  3$:
021766                                  10001$:
021766  104405                                TRAP    C$ESEG
021770  005337  002402                        DEC     ITCOUN          ;ONE LESS ITERATION TO-GO
021774  003311                                BGT     1$              ;IF NOT 0, KEEP GOING!
021776                                  L10020:
```

```
        021??o  104401                          TRAP    C$ETST
```

```
                                .SBTTL  TEST 3  RPCS2 READ WRITE TEST

                                ;%      TEST 03  RPCS2 READ-WRITE TEST
                                ;%      :  WRITE RPCS2 WITH DATA PATTERNS 1-4, ONE AT A TIME
                                ;%      :  BITS TO TEST = 0..2
                                ;%      :  IF RPCS2 DOES NOT MATCH PATTERN
                                ;%      :  :  THEN
                                ;%      :  :  OUTPUT ERROR MESSAGE (BIT UNDER TEST DID-NOT SET)
                                ;%      :  :  ELSE
                                ;%      :  :  SET RPCS2:  CLR = 1
                                ;%      :  ENDIF
                                ;%      :  IF RPCS2 BIT UNDER TEST DID NOT CLEAR
                                ;%      :  :  THEN OUTPUT ERROR MESSAGE (BIT DIDN'T CLEAR WITH DEVICE CLEAR)
                                ;%      :  ENDIF
                                ;%      END TEST 03

022000                          T3::
022000  012737  000002  002406          MOV     #BIT1,ERRWD2    ;SET UP THE MODULE CALLOUT (JUST-IN-CASE)
022006  005037  002404                  CLR     ERRWD1          ;NO MODULE CALLOUT FOR THE DRIVE
022012  012737  000012  002402          MOV     #10.,ITCOUN     ;LOAD THE OVERALL ITERATION COUNT
022020                          1$:
022020  004737  017744                  JSR     PC,SETUP        ;LOAD I/O POINTERS
022024  004160                          TST03                   ;FROM THIS TABLE
022026  013737  002444  002436  64$:    MOV     SRCTMP,TEMP     ;SET UP FOR POSSIBLE LOOP
022034  104404                          TRAP    C$BSEG
022036  004737  020034                  JSR     PC,FLOAT        ;FLOAT THE PATTERN
022042  000403                          BR      65$             ;PATTERN FLOATED OK, SKIP ERROR DSPATCH
022044  013737  002436  002444          MOV     TEMP,SRCTMP     ;RESTORE THE OLD DATA PATTERN FOR ERROR LOOP
022052                          65$:
022052                          10000$:
022052  104405                          TRAP    C$ESEG
022054  005737  002446                  TST     MASK            ;IF MASK = 0, WE'RE DONE
022060  001362                          BNE     64$
022062  004737  020330                  JSR     PC,CONSET       ;GET NEXT PATTERN
022066  005737  002434                  TST     PATCNT          ;IF PATTERN COUNT UNDERFLOWED, DONE!
022072  002355                          BGE     64$             ;NOT DONE YET, GO-ON
022074  104404                          TRAP    C$BSEG
022076  004737  020202                  JSR     PC,COMPAR       ;WRITE THE NEXT PATTERN
022102  002352                          PATT4                   ;WHICH IS PATTERN #4
022104                          10001$:
022104  104405                          TRAP    C$ESEG
022106  104404                          TRAP    C$BSEG
022110  104404                          TRAP    C$BSEG
022112  004737  020202                  JSR     PC,COMPAR       ;DO ANOTHER DATA COMPARISON
022116  002350                          PATT3                   ;USING PATTERN #3
022120                          10003$:
022120  104405                          TRAP    C$ESEG
022122  004737  017474                  JSR     PC,RESET        ;RESET THE DEVICE
022126  002522                          RPCS2                   ;CLEAR RPCS2 BY SETTING MASSBUS CLEAR
022130                          10002$:
022130  104405                          TRAP    C$ESEG
022132  005337  002402                  DEC     ITCOUNT         ;ONE LESS ITERATION TO-GO
022136  003330                          BGT     1$              ;KEEP GOING IF NOT ZERO
022140                          L10021:
022140  104401                          TRAP    C$ETST
```

```
                                        .SBTTL  TEST 4  RPWC READ WRITE TEST
                                        ;%      TEST 04  RPWC READ-WRITE TEST
                                        ;%      :  WRITE RPWC WITH DATA PATTERNS 1..4
                                        ;%      :  BITS TO TEST = 1..15
                                        ;%      :  IF RPWC BIT UNDER TEST DOESN'T MATCH EXPECTED
                                        ;%      :  :  THEN
                                        ;%      :  :  OUTPUT ERROR MESSAGE (BIT UNDER TEST DID NOT SET)
                                        ;%      :  :  ELSE
                                        ;%      :  :  WRITE RPWC = 0
                                        ;%      :  ENDIF
                                        ;%      :  IF RPWC BIT(S) UNDER TEST DID NOT CLEAR
                                        ;%      :  :  THEN
                                        ;%      :  :  OUTPUT ERROR MESSAGE (BIT(S) DIDN'T CLEAR WHEN EXPECTED)
                                        ;%      :  ENDIF
                                        ;%      END TEST 04

022142                                  T4::
022142  005037  002404                          CLR     ERRWD1          ;MODULE CALLOUT
022146  012737  000002  002406                  MOV     #BIT1,ERRWD2    ;FOR THIS TEST
022154  012737  000012  002402                  MOV     #10.,ITCOUN     ;LOAD THE OVERALL ITERATION COUNT
022162                                  1$:
022162  004737  017744                          JSR     PC,SETUP        ;LOAD I/O POINTERS
022166  004172                                  TST04                   ;FROM THIS TABLE
022170  013737  002444  002436          64$:    MOV     SRCTMP,TEMP     ;SET UP FOR POSSIBLE LOOP
022176  104404                                  TRAP    C$BSEG
022200  004737  020034                          JSR     PC,FLOAT        ;FLOAT THE PATTERN
022204  000403                                  BR      65$             ;PATTERN FLOATED OK, SKIP ERROR DSPATCH
022206  013737  002436  002444                  MOV     TEMP,SRCTMP     ;RESTORE THE OLD DATA PATTERN FOR ERROR LOOP
022214                                  65$:
022214                                  10000$:
022214  104405                                  TRAP    C$ESEG
022216  005737  002446                          TST     MASK            ;IF MASK = 0, WE'RE DONE
022222  001362                                  BNE     64$
022224  004737  020330                          JSR     PC,CONSET       ;GET NEXT PATTERN
022230  005737  002434                          TST     PATCNT          ;IF PATTERN COUNT UNDERFLOWED, DONE!
022234  002355                                  BGE     64$             ;NOT DONE YET, GO-ON
022236  104404                                  TRAP    C$BSEG
022240  004737  020202                          JSR     PC,COMPAR       ;WRITE THE NEXT PATTERN
022244  002352                                  PATT4                   ;WHICH IS PATTERN #4
022246                                  10001$:
022246  104405                                  TRAP    C$ESEG
022250  104404                                  TRAP    C$BSEG
022252  104404                                  TRAP    C$BSEG
022254  004737  020202                          JSR     PC,COMPAR       ;DO ANOTHER DATA COMPARISON
022260  002350                                  PATT3                   ;USING PATTERN #3
022262                                  10003$:
022262  104405                                  TRAP    C$ESEG
022264  004737  017572                          JSR     PC,LDZERO       ;WRITE RPWC TO 0 TO CLEAR IT!
022270                                  10002$:
022270  104405                                  TRAP    C$ESEG
022272  005337  002402                          DEC     ITCOUN          ;0   LESS ITERATION TO-GO
022276  003331                                  BGT     1$              ;IF NOT ZERO, KEEP GOING
022300                                  L10022:
022300  104401                                  TRAP    C$ETST
```

```
                                .SBTTL  TEST 5  RPBA READ WRITE TEST
                                
                                ;%      TEST 05  RPBA READ-WRITE TEST
                                ;%      :  WRITE RPBA WITH DATA PATTERNS 1..4, ONE AT A TIME
                                ;%      :  BITS TO TEST = 0..15
                                ;%      :  IF RPBA BIT(S) UNDER TEST DON'T MATCH EXPECTED DATA
                                ;%      :  :  THEN
                                ;%      :  :  OUTPUT ERROR MESSAGE (BIT(S) UNDER TEST DON'T MATCH TEST DATA)
                                ;%      :  :  ELSE
                                ;%      :  :  WRITE RPCS2:  CLR = 1
                                ;%      :  ENDIF
                                ;%      :  IF RPBA BIT(S) UNDER TEST DIDN'T CLEAR
                                ;%      :  :  THEN
                                ;%      :  :  OUTPUT ERROR MESSAGE (BIT(S) UNDER TEST DIDN'T CLEAR)
                                ;%      :  ENDIF
                                ;%      END TEST 05
022302                          T5::
022302  005037  002404                  CLR     ERRWD1          ;MODULE CALLOUT
022306  012737  000002  002406          MOV     #BIT1,ERRWD2    ;FOR THIS TEST
022314  012737  000012  002402          MOV     #10.,ITCOUN     ;LOAD THE ITERATION COUNTER
022322                          1$:
022322  004737  017744                  JSR     PC,SETUP        ;LOAD I/O POINTERS
022326  004204                          TST05                   ;FROM THIS TABLE
022330  013737  002444  002436  64$:    MOV     SRCTMP,TEMP     ;SET UP FOR POSSIBLE LOOP
022336  104404                          TRAP    C$BSEG
022340  004737  020034                  JSR     PC,FLOAT        ;FLOAT THE PATTERN
022344  000403                          BR      65$             ;PATTERN FLOATED OK, SKIP ERROR DSPATCH
022346  013737  002436  002444          MOV     TEMP,SRCTMP     ;RESTORE THE OLD DATA PATTERN FOR ERROR LOOP
022354                          65$:
022354                          10000$:
022354  104405                          TRAP    C$ESEG
022356  005737  002446                  TST     MASK            ;IF MASK = 0, WE'RE DONE
022362  001362                          BNE     64$
022364  004737  020330                  JSR     PC,CONSET       ;GET NEXT PATTERN
022370  005737  002434                  TST     PATCNT          ;IF PATTERN COUNT UNDERFLOWED, DONE!
022374  002355                          BGE     64$             ;NOT DONE YET, GO-ON
022376  104404                          TRAP    C$BSEG
022400  004737  020202                  JSR     PC,COMPAR       ;WRITE THE NEXT PATTERN
022404  002352                          PATT4                   ;WHICH IS PATTERN #4
022406                          10001$:
022406  104405                          TRAP    C$ESEC
022410  104404                          TRAP    C$BSEG
022412  104404                          TRAP    C$BSEG
022414  004737  020202                  JSR     PC,COMPAR       ;DO ANOTHER DATA COMPARISON
022420  002350                          PATT3                   ;USING PATTERN #3
022422                          10003$:
022422  104405                          TRAP    C$ESEG
022424  004737  017474                  JSR     PC,RESET        ;RESET THE DEVICE
022430  002516                          RPBA                    ;CLEAR RPBA BY SETTING MASSBUS CLEAR
022432                          10002$:
022432  104405                          TRAP    C$ESEG
022434  005337  002402                  DEC     ITCOUN          ;ONE LESS TO GO
022440  003330                          BGT     1$              ;IF => 0, KEEP GOING!
022442                          L10023:
022442  104401                          TRAP    C$ETST
```

```
                                .SBTTL  TEST 6  SC & TRE TEST 1 (RH11)

                                ;%      TEST 06  SPECIAL CONDITION AND TRANSFER ERROR TEST (RH11 TEST ONLY!)
                                ;%      :  SET RPCS2:  CLR = 1
                                ;%      :  IF RPCS1:  SC OR RPCS1:  TRE = 1
                                ;%      :  :  THEN
                                ;%      :  :  OUTPUT ERROR MESSAGE (BIT STUCK AT 1, AND SHOULDN'T BE)
                                ;%      :  :  ELSE
                                ;%      :  :  SET RPCS2:  MXF (BIT 09) = 1
                                ;%      :  :  IF RPCS2:  MXF <> 1
                                ;%      :  :  :  THEN
                                ;%      :  :  :  OUTPUT ERROR MESSAGE (BIT FAILED TO SET WHEN EXPECTED)
                                ;%      :  :  :  ELSE
                                ;%      :  :  :  IF RPCS1: TRE <> 1
                                ;%      :  :  :  :  THEN
                                ;%      :  :  :  :  OUTPUT ERROR MESSAGE (BIT FAILED TO SET WHEN EXPECTED)
                                ;%      :  :  :  ENDIF
                                ;%      :  :  :  IF RPCS1:  SC <> 1
                                ;%      :  :  :  :  THEN
                                ;%      :  :  :  :  OUTPUT ERROR MESSAGE (BIT FAILED TO SET WHEN EXPECTED)
                                ;%      :  :  :  ENDIF
                                ;%      :  :  :  SET RPCS2:  CLR = 1
                                ;%      :  :  :  IF RPCS1:  TRE OR SC = 1
                                ;%      :  :  :  :  THEN
                                ;%      :  :  :  :  OUTPUT ERROR MESSAGE (BITS FAILED TO CLEAR)
                                ;%      :  :  :  ENDIF
                                ;%      :  :  ENDIF
                                ;%      :  ENDIF
                                ;%      END TEST 06

022444                          T6::
022444  005737  002504                   TST     RHTYPE          ;WHICH CONTROLLER??
022450  001402                           BEQ     1$              ;IF 0, IT'S AN RH11
022452  104432                           TRAP    C$EXIT
022454  000316                           .WORD   L10024-.
022456  005037  002404          1$:      CLR     ERRWD1          ;MODULE CALLOUT FOR THIS TEST
022462  012737  000002  002406           MOV     #BIT1,ERRWD2    ;ONLY THE CONTROLLER
022470  012737  000012  002402           MOV     #10.,ITCOUN     ;LOAD THE ITERATION COUNTER
022476                          2$:
022476  104404                           TRAP    C$BSEG
022500  104404                           TRAP    C$BSEG
022502  052777  000040  160012           BIS     #CLR, @RPCS2    ;INITIALIZE THE DEVICE
022510  013777  002506  160004           MOV     DRVNO,@RPCS2    ;AND LOAD THE DRIVE NUMBER
022516  032777  140000  157766           BI      #SC!TRE,@RPCS1  ;SPECIAL CONDITION OR TRANSFER ERROR?
022524  001412                           BEQ     3$
022526  004737  017422                   JSR     PC,BICEXP       ;LOAD FAILING DATA
022532  002512                           RPCS1                   ;FAILING REGISTER
022534  140000                           SC!TRE                  ;BIT UNDER TEST
022536  104456                           TRAP    C$ERHRD
022540  000010                           .WORD   8
022542  012562                           .WORD   EM16
022544  014172                           .WORD   ERR0
022546  005037  002402                   CLR     ITCOUN          ;ITERATIONS = 0
022552                          3$:
022552                          10001$:
022552  104405                           TRAP    C$ESEG
022554  104404                           TRAP    C$BSEG
```

```
 51 022556  052777  001000  157736          BIS     #MXF,@RPCS2     ;SET MISSED TRANSFER = 1
 52 022564  032777  001000  157730          BIT     #MXF,@RPCS2     ;DID IT SET?
 53 022572  001012                          BNE     4$              ;YES IT DID, SKIP ERROR DISPATCH
 54 022574  004737  017372                  JSR     PC,BISEXP       ;LOAD FAILING DATA
 55 022600  002522                          RPCS2                   ;FAILING REGISTER
 56 022602  001000                          MXF                     ;BIT UNDER TEST
 57 022604  104456                          TRAP    C$ERHRD
    022606  000011                          .WORD   9
    022610  012776                          .WORD   EM22
    022612  014172                          .WORD   ERR0
 58 022614  005037  002402                  CLR     ITCOUN          ;ITERATIONS = 0
 59 022620                          4$:
    022620                          10002$:
    022620  104405                          TRAP    C$ESEG
 60 022622  032777  040000  157662          BIT     #TRE,@RPCS1     ;DID WE DETECT A TRANSFER ERROR??
 61 022630  001012                          BNE     5$              ;YES, GO-ON
 62 022632  004737  017372                  JSR     PC,BISEXP       ;LOAD FAILING DATA
 63 022636  002512                          RPCS1                   ;FAILING REGISTER
 64 022640  040000                          TRE                     ;BIT UNDER TEST
 65 022642  104456                          TRAP    C$ERHRD
    022644  000012                          .WORD   10
    022646  012776                          .WORD   EM22
    022650  014172                          .WORD   ERR0
 66 022652  005037  002402                  CLR     ITCOUN          ;!TERATIONS = 0
 67 022656  032777  100000  157626  5$:     BIT     #SC,@RPCS1      ;DID WE GET SPECIAL CONDITION?
 68 022664  001012                          BNE     6$              ;YES, SKIP ERROR DISPATCH
 69 022666  004737  017372                  JSR     PC,BISEXP       ;LOAD FAILING DATA
 70 022672  002512                          RPCS1                   ;FAILING REGISTER
 71 022674  100000                          SC                      ;BIT UNDER TEST
 72 022676  104456                          TRAP    C$ERHRD
    022700  000013                          .WORD   11
    022702  012776                          .WORD   EM22
    022704  014172                          .WORD   ERR0
 73 022706  005037  002402                  CLR     ITCOUN          ;ITERATIONS = 0
 74 022712  052777  000040  157602  6$:     BIS     #CLR,@RPCS2     ;CLEAR OUT THE CONTROLLER
 75 022720  013777  002506  157574          MOV     DRVNO,@RPCS2    ;RELOAD THE DRIVE NUMBER
 76 022726  032777  140000  157556          BIT     #SC!TRE,@RPCS1  ;DID SC AND TRE CLEAR OUT?
 77 022734  001412                          BEQ     7$              ;YES, TEST OK!
 78 022736  004737  017422                  JSR     PC,BICEXP       ;LOAD FAILING DATA
 79 022742  002512                          RPCS1                   ;FAILING REGISTER
 80 022744  140000                          SC!TRE                  ;BIT UNDER TEST
 81 022746  104456                          TRAP    C$ERHRD
    022750  000014                          .WORD   12
    022752  013051                          .WORD   EM23
    022754  014172                          .WORD   ERR1
 82 022756  005037  002402                  CLR     ITCOUN          ;ITERATIONS = 0
 83 022762                          7$:
    022762                          10000$:
    022762  104405                          TRAP    C$ESEG
 84 022764  005337  002402                  DEC     ITCOUN          ;ONE LESS ITERATION TO GO
 85 022770  003242                          BGT     2$              ;KEEP GOING IF => 0!
 86 022772                          L10024:
    022772  104401                          TRAP    C$ETST
```

```
                                .SBTTL  TEST 7  IR AND OR TEST
                                
                                ;%      TEST 07  IR AND OR TEST #1
                                ;%      :  TEST RPCS2:  IR = 1
                                ;%      :  IF RPCS2:  IR <> 1
                                ;%      :  :  THEN
                                ;%      :  :  WAIT USING A TIMING LOOP
                                ;%      :  :  IF TIMING LOOP HAS EXPIRED AND IR <> 1
                                ;%      :  :  :  THEN
                                ;%      :  :  :  OUTPUT ERROR MESSAGE (BIT FAILED TO SET WHEN EXPECTED)
                                ;%      :  :  :  ELSE
                                ;%      :  :  :  WRITE RPDB = 0, ONCE
                                ;%      :  :  ENDIF
                                ;%      :  :  IF RPCS2:  OR <> 1
                                ;%      :  :  :  THEN
                                ;%      :  :  :  WAIT, USING A TIMING LOOP
                                ;%      :  :  :  IF TIMING LOOP HAS EXPIRED AND RPCS2:  OR <> '
                                ;%      :  :  :  :  THEN
                                ;%      :  :  :  :  OUTPUT ERROR MESSAGE (RPCS2:  OR DIDN'T SET IN TIME)
                                ;%      :  :  :  ENDIF
                                ;%      :  :  :  ELSE
                                ;%      :  :  :  READ RPDB ONCE
                                ;%      :  :  ENDIF
                                ;%      :  :  IF RPCS2:  OR <> 0
                                ;%      :  :  :  THEN
                                ;%      :  :  :  OUTPUT ERROR MESSAGE (BIT FAILED TO CLEAR WHEN EXPECTED)
                                ;%      :  :  ENDIF
                                ;%      :  ENDIF
                                ;%      END TEST 07
                                
022774                          T7::
022774  005037  002404                  CLR     ERRWD1          ;MODULE CALLOUT FOR THIS TEST
023000  012737  000002  002406          MOV     #BIT1,ERRWD2    ;ONLY THE CONTROLLER COULD FAIL!
023006  012737  000012  002402          MOV     #10.,ITCOUNT    ;LOAD THE ITERATION COUNT
023014                          1$:
023014  104404                          TRAP    C$BSEG
023016  104404                          TRAP    C$BSEG
023020  032777  000100  157474          BIT     #IR,@RPCS2      ;LOOK FOR IR TO SET IN RPCS2
023026  001032                          BNE     2$              ;SET, GO-ON
023030  012727  000002                  MOV     #2,(PC)+
023034  000000                          .WORD   0
023036  013727  002116                  MOV     L$DLY,(PC)+
023042  000000                          .WORD   0
023044  005367  177772                  DEC     -6(PC)
023050  001375                          BNE     .-4
023052  005367  177756                  DEC     -22(PC)
023056  001367                          BNE     .-20
023060  032777  000100  157434          BIT     #IR,@RPCS2      ;LOOK FOR IR TO BE SET NOW!
023066  001012                          BNE     2$              ;IT SET IN TIME
023070  004737  017372                  JSR     PC,BISEXP       ;LOAD FAILING DATA
023074  002522                          RPCS2                   ;FAILING REGISTER
023076  000100                          IR                      ;BIT UNDER TEST
023100  104456                          TRAP    C$ERHRD
023102  000015                          .WORD   13
023104  012622                          .WORD   EM17
023106  014172                          .WORD   ERR0
023110  005037  002402                  CLR     ITCOUN          ;ITERATIONS = 0
```

```
023114                          2$:
023114                          10001$:
023114  104405                          TRAP    C$ESEG
023116  005077  157412                  CLR     @RPDB           ;WRITE RPDB ONCE WITH DATA
023122  032777  000200  157372          BIT     #OR,@RPCS2      ;NOW LOOK FOR OUTPUT READY
023130  001032                          BNE     3$              ;GOT IT, GO ON
023132  012727  000020                  MOV     #20,(PC)+
023136  000000                          .WORD   0
023140  013727  002116                  MOV     L$DLY,(PC)+
023144  000000                          .WORD   0
023146  005367  177772                  DEC     -6(PC)
023152  001375                          BNE     .-4
023154  005367  177756                  DEC     -22(PC)
023160  001367                          BNE     .-20
023162  032777  000200  157332          BIT     #OR,@RPCS2      ;LOOK FOR OR TO BE SET NOW
023170  001012                          BNE     3$              ;IT SET IN TIME
023172  004737  017372                  JSR     PC,BISEXP       ;LOAD FAILING DATA
023176  002522                          RPCS2                   ;FAILING REGISTER
023200  000200                          OR                      ;BIT UNDER TEST
023202  104456                          TRAP    C$ERHRD
023204  000016                          .WORD   14
023206  012116                          .WORD   EM5
023210  014172                          .WORD   ERRO
023212  005037  002402                  CLR     ITCOUN          ;ITERATTIONS = 0
023216  005777  157312          3$:     TST     @RPDB           ;READ THE BUFFER NOW
023222  032777  000200  157272          BIT     #OR,@RPCS2      ;OR SHOULD NOW = 0
023230  001412                          BEQ     4$              ;IT CLEARED, TEST OK
023232  004737  017422                  JSR     PC,BICEXP       ;LOAD FAILING DATA
023236  002522                          RPCS2                   ;FAILING REGISTER
023240  000200                          OR                      ;BIT UNDER TEST
023242  104456                          TRAP    C$ERHRD
023244  000017                          .WORD   15
023246  012155                          .WORD   EM6
023250  014172                          .WORD   ERRO
023252  005037  002402                  CLR     ITCOUN          ;ITERATIONS = 0
023256                          4$:
023256                          10000$:
023256  104405                          TRAP    C$ESEG
023260  005337  002402                  DEC     ITCOUN          ;ONE LESS ITERATION TO-GO
023264  003253                          BGT     1$              ;KEEP GOING UNTIL <= 0
023266                          L10025:
023266  104401                          TRAP    C$ETST
```

```
                                .SBTTL  TEST 8  RPDB READ WRITE TEST #1
                                ;%      TEST 08 RPDB READ WRITE TEST #1
                                ;%      :  WRITE RPDB WITH DATA PATTERNS 1,2,5, ONE AT A TIME
                                ;%      :  BITS TO TEST=0..15
                                ;%      :  IF RPCS2:  IR<>1
                                ;%      :  :  THEN
                                ;%      :  :  POLL BIT UNTIL IT SETS
                                ;%      :  :  ELSE
                                ;%      :  :  WRITE DATA TO RPDB
                                ;%      :  ENDIF
                                ;%      :  IF RPCS2:  OR<>1
                                ;%      :  :  THEN
                                ;%      :  :  POLL BIT UNTIL IT SETS
                                ;%      :  :  ELSE
                                ;%      :  :  READ RPDB
                                ;%      :  ENDIF
                                ;%      :  IF RPDB RECEIVED DATA DOESN'T MATCH EXPECTED DATA
                                ;%      :  :  THEN
                                ;%      :  :  OUTPUT ERROR MESSAGE (BITS RECEIVED DON'T MATCH EXPECTED DATA)
                                ;%      :  ENDIF
                                ;%      :  IF RPCS2:  IR<>1
                                ;%      :  :  THEN
                                ;%      :  :  POLL RPCS2:  IR UNTIL IT SETS
                                ;%      :  ENDIF
                                ;%      :  WRITE RPDB WITH 0'S
                                ;%      :  IF RPCS2:  OR<>1
                                ;%      :  :  THEN
                                ;%      :  :  POLL RPCS2:  OR UNTIL IT SETS
                                ;%      :  ENDIF
                                ;%      :  IF RPDB<>0
                                ;%      :  :  THEN
                                ;%      :  :  OUTPUT ERROR MESSAGE (BITS FAILED TO CLEAR)
                                ;%      :  ENDIF
                                ;%      END TEST 08

023270                          T8::
023270  012737  177777  002460          MOV     #-1,ILOCK       ;MARK THE RPDB POLL MODE
023276  005037  002404                  CLR     ERRWD1          ;CREATE THE MODULE CALLOUT
023302  012737  000002  002406          MOV     #BIT1,ERRWD2    ;FOR THIS TEST
023310  012737  000012  002402          MOV     #10.,ITCOUN     ;LOAD THE ITERATION COUNTER
023316                          1$:
023316  004737  017744                  JSR     PC,SETUP        ;LOAD I/O POINTERS
023322  004216                          TST08                   ;FROM THIS TABLE
023324  013737  002444  002436  64$:    MOV     SRCTMP,TEMP     ;SET UP FOR POSSIBLE LOOP
023332  104404                          TRAP    C$BSEG
023334  004737  020034                  JSR     PC,FLOAT        ;FLOAT THE PATTERN
023340  000403                          BR      65$             ;PATTERN FLOATED OK, SKIP ERROR DSPATCH
023342  013737  002436  002444          MOV     TEMP,SRCTMP     ;RESTORE THE OLD DATA PATTERN FOR ERROR LOOP
023350                          65$:
023350                          10000$:
023350  1044[-                         TRAP    C$ESEG
023352  00573.  002446                  TST     MASK            ;IF MASK = 0, WE'RE DONE
023356  001362                          BNE     64$
023360  004737  020330                  JSR     PC,CONSET       ;GET NEXT PATTERN
023364  005737  002434                  TST     PATCNT          ;IF PATTERN COUNT UNDERFLOWED, DONE!
023370  002355                          BGE     64$             ;NOT DONE YET, GO-ON
```

```
        023372  104404                          TRAP    C$BSEG
        023374  004737  020202                  JSR     PC,COMPAR       ;WRITE THE NEXT PATTERN
        023400  002352                          PATT4                   ;WHICH IS PATTERN #4
        023402                          10001$:
        023402  104405                          TRAP    C$ESEG
        023404  104404                          TRAP    C$BSEG
        023406  104404                          TRAP    C$BSEG
        023410  004737  020202                  JSR     PC,COMPAR       ;DO ANOTHER DATA COMPARISON
        023414  002350                          PATT3                   ;USING PATTERN #3
        023416                          10003$:
        023416  104405                          TRAP    C$ESEG
        023420  004737  017572                  JSR     PC,LDZERO       ;WRITE RPDB TO 0 TO CLEAR IT!
        023424                          10002$:
        023424  104405                          TRAP    C$ESEG
     43 023426  005337  002402                  DEC     ITCOUN          ;ONE LESS ITERATION TO-GO
     44 023432  003331                          BGT     1$              ;KEEP GOING UNTIL <= 0!
     45 023434  005037  002460                  CLR     ILOCK           ;CLEAR THE FOLLED MODE OF OPERATION
     46 023440                          L10026:
        023440  104401                          TRAP    C$ETST
```

```
                                .SBTTL  TEST 09 RPDB READ WRITE TEST #2

                                ;%      TEST 09  RPDB READ WRITE TEST #2
                                ;%      :  FOR 2 ITERATIONS DO
                                ;%      :  :  IF RPCS2:  IR <> 1
                                ;%      :  :  :  THEN
                                ;%      :  :  :  POLL BIT UNTIL IT SETS
                                ;%      :  :  :  ELSE
                                ;%      :  :  :  WRITE RPDB WITH PATTERN #5
                                ;%      :  :  ENDIF
                                ;%      :  END DO
                                ;%      :  FOR 2 ITERATIONS DO
                                ;%      :  :  IF RPCS2:  OR <> 1
                                ;%      :  :  :  THEN
                                ;%      :  :  :  POLL BIT UNTIL IT SETS
                                ;%      :  :  :  ELSE
                                ;%      :  :  :  READ RPDB
                                ;%      :  :  ENDIF
                                ;%      :  :  IF RPDB <> PATTERN #5
                                ;%      :  :  :  THEN
                                ;%      :  :  :  OUTPUT ERROR MESSAGE (BITS RECE VED DON'T MATCH EXPECTED DATA)
                                ;%      :  :  ENDIF
                                ;%      :  END DO
                                ;%      END TEST 09

023442                          T9::
023442  012737  002534  002454          MOV     #PATT5,EXPTED   ;GET THE TESTING DATA PATTERN
023450  005037  002404                  CLR     ERRWD1          ;CREATE THE MODULE CALLOUT
023454  012737  000002  002406          MOV     #BIT1,ERRWD2    ;FOR THIS TEST
023462  012737  000012  002402          MOV     #10.,ITCOUN     ;LOAD THE ITERATION COUNT
023470                          1$:
023470  104404                          TRAP    C$BSEG
023472  012703  000001                  MOV     #1,R3           ;SET UP TO DO TWO WRITE OPERATIONS
023476  004737  017672          2$:     JSR     PC,IRLOCK       ;WAIT FOR IR TO SET!
023502  013777  002454  157024          MOV     EXPTED,@RPDB    ;NOW LOAD RPDB ONCE
023510  005303                          DEC     R3              ;ONE LESS ITERATION TO GO
023512  002371                          BGE     2$              ;IF NOT MINUS, LOAD RPDB AGAIN!
023514  012703  000001                  MOV     #1,R3           ;NOW SET-UP TO DO TWO READ OPERATIONS
023520  004737  017706          3$:     JSR     PC,ORLOCK       ;WAIT FOR OR TO SET
023524  023777  002454  157002          CMP     EXPTED,@RPDB    ;DOES THE DATA MATCH?
023532  001414                          BEQ     4$              ;IF EQUAL, YES IT'S OK
023534  013737  002534  002456          MOV     RPDB,TESTRG     ;GET THE FAILING REGISTER
023542  017737  156766  002452          MOV     @RPDB,RCVED     ;NOW GET THE FAILING DATA
023550  104456                          TRAP    C$ERHRD
023552  000020                          .WORD   16
023554  012454                          .WORD   EM14
023556  014172                          .WORD   ERRO
023560  005037  002402                  CLR     ITCOUN          ;RESET FURTHER ITERATONS
023564  005303                  4$:     DEC     R3              ;ONE LESS ITERATION TO-DO
023566  002354                          BGE     3$              ;IF NOT MINUS, DO-AGAIN
023570                          10000$:
023570  104405                          TRAP    C$ESEG
023572  005337  002402                  DEC     ITCOUN          ;ONE LESS ITERATION TO GO
023576  003334                          BGT     1$              ;KEEP GOING UNTIL <= 0
023600                          L10027:
023600  104401                          TRAP    C$ETST
```

```
                                .SBTTL  TEST 10 RPDB READ WRITE TEST #3
                                ;
                                ;%      TEST 10  RPDB READ WRITE TEST #3
                                ;%      :  FOR 8 ITERATIONS DO
                                ;%      :  :  IF RRPCS2:  IR <> 1
                                ;%      :  :  :  THEN
                                ;%      :  :  :  POLL BIT UNTIL IT SETS
                                ;%      :  :  :  ELSE
                                ;%      :  :  :  WRITE RPDB WITH A DATA PATTERN (SEQUENTIALLY USING PATTERNS 1 THRU 8)
                                ;%      :  :  ENDIF
                                ;%      :  END DO
                                ;%      :  FOR 8 ITERATIONS DO
                                ;%      :  :  IF RPCS2:  OR <> 1
                                ;%      :  :  :  THEN
                                ;%      :  :  :  POLL BIT UNTIL IT SETS
                                ;%      :  :  :  ELSE
                                ;%      :  :  :  READ RPDB
                                ;%      :  :  ENDIF
                                ;%      :  :  IF RPDB DOESN'T MATCH EXPECTED DATA
                                ;%      :  :  :  THEN
                                ;%      :  :  :  OUTPUT ERROR MESSAGE (BITS RECEIVED DON'T MATCH EXPECTED DATA)
                                ;%      :  :  ENDIF
                                ;%      :  END DO
                                ;%      END TEST 10
                                ;
023602                          T10::
023602  013737  002534  002456          MOV     RPDB,TESTRG     ;GET THE ADDRESS OF THE REGISTER UNDER TEST
023610  005037  002404                  CLR     ERRWD1          ;MODULE CALLOUT, THIS TEST
023614  012737  000002  002406          MOV     #BIT1,ERRWD2    ;ONLY THE CONTROLLER
023622  012737  000012  002402          MOV     #10.,ITCOUN     ;LOAD THE ITERATION COUNT
023630                          1$:
023630  104404                          TRAP    C$BSEG
023632  012704  000001                  MOV     #1,R4           ;OVERALL LOOP COUNTER
023636  012702  002344                  MOV     #PATT1,R2       ;INPUT POINTER
023642                          2$:
023642  104404                          TRAP    C$BSEG
023644  010246                          MOV     R2,-(SP)        ;SAVE THE INPUT START ADDRESS
023646  012703  000010                  MOV     #8.,R3          ;SET UP TO WRITE 8 TIMES
023652  004737  017672          3$:     JSR     PC,IRLOCK       ;POLL IR AND WAIT FOR IT
023656  012277  156652                  MOV     (R2)+,@RPDB     ;LOAD THE BUFFER
023662  005303                          DEC     R3              ;REDUCE THE # OF ITERATIONS
023664  001372                          BNE     3$              ;AND CONTINUE
023666  012602                          MOV     (SP)+,R2        ;RESTORE THE ORIGINAL POINTER
023670  012703  000010                  MOV     #8.,R3          ;AND THE ITERATION COUNTERS
023674  004737  017706          4$:     JSR     PC,ORLOCK       ;POLL OR AND WAIT FOR IT
023700  022277  156630                  CMP     (R2)+,@RPDB     ;DOES THE DATA MATCH
023704  001414                          BEQ     5$              ;IF IT DOES, SKIP ERROR DISPATCH
023706  017737  156622  002452          MOV     @RPDB,RCVED     ;GET THE BAD DATA
023714  016237  177776  002454          MOV     -2(R2),EXPTED   ;AND THE EXPECTED DATA
023722  104456                          TRAP    C$ERHRD
023724  000021                          .WORD   17
023726  012454                          .WORD   EM14
023730  014172                          .WORD   ERR0
023732  005037  002402                  CLR     ITCOUN          ;RESET FURTHER ITERATIONS
023736  005303                  5$:     DEC     R3              ;ONE LESS ITERATION TO GO
023740  001355                          BNE     4$              ;NOT FINISHED, CHECK NEXT PATTERN
023742                          10001$:
```

```
            023742  104405                          TRAP    C$ESEG
     53     023744  005704                          TST     R4              ;DONE?
     54     023746  001404                          BEQ     6$              ;IF 0, YES
     55     023750  012702  002346                  MOV     #PATT2,R2       ;GET NEXT PATTERN
     56     023754  005004                          CLR     R4              ;AND INDICATE 2ND HALF OF TEST
     57     023756  000731                          BR      2$              ;NOW DO IT!
     58     023760                          6$:
            023760                          10000$:
            023760  104405                          TRAP    C$ESEG
     59     023762  005337  002402                  DEC     ITCOUN          ;ONE LESS ITERATION TO GO
     60     023766  003320                          BGT     1$              ;KEEP GOING UNTIL <= 0
     61     023770                          L10030:
            023770  104401                          TRAP    C$ETST
```

```
                                        .SBTTL  TEST 11 MDPE, SC & TRE TEST (RH70 TEST)
                                        ;%      TEST 11 MDPE, SC & TRE TEST (RH70 TEST)
                                        ;%      SET RPCS2:  CLR = 1
                                        ;%      LOAD THE UNIT-UNDER-TEST # INTO RPCS2
                                        ;%      SET RPCS2:  PAT = 1
                                        ;%      IF RPCS2:  IR <> 1
                                        ;%      :  :  THEN
                                        ;%      :  :  WAIT UNTIL RPCS2:  :  IR = 1
                                        ;%      :  :  ELSE
                                        ;%      :  :  WRITE RPDB ONCE, WITH PATTERN #3
                                        ;%      :  ENDIF
                                        ;%      :  IF RPCS2:  MDPE <> 1
                                        ;%      :  :  THEN
                                        ;%      :  :  OUTPUT ERROR MESSAGE (MDPE DIDN'T SET WHEN EXPECTED)
                                        ;%      :  :  ELSE
                                        ;%      :  :  IF (RPCS1:  SC & RPCS1:  TRE <> 1)
                                        ;%      :  :  :  THEN
                                        ;%      :  :  :  OUTPUT ERROR MESSAGE (FAILED TO DETECT RPCS1:  SC OR TRE)
                                        ;%      :  :  ENDIF
                                        ;%      :  ENDIF
                                        ;%      END TEST 11

024772                                  T11::
023772  005737  002504                          TST     RHTYPE          ;WHICH CONTROLLER TYPE?
023776  003002                                  BGT     1$              ;IF > 0, RH70...
024000  104432                                  TRAP    C$EXIT
024002  000146                                  .WORD   L10031-.
024004  005037  002404                  1$:     CLR     ERRWD1          ;CREATE THE MODULE CALLOUT
024010  012737  000002  002406                  MOV     #BIT1,ERRWD2    ;FOR THIS TEST
024016  012737  000012  002402                  MOV     #10.,ITCOUN     ;LOAD THE ITERATION COUNT
024024                                  2$:
024024  104404                                  TRAP    C$BSEG
024026  052777  000040  156466                  BIS     #CLR,@RPCS2     ;START OUT WITHOUT ERRORS!
024034  013777  002506  156460                  MOV     DRVNO,@RPCS2    ;LOAD THE DRIVE NUMBER
024042  052777  000020  156452                  BIS     #PAT,@RPCS2     ;NOW INVERT PARITY
024050  004737  017672                          JSR     PC,IRLOCK       ;WAIT FOR IR TO SET!
024054  013777  002350  156452                  MOV     PATT3,@RPDB     ;WRITE THIS DATA
024062  032777  000400  156432                  BIT     #MDPE,@RPCS2    ;DID WE FORCE A MASSBUS PARITY ERROR?
024070  001005                                  BNE     3$              ;IF SET, YES!!
024072  004737  017372                          JSR     PC,BISEXP       ;FORM THE REPORT DATA
024076  002522                                  RPCS2                   ;THIS REGISTER
024100  000400                                  MDPE                    ;THIS BIT FAILED TO SET
024102  000410                                  BR      4$              ;NOW TAKE THE CALL!
024104  032777  140000  156400          3$:     BIT     #SC!TRE,@RPCS1  ;DID WE GET TRANSFER ERROR AND SPECIAL CONDITION?
024112  001012                                  BNE     5$              ;YES, TEST PASSES!
024114  004737  017372                          JSR     PC,BISEXP       ;GET THE FAILING DATA
024120  002512                                  RPCS1                   ;THIS REGISTER
024122  140000                                  SC!TRE                  ;THESE BITS FAILED TO SET!
024124                                  4$:
024124  104456                                  TRAP    .$ERHRD
024126  000022                                  .WORD   18
024130  013441                                  .WORD   EM33
024132  014172                                  .WORD   ERR0
024134  005037  002402                          CLR     ITCOUN          ;NO FURTHER ITERATIONS
024140                                  5$:
024140                                  10000$:
```

```
        024140  104405                          TRAP    C$ESEG
     51 024142  005337  002402                  DEC     ITCOUN          ;ONE LESS ITERATION TO GO
     52 024146  003326                          BGT     2$              ;KEEP GOING IF NOT <= 0!
     53 024150                          L10031:
        024150  104401                          TRAP    C$ETST
```

```
                                .SBTTL  TEST 12 RPCS3 READ/WRITE TEST
                                ;
                                ;%      TEST 09 (RH70 TEST ONLY)  RPCS3 RE, -WRITE TEST
                                ;%      :  WRITE RPCS3 WITH DATA PATTERNS 1..4, ONE AT A TIME
                                ;%      :  BITS TO TEST = 0..3, 6
                                ;%      :  IF RPCS3 BIT(S) UNDER TEST DIDN'T SET
                                ;%      :  :  THEN
                                ;%      :  :  OUTPUT ERROR MESSAGE (BIT(S) DIDN'T SET)
                                ;%      :  :  ELSE
                                ;%      :  :  SET RPCS2:  CLR = 1
                                ;%      :  ENDIF
                                ;%      :  IF RPCS3 BIT(S) UNDER TEST DIDN'T CLEAR
                                ;%      :  :  THEN
                                ;%      :  :  OUTPUT ERROR MESSAGE (BIT(S) UNDER TEST DIDN'T CLEAR)
                                ;%      :  ENDIF
                                ;%      END TEST 12
                                ;
024152                          T12::
024152  005737  002504                  TST     RHTYPE          ;IF RHTYPE=+1 CONTROLLER IS AN RH70
024156  003002                          BGT     1$
024160  104432                          TRAP    C$EXIT
024162  000150                          .WORD   L10032-.
024164  005037  002404          1$:     CLR     ERRWD1          ;MODULE CALLOUT
024170  012737  000002  002406          MOV     #BIT1,ERRWD2    ;FOR THIS TEST
024176  012737  000012  002402          MOV     #10.,ITCOUN     ;SET UP THE ITERATION COUNTER
024204                          2$:                             ;SET PRIORITY TO 7
024204  012700  000340                  MOV     #PRI07,R0
024210  104441                          TRAP    C$SPRI
024212  004737  017744                  JSR     PC,SETUP        ;LOAD I/O POINTERS
024216  004232                          TST11                   ;FROM THIS TABLE
024220  013737  002444  002436  64$:     MOV     SRCTMP,TEMP     ;SET UP FOR POSSIBLE LOOP
024226  104404                          TRAP    C$BSEG
024230  004737  020034                  JSR     PC,FLOAT        ;FLOAT THE PATTERN
024234  000403                          BR      65$             ;PATTERN FLOATED OK, SKIP ERROR DSPATCH
024236  013737  002436  002444          MOV     TEMP,SRCTMP     ;RESTORE THE OLD DATA PATTERN FOR ERROR LOOP
024244                          65$:
024244                          10000$:
024244  104405                          TRAP    C$ESEG
024246  005737  002446                  TST     MASK            ;IF MASK = 0, WE'RE DONE
024252  001362                          BNE     64$
024254  004737  02033U                  JSR     PC,CONSET       ;GET NEXT PATTERN
024260  005737  002434                  TST     PATCNT          ;IF PATTERN COUNT UNDERFLOWED, DONE!
024264  002355                          BGE     64$             ;NOT DONE YET, GO-ON
024266  104404                          TRAP    C$BSEG
024270  004737  020202                  JSR     PC,COMPAR       ;WRITE THE NEXT PATTERN
024274  002352                          PATT4                   ;WHICH IS PATTERN
024276                          10001$:
024276  104405                          TRAP    C$ESEG
024300  104404                          TRAP    C$BSEG
024302  104404                          TRAP    C$BSEG
024304  004737  020202                  JSR     PC,COMPAR       ;DO ANOTHER D TA COMPARISON
024310  002350                          PATT3                   ;JSING PATTERN #3
024312                          10003$:
024312  104405                          TRAP    C$ESEG
024314  004737  017474                  JSR     PC,RESET        ;RESET THE DEVICE
024320  002564                          RPCS3                   ;CLEAR RPCS3 BY SETTING MASSBUS CLEAR
024322                          10002$:
```

```
            024322  104405                          TRAP    C$ESEG
      28    024324  005337  002402                  DEC     ITCOUN          ;ONE LESS ITERATION TO GO
      29    024330  003325                          BGT     2$              ;KEEP GOING IF NOT <= 0!
      30    024332                          L10032:
            024332  104401                          TRAP    C$ETST
```

```
                                .SBTTL  TEST 13 RPBAE READ/WRITE TEST
                                ;
                                ;%      TEST 13 (RH70 TEST ONLY)  RPBAE READ-WRITE TEST
                                ;%      :  WRITE RPBAE WITH DATA PATTERNS 1..4, ONE AT A TIME
                                ;%      :  BITS TO TEST = 0..5
                                ;%      :  IF RPBAE BIT(S) UNDER TEST DIDN'T MATCH EXPECTED DATA
                                ;%      :  :  THEN
                                ;%      :  :  OUTPUT ERROR MESSAGE (BIT(S) DIDN'T SET)
                                ;%      :  :  ELSE
                                ;%      :  :  SET RPCS2:  CLR = 1
                                ;%      :  ENDIF
                                ;%      :  IF RPBAE BIT(S) UNDER TEST DIDN'T CLEAR
                                ;%      :  :  THEN
                                ;%      :  :  OUTPUT ERROR MESSAGE (BIT(S) UNDER TEST DIDN'T CLEAR)
                                ;%      :  ENDIF
                                ;%      END TEST 13
                                ;
024334                          T13::
024334  005737  002504                  TST     RHTYPE          ;TEST CONTROLLER TYPE
024340  003002                          BGT 1$                  ;IF > 0, IT IS AN RH70
024342  104432                          TRAP    C$EXIT
024344  000142                          .WORD   L10033-.
024346  005037  002404          1$:     CLR     ERRWD1          ;MODULE CALLOUT
024352  012737  000002  002406          MOV     #BIT1,ERRWD2    ;FOR THIS TEST
024360  012737  000012  002402          MOV     #10.,ITCOUN     ;LOAD THE ITERATION COUNTER
024366                          2$:
024366  004737  017744                  JSR     PC,SETUP        ;LOAD I/O POINTERS
024372  004244                          TST12                   ;FROM THIS TABLE
024374  013737  002444  002436  64$:    MOV     SRCTMP,TEMP     ;SET UP FOR POSSIBLE LOOP
024402  104404                          TRAP    C$BSEG
024404  004737  020034                  JSR     PC,FLOAT        ;FLOAT THE PATTERN
024410  000403                          BR      65$             ;PATTERN FLOATED OK, SKIP ERROR DSPATCH
024412  013737  002436  002444          MOV     TEMP,SRCTMP     ;RESTORE THE OLD DATA PATTERN FOR ERROR LOOP
024420                          65$:
024420                          10000$:
024420  104405                          TRAP    C$ESEG
024422  005737  002446                  TST     MASK            ;IF MASK = 0, WE'RE DONE
024426  001362                          BNE     64$
024430  004737  020330                  JSR     PC,CONSET       ;GET NEXT PATTERN
024434  005737  002434                  TST     PATCNT          ;IF PATTERN COUNT UNDERFLOWED, DONE!
024440  002355                          BGE     64$             ;NOT DONE YET, GO-ON
024442  104404                          TRAP    C$BSEG
024444  004737  020202                  JSR     PC,COMPAR       ;WRITE THE NEXT PATTERN
024450  002352                          PATT4                   ;WHICH IS PATTERN #4
024452                          10001$:
024452  104405                          TRAP    C$ESEG
024454  104404                          TRAP    C$BSEG
024456  104404                          TRAP    C$BSEG
024460  004737  020202                  JSR     PC,COMPAR       ;DO ANOTHER DATA COMPARISON
024464  002350                          PATT3                   ;USING PATTERN #3
024466                          10003$:
024466  104405                          TRAP    C$ESEG
024470  004737  017474                  JSR     PC,RESET        ;RESET THE DEVICE
024474  002562                          RPBAE                   ;CLEAR RPBAE BY SETTING MASSBUS CLEAR
024476                          10002$:
024476  104405                          TRAP    C$ESEG
024500  005337  002402                  DEC     ITCOUN          ;ONE LESS ITERATION
```

```
     27 024504  003330                    BGT     2$              ;IF NOT <= 0, KEEP GOING
     28 024506                  L10033:
        024506  104401                    TRAP    C$E'ST
```

```
                                .SBTTL  TEST 14 RPBAE DUPLICATED A16 TEST
                                ;
                                ;%      TEST 14 (RH70 TEST ONLY)  RPBAE DUPLICATED A16 TEST
                                ;%      :  WRITE RPCS1:  A16 (BIT 08) = 1
                                ;%      :  IF RPCS1:  A16 <> 1
                                ;%      :  :  THEN
                                ;%      :  :  OUTPUT ERROR MESSAGE (BIT DIDN'T SET AS EXPECTED)
                                ;%      :  :  ELSE
                                ;%      :  :  IF RPCS1:  A17 = 1
                                ;%      :  :  :  THEN
                                ;%      :  :  :  OUTPUT ERROR MESSAGE (BIT SET WHEN NOT EXPECTED)
                                ;%      :  :  ENDIF
                                ;%      :  :  IF RPBAE:  BIT 0 <> 1
                                ;%      :  :  :  THEN OUTPUT ERROR MESSAGE (BIT STUCK AT 0)
                                ;%      :  :  :  ELSE
                                ;%      :  :  :  SET RPCS2:  CLR = 1
                                ;%      :  :  ENDIF
                                ;%      :  ENDIF
                                ;%      :  IF ((RPCS1:  A16) AND (RPBAE:  BIT 0)) <> 0
                                ;%      :  :  THEN OUTPUT ERROR MESSAGE (BIT(S) STUCK AT 1)
                                ;%      :  ENDIF
                                ;%      END TEST 14
                                ;
024510                          T14::
024510  012737  000002  002406          MOV     #BIT1,ERRWD2    ;MODULE CALLOUT, THIS TEST
024516  005037  002404                  CLR     ERRWDI          ;NO RP07 BOARDS
024522  012737  000012  002402          MOV     #10.,ITCOUN     ;LOAD THE ITERATION COUNTER
024530                          1$:
024530  104404                          TRAP    C$BSEG
024532  012777  000400  155752          MOV     #A16,@RPCS1     ;SET RPCS1:A16=1
024540  032777  000400  155744          BIT     #A16,@RPCS1     ;TEST RPCS1:A16
024546  001012                          BNE     2$              ;IF =2, GO ON
024550  004737  017372                  JSR     PC,BISEXP       ;LOAD FAILING DATA
024554  002512                          RPCS1                   ;FAILING REGISTER
024556  000400                          A16                     ;BIT UNDER TEST
024560  104456                          TRAP    C$ERHRD
024562  000022                          .WORD   18
024564  012776                          .WORD   EM22
024566  014172                          .WORD   ERR0
024570  005037  002402                  CLR     ITCOUN          ;NO FURTHER ITERATIONS
024574  032777  001000  155710  2$:     BIT #A17,@RPCS1         ;DID A17 ALSO SET?
024602  001412                          BEQ     3$              ;IF ZERO, IT'S OK!
024604  004737  017422                  JSR     PC,BICEXP       ;LOAD THE OFFENDING BIT
024610  002512                          RPCS1                   ;FOR THIS REGISTER
024612  001000                          A17                     ;THIS BIT!
024614  104456                          TRAP    C$ERHRD
024616  000023                          .WORD   19
024620  012454                          .WORD   EM14
024622  014172                          .WORD   ERR0
024624  005037  002402                  CLR     ITCOUN          ;ITERATIONS = 0
024630                          3$:
024630                          10000$:
024630  104405                          TRAP    C$ESEG
024632  104404                          TRAP    C$BSEG
024634  005737  002504                  TST     RHTYPE          ;TEST CONTROLLER TYPE
024640  003002                          BGT     4$              ;IF > 0, IT IS AN RH70
024642  104432                          TRAP    C$EXIT
```

```
                024644  000036                          .WORD   10001$-.
50              024646  032777  000001  155706  4$:     BIT     #BIT0,@RPBAE    ;TEST RPBA4:BIT0.(PARALLELS RPCS1=A16)
51              024654  001012                          BNE     5$              ;IF SET, GO ON
52              024656  004737  017372                  JSR     PC,BISEXP       ;LOAD FAILING DATA
53              024662  002562                          RPBAE                   ;FAILING REGISTER
54              024664  000001                          BIT0                    ;BIT UNDER TEST
55              024666  104456                          TRAP    C$ERHRD
                024670  000024                          .WORD   20
                024672  012776                          .WORD   EM22
                024674  014172                          .WORD   ERR0
56              024676  005037  002402                  CLR     ITCOUN          ;ITERATION COUNT = 0
57              024702                          5$:
58              024702                          10001$:
                024702  104405                          TRAP    C$ESEG
59              024704  104404                          TRAP    C$BSEG
60              024706  052777  000040  155606          BIS     #CLR,@RPCS2     ;CLEAR OUT THE DEVICE
61              024714  032777  000400  155570          BIT     #A16,@RPCS1     ;TEST RPCS1:A16
62              024722  001412                          BEQ     6$              ;IF ZERO, GO ON
63              024724  004737  017422                  JSR     PC,BICEXP       ;LOAD FAILING DATA
64              024730  002512                          RPCS1                   ;FAILING REGISTER
65              024732  000400                          A16                     ;BIT UNDER TEST
66              024734  104456                          TRAP    C$ERHRD
                024736  000025                          .WORD   21
                024740  013051                          .WORD   EM23
                024742  014172                          .WORD   ERR0
67              024744  005037  002402                  CLR     ITCOUN          ;NO FURTHER ITERATIONS
68              024750                          6$:
69              024750                          10002$:
                024750  104405                          TRAP    C$ESEG
70              024752  104404                          TRAP    C$BSEG
71              024754  005737  002504                  TST     RHTYPE          ;TEST CONTROLLER TYPE
72              024760  003002                          BGT     7$              ;IF > 0, IT IS AN RH70
73              024762  104432                          TRAP    C$EXIT
                024764  000036                          .WORD   10003$-.
74              024766  032777  000001  155566  7$:     BIT     #BIT0,@RPBAE    ;TEST RPBAE:BIT0
75              024774  001412                          BEQ     8$              ;IF 0, GO ON
76              024776  004737  017422                  JSR     PC,BICEXP       ;LOAD FAILING DATA
77              025002  002562                          RPBAE                   ;FAILING REGISTER
78              025004  000001                          BIT0                    ;BIT UNDER TEST
79              025006  104456                          TRAP    C$ERHRD
                025010  000026                          .WORD   22
                025012  013051                          .WORD   EM23
                025014  014172                          .WORD   ERR0
80              025016  005037  002402                  CLR     ITCOUN          ;RESET THE ITERATION COUNTER
81              025022                          8$:
82              025022                          10003$:
                025022  104405                          TRAP    C$ESEG
83              025024  005337  002402                  DEC     ITCOUN          ;ONE LESS ITERATION TO GO
84              025030  003237                          BGT     1$              ;DO UNTIL <= 0
85              025032                          L10034:
                025032  104401                          TRAP    C$ETST
```

```
                                .SBTTL  TEST 15 RPBAE DUPLICATED A17 TEST
                                ;
                                ;%      TEST 15 (RH70 TEST ONLY)  RPBAE DUPLICATED A17 TEST
                                ;%      :  WRITE RPCS1:  A17 (BIT 09) = 1
                                ;%      :  IF RPCS1:  A17 <> 1
                                ;%      :  :  THEN
                                ;%      :  :  OUTPUT ERROR MESSAGE (BIT FAILED TO SET`
                                ;%      :  :  ELSE
                                ;%      :  :  IF RPCS1:  A16 = 1
                                ;%      :  :  :  THEN
                                ;%      :  :  :  OUTPUT ERROR MESSAGE (BIT SET WHEN NOT EXPECTED)
                                ;%      :  :  ENDIF
                                ;%      :  :  IF RPBAE:  BIT01 DIDN'T SET
                                ;%      :  :  :  THEN
                                ;%      :  :  :  OUTPUT ERROR MESSAGE (BIT FAILED TO SET)
                                ;%      :  :  :  ELSE
                                ;%      :  :  :  SET RPCS2:  CLR = 1
                                ;%      :  :  ENDIF
                                ;%      :  :  IF ((RPCS1:  A17) AND (RPBAE:  BIT01)) <> 0
                                ;%      :  :  :  THEN
                                ;%      :  :  :  OUTPUT ERROR MESSAGE (BIT(S) DIDN'T CLEAR)
                                ;%      :  :  ENDIF
                                ;%      :  ENDIF
                                ;%      END TEST 15
                                
026 025034                      T15::
027 025034  005037  002404              CLR     ERRWD1          ;MODULE CALLOUT FOR THIS TEST
028 025040  012737  000002  002406      MOV     #BIT1,ERRWD2    ;CONTROLLER ONLY
029 025046  012737  000012  002402      MOV     #10.,ITCOUN     ;LOAD THE ITERATION COUNT
030 025054                      1$:
    025054  104404                      TRAP    C$BSEG
031 025056  012777  001000  155426      MOV     #A17,@RPCS1     ;SET RPCS1:A17=1
032 025064  032777  001000  155420      BIT     #A17,@RPCS1     ;TEST RPCS1:A17
033 025072  001012                      BNE     2$              ;IF =2, OK
034 025074  004737  017372              JSR     PC,BISEXP       ;LOAD FAILING DATA
035 025100  002512                      RPCS1                   ;FAILING REGISTER
036 025102  001000                      A17                     ;BIT UNDER TEST
037 025104  104456                      TRAP    C$ERHRD
    025106  000027                      .WORD   23
    025110  012776                      .WORD   EM22
    025112  014172                      .WORD   ERR0
038 025114  005037  002402              CLR     ITCOUN          ;NO ITERATIONS
039 025120  032777  000400  155364  2$: BIT     #A16,@RPCS1     ;DID A16 ALSO SET?
040 025126  001412                      BEQ     3$              ;IF ZERO, NO-IT'S OK!
041 025130  004737  017422              JSR     PC,BICEXP       ;LOAD THE FAILING DATA
042 025134  002512                      RPCS1                   ;THIS REGISTER
043 025136  000400                      A16                     ;THIS BIT FAILED TO REMAIN CLEAR!
044 025140  104456                      TRAP    C$ERHRD
    025142  000030                      .WORD   24
    025144  012454                      .WORD   EM14
    025146  014172                      .WORD   ERR0
045 025150  005037  002402              CLR     ITCOUN          ;ITERATIONS = 0
046 025154                      3$:
047 025154                      10000$:
    025154  104405                      TRAP    C$ESEG
048 025156  104404                      TRAP    C$BSEG
049 025160  005737  002504              TST     RHTYPE          ;TEST CONTROLLER TYPE
```

```
    025164  003002                          BGT     4$              ;IF > 0, = RH70
    025166  104432                          TRAP    C$EXIT
    025170  000036                          .WORD   10001$-.
    025172  032777  000002  155362  4$:     BIT     #BIT1,@RPBAE    ;TEST RPBAE:BIT1
    025200  001012                          BNE     5$              ;IF =1, OK
    025202  004737  017372                  JSR     PC,BISEXP       ;LOAD FAILING DATA
    025206  002562                          RPBAE                   ;FAILING REGISTER
    025210  000002                          BIT1                    ;BIT UNDER TEST
    025212  104456                          TRAP    C$ERHRD
    025214  000031                          .WORD   25
    025216  012776                          .WORD   EM22
    025220  014172                          .WORD   ERR0
    025222  005037  002402                  CLR     ITCOUN          ;ITERATIONS = 0
    025226                          5$:
    025226                          10001$:
    025226  104405                          TRAP    C$ESEG
    025230  104404                          TRAP    C$BSEG
    025232  052777  000040  155262          BIS     #CLR,@RPCS2     ;SET RPCS2:CLR=1
    025240  032777  001000  155244          BIT     #A17,@RPCS1     ;TEST RPCS1:A17
    025246  001412                          BEQ     6$              ;IF 0, OK
    025250  004737  017422                  JSR     PC,BICEXP       ;LOAD FAILING DATA
    025254  002512                          RPCS1                   ;FAILING REGISTER
    025256  001000                          A17                     ;BIT UNDER TEST
    025260  104456                          TRAP    C$ERHRD
    025262  000032                          .WORD   26
    025264  013051                          .WORD   EM23
    025266  014172                          .WORD   ERR0
    025270  005037  002402                  CLR     ITCOUN          ;ITERATIONS = 0
    025274                          6$:
    025274                          10002$:
    025274  104405                          TRAP    C$ESEG
    025276  104404                          TRAP    C$BSEG
    025300  005737  002504                  TST     RHTYPE          ;TEST CONTROLLER TYPE
    025304  003002                          BGT     7$              ;IF =+1, IS RH70
    025306  104432                          TRAP    C$EXIT
    025310  000036                          .WORD   10003$-.
    025312  032777  000002  155242  7$:     BIT     #BIT1,@RPBAE    ;TEST RPBAE:BIT1
    025320  001412                          BEQ     8$              ;IF =0, OK
    025322  004737  017422                  JSR     PC,BICEXP       ;LOAD FAILING DATA
    025326  002562                          RPBAE                   ;FAILING REGISTER
    025330  001000                          A17                     ;BIT UNDER TEST
    025332  104456                          TRAP    C$ERHRD
    025334  000033                          .WORD   27
    025336  013051                          .WORD   EM23
    025340  014172                          .WORD   ERR0
    025342  005037  002402                  CLR     ITCOUN          ;ITERATIONS = 0
    025346                          8$:
    025346                          10003$:
    025346  104405                          TRAP    C$ESEG
    025350  005337  002402                  DEC     ITCOUN          ;ONE LESS ITERATION
    025354  003237                          BGT     1$              ;IF NOT <= 0, KEEP GOING
    025356                          L10035:
    025356  104401                          TRAP    C$ETST
```

TEST 16 INTERRUPT ENABLE - BIT TEST

```
                                        .SBTTL  TEST 16 INTERRUPT ENABLE - BIT TEST
                                        ;%      TEST 16  INTERRUPT ENABLE BIT SET-CLEAR TEST
                                        ;%      :  SET PROCESSOR PRIORITY = 7 (LOCK OUT ALL INTERRUPTS)
                                        ;%      :  SET RPCS1:  IE (BIT 06) = 1
                                        ;%      :  IF RPCS1:  IE <> 1
                                        ;%      :  :  THEN
                                        ;%      :  :  OUTPUT ERROR MESSAGE (BIT DIDN'T SET)
                                        ;%      :  :  ELSE
                                        ;%      :  :  SET RPCS2:  CLR = 1
                                        ;%      :  ENDIF
                                        ;%      :  IF RPCS1:  IE <> 0
                                        ;%      :  :  THEN
                                        ;%      :  :  OUTPUT ERROR MESSAGE (BIT DIDN'T CLEAR)
                                        ;%      :  ENDIF
                                        ;%      END TEST 16

025360                                  T16::
025360  005037  002404                          CLR     ERRWD1          ;MODULE CALLOUT
025364  012737  000002  002406                  MOV     #BIT1,ERRWD2    ;FOR THIS TEST
025372  012737  000012  002402                  MOV     #10.,ITCOUN     ;LOAD THE ITERATION COUNT
025400                                  1$:                             ;SET PRIORITY TO 7
025400  012700  000340                          MOV     #PRI07,R0
025404  104441                                  TRAP    C$SPRI
025406  104404                                  TRAP    C$BSEG
025410  052777  000100  155074                  BIS     #IE,@RPCS1      ;WRITE RPCS1:INTERRUPT ENABLE=1
025416  032777  000100  155066                  BIT     #IE,@RPCS1      ;TEST RPCS1:IE
025424  001012                                  BNE     2$              ;IF 2, GO ON
025426  004737  017372                          JSR     PC,BISEXP       ;LOAD FAILING DATA
025432  002512                                  RPCS1                   ;FAILING REGISTER
025434  000100                                  IE                      ;BIT UNDER TEST
025436  104456                                  TRAP    C$ERHRD
025440  000034                                  .WORD   28
025442  012776                                  .WORD   EM22
025444  014172                                  .WORD   ERR0
025446  005037  002402                          CLR     ITCOUN          ;ITERATIONS = 0
025452                                  2$:
025452                                  10000$:
025452  104405                                  TRAP    C$ESEG
025454  104404                                  TRAP    C$BSEG
025456  052777  000040  155036                  BIS     #CLR,@RPCS2     ;SET RPCS2:CLR=1
025464  032777  000100  155020                  BIT     #IE,@RPCS1      ;TEST RPCS1:IE
025472  001412                                  BEQ     3$              ;IF 0, TEST PASSES
025474  004737  017422                          JSR     PC,BICEXP       ;LOAD FAILING DATA
025500  002512                                  RPCS1                   ;FAILING REGISTER
025502  000100                                  IE                      ;BIT UNDER TEST
025504  104456                                  TRAP    C$ERHRD
025506  000035                                  .WORD   29
025510  013051                                  .WORD   EM23
025512  014172                                  .WORD   ERR0
025514  005037  002402                          CLR     ITCOUN          ;RESET FURTHER ITERATIONS
025520                                  3$:
025520                                  10001$:
025520  104405                                  TRAP    C$ESEG
025522  005337  002402                          DEC     ITCOUN          ;ONE LESS ITERATION TO-GO
025526  003324                                  BGT     1$              ;IF NOT <= 0, WE'RE NOT DONE
025530  012700  000000                          MOV     #0,R0
```

TEST 16 INTERRUPT ENABLE - BIT TEST

```
025534  104441                          TRAP    C$SPRI
49 025536                       L10036:
025536  104401                          TRAP    C$ETST
```

```
                                .SBTTL  TEST 17 RH70 DUPLICATE INTERRUPT ENABLE TEST
                                ;
                                ;%      TEST 17 (RH70 TEST ONLY) RPCS3 DUPLICATE INTERRUPT ENABLE TEST
                                ;%      :  SET PROCESSOR PRIORITY = 7
                                ;%      :  SET RPCS1:  IE (BIT 06) = 1
                                ;%      :  IF RPCS3:  IE (BIT 06) <> 1
                                ;%      :  :  THEN
                                ;%      :  :  OUTPUT ERROR MESSAGE
                                ;%      :  :  ELSE SET RPCS2:  CLR = 1
                                ;%      :  ENDIF
                                ;%      :  IF ((RPCS1:  IE) AND (RPCS3:  IE)) <> 0
                                ;%      :  :  THEN
                                ;%      :  :  OUTPUT ERROR MESSAGE (BIT(S) DIDN'T CLEAR)
                                ;%      :  ENDIF
                                ;%      END TEST 17
                                ;
025540                          T17::
025540  005737  002504                  TST     RHTYPE          ;CAN WE DO THIS TEST
025544  003002                          BGT     1$              ;IF RH TYPE =+1, CONTROLLER IS RH70
025546  104432                          TRAP    C$EXIT
025550  000160                          .WORD   L1C037-.
025552  005037  002404          1$:     CLR     ERRWD1          ;MODULE CALLOUT
025556  012737  000002  002406          MOV     #BIT1,ERRWD2    ;FOR THIS TEST
025564  012737  000012  0C2402          MOV     #10.,ITCOUN     ;LOAD THE ITERATION COUNT
025572                          2$:
025572  104404                          TRAP    C$BSEG
                                                                ;SET PRIORITY TO 7
025574  012700  000340                  MOV     #PRI07,R0
025600  104441                          TRAP    C$SPRI
025602  012777  000100  154702          MOV     #IE,@RPCS1      ;SET RPCS1:IE=1
025610  032777  000100  154746          BIT     #IE,@RPCS3      ;TEST RPCS3:IE
025616  001012                          BNE     3$              ;IF SET, GO ON
025620  004737  017372                  JSR     PC,BISEXP       ;LOAD FAILING DATA
025624  002564                          RPCS3                   ;FAILING REGISTER
025626  000100                          IE                      ;BIT UNDER TEST
025630  104456                          TRAP    C$ERHRD
025632  000036                          .WORD   30
025634  012776                          .WORD   EM22
025636  014172                          .WORD   ERR0
025640  005037  002402                  CLR     ITCOUN          ;NO ITERATIONS NECESSARY
025644                          3$:
025644                          10000$:
025644  104405                          TRAP    C$ESEG
025646  104404                          TRAP    C$BSEG
025650  052777  000040  154644          BIS     #CLR,@RPCS2     ;CLEAR OUT THE DEVICE
025656  032777  000100  154700          BIT     #IE,@RPCS3      ;TEST RPCS3:IE
025664  001412                          BEQ     4$              ;IF CLEAR, TEST PASSES
025666  004737  017422                  JSR     PC,BICEXP       ;LOAD FAILING DATA
025672  002564                          RPCS3                   ;FAILING REGISTER
025674  000100                          IE                      ;BIT UNDER TEST
025676  104456                          TRAP    C$ERHRD
025700  000037                          .WORD   31
025702  013051                          .WORD   EM23
025704  014172                          .WORD   ERR0
025706  005037  002402                  CLR     ITCOUN          ;NO ITERATIONS
025712                          4$:
025712                          10001$:
```

```
        025712  104405                          TRAP    C$ESEG
     48 025714  005337  002402                  DEC     ITCOUN          ;ONE LESS ITERATION TO-GO
     49 025720  003324                          BGT     2$              ;>0 ?? DO AGAIN!!
     50 025722  012700  000000                  MOV     #0,R0
        025726  104441                          TRAP    C$SPRI
     51 025730                          L10037:
        025730  104401                          TRAP    C$ETST
```

```
                                .SBTTL  TEST 18 IPCK0 TEST
                                ;
                                ;%      TEST 18 (RH70 TEST ONLY)  MDPE TEST 1
                                ;%      :  SET RPCS3:  IPCK0 (BIT 0) = 1
                                ;%      :  IF RPCS3:  IPCK0 <> 1
                                ;%      :  :  THEN
                                ;%      :  :  OUTPUT ERROR MESSAGE (BIT DIDN'T SET)
                                ;%      :  :  ELSE
                                ;%      :  :  IF RPCS2:  IR <> 1
                                ;%      :  :  :  THEN
                                ;%      :  :  :  WAIT
                                ;%      :  :  ENDIF
                                ;%      :  :  WRITE DATA TO RPDB
                                ;%      :  ENDIF
                                ;%      :  IF ((RPCS1:  TRE) AND (RPCS1:  SC) AND (RPCS2:  MCPE)) <> 1
                                ;%      :  :  THEN
                                ;%      :  :  OUTPUT ERROR MESSAGE (SHOULD HAVE DETECTED A PARITY ERROR)
                                ;%      :  :  ELSE
                                ;%      :  :  SET RPCS2:  CLR = 1
                                ;%      :  :  IF ((RPCS2:  MCPE) OR (RPCS1:  SC) OR (RPCS1:  TRE)) = 1
                                ;%      :  :  :  :  THEN
                                ;%      :  :  :  OUTPUT ERROR MESSAGE (ERROR STATUS DIDN'T CLEAR)
                                ;%      :  :  ENDIF
                                ;%      :  ENDIF
                                ;%      :  ENDIF
                                ;%      END TEST 18
                                ;
028 025732                      T18::
029 025732  005737  002504              TST     RHTYPE          ;IS THE CONTROLLER AN RH70?
    025736  003002                      BGT     64$             ;IF > 0, YES,
    025740  104432                      TRAP    C$EXIT
    025742  000264                      .WORD   L10040-.
    025744  005037  002404      64$:    CLR     ERRWD1          ;SET THE MODULE CALLOUT
    025750  012737  000002  002406      MOV     #BIT1,ERRWD2    ;FOR THIS TEST
    025756  012737  000012  002402      MOV     #10.,ITCOUN     ;LOAD THE ITERATION COUNT
    025764                      66$:
    025764  104404                      TRAP    C$BSEG
    025766  052777  000001  154570      BIS     #BIT0,@RPCS3    ;SET THE BIT0-UNDER-TEST
    025774  032777  000001  154562      BIT     #BIT0,@RPCS3    ;DID BIT0 SET IN RPCS3?
    026002  001012                      BNE     65$             ;YES, SKIP ERROR DISPATCH
    026004  004737  017372              JSR     PC,BISEXP       ;LOAD FAILING DATA
    026010  002564                      RPCS3                   ;FAILING REGISTER
    026012  000001                      BIT0                    ;BIT UNDER TEST
    026014  104456                      TRAP    C$ERHRD
    026016  000040                      .WORD   32.
    026020  012776                      .WORD   EM22
    026022  014172                      .WORD   ERR0
    026024  005037  002402              CLR     ITCOUN          ;RESET FURTHER ITERATIONS
    026030                      65$:
    026030                      10000$:
    026030  104405                      TRAP    C$ESEG
    026032  104404                      TRAP    C$BSEG
    026034  004737  017672              JSR     PC,IRLOCK       ;POLL INPUT READY IN RPCS2
    026040  005077  154470              CLR     @RPDB           ;WRITE RPDB WITH 0'S
    026044  004737  017706              JSR     PC,ORLOCK       ;NOW WAIT FOR OUTPUT READY IN RPCS2
    026050  005777  154460              TST     @RPDB           ;NOW DO A ONE WORD READ OF RPDB
    026054  004737  017000              JSR     PC,WAIT         ;WAIT FOR THE RP07 MICROPROCESSOR
```

```
026060  032777  140000  154424          BIT     #SC!TRE,@RPCS1  ;LOOK FOR SC AND TRE
026066  001012                          BNE     67$             ;THEY BOTH SET, GO-ON
026070  004737  017372                  JSR     PC,BISEXP       ;LOAD FAILING DATA
026074  002512                          RPCS1                   ;FAILING REGISTER
026076  140000                          SC!TRE                  ;BIT UNDER TEST
026100  104456                          TRAP    C$ERHRD
026102  000041                          .WORD   33
026104  012776                          .WORD   EM22
026106  014172                          .WORD   ERR0
026110  005037  002402                  CLR     ITCOUN          ;RESET FURTHER ITERATIONS
026114  032777  000400  154400  67$:    BIT     #MDPE,@RPCS2    ;DID WE DETECT PARITY ERROR?
026122  001012                          BNE     68$             ;YES, GO-ON
026124  004737  017372                  JSR     PC,BISEXP       ;LOAD FAILING DATA
026130  002522                          RPCS2                   ;FAILING REGISTER
026132  000400                          MDPE                    ;BIT UNDER TEST
026134  104456                          TRAP    C$ERHRD
026136  000042                          .WORD   34
026140  012776                          .WORD   EM22
026142  014172                          .WORD   ERR0
026144  005037  002402                  CLR     ITCOUN          ;RESET FURTHER ITERATIONS
026150  052777  000040  154344  68$:    BIS     #CLR,@RPCS2     ;CLEAR OUT THE DEVICE
026156                          10001$:
026156  104405                          TRAP    C$ESEG
026160  104404                          TRAP    C$BSEG
026162  032777  000001  154374          BIT     #BIT0,@RPCS3    ;NOW CHECK TO SEE THAT #BIT0 DID CLEAR
026170  001412                          BEQ     69$             ;= 0, TEST OK!!
026172  004737  017422                  JSR     PC,BICEXP       ;LOAD FAILING DATA
026176  002564                          RPCS3                   ;FAILING REGISTER
026200  000001                          BIT0                    ;BIT UNDER TEST
026202  104456                          TRAP    C$ERHRD
026204  000043                          .WORD   35
026206  013051                          .WORD   EM23
026210  000000                          .WORD   0
026212  005037  002402                  CLR     ITCOUN          ;RESET FURTHER ITERATIONS
026216                          69$:
026216                          10002$:
026216  104405                          TRAP    C$ESEG
026220  005337  00?''                   DEC     ITC'UN          ;ONE LESS ITERATION TO-GO
026224  003257                          BGT     66$             ;TAKE BRANCH IF NOT DONE
30 026226                       L10040:
026226  1044.1                          TRAP    C$ETST
```

```
                                .SBTTL  TEST 19 IPCK1 TEST
                                ;
                                ;%      TEST 19 (RH70 TEST ONL:) MDPE TEST 2
                                ;%      :  SET RPCS3:  BIT 01 (IPCK1) = 1
                                ;%      :  IF RPCS3:  IPCK1 <> 1
                                ;%      :  :  THEN
                                ;%      :  :  OUTPUT ERROR MESSAGE (BIT DIDN'T SET)
                                ;%      :  :  ELSE
                                ;%      :  :  IF RPCS2:  IR <> 1
                                ;%      :  :  :  THEN
                                ;%      :  :  :  WAIT FOR RPCS2:  IR TO SET
                                ;%      :  :  ENDIF
                                ;%      :  :  WRITE RPDB ONCE
                                ;%      :  ENDIF
                                ;%      :  IF ((RPCS1:  TRE) AND (RPCS1:  SC) AND (RPCS2:  MDPE)) <> 1
                                ;%      :  :  :  THEN
                                ;%      :  :  OUTPUT ERROR MESSAGE  (UNDETECTED PARITY ERROR)
                                ;%      :  :  ELSE
                                ;%      :  :  SET RPCS2:  CLR = 1
                                ;%      :  :  IF ((RPCS1:  TRE) OR (RPCS1:  SC) OR (RPCS2:  MDPE)) = 1
                                ;%      :  :  :  THEN
                                ;%      :  :  :  OUTPUT ERROR MESSAGE (ERROR STATUS FAILED TO CLEAR)
                                ;%      :  :  ENDIF
                                ;%      :  ENDIF
                                ;%      END TEST 19
                                ;
026230                          T19::
026230  005737  002504                  TST     RHTYPE          ;IS THE CONTROLLER AN RH7C?
026234  003002                          BGT     64$             ;IF > 0, YES,
026236  104432                          TRAP    C$EXIT
026240  000264                          .WORD   L10041-.
026242  005037  002404          64$:    CLR     ERRWD1          ;SET THE MODULE CALLOUT
026246  012737  000002  002406          MOV     #BIT1,ERRWD2    ;FOR THIS TEST
026254  012737  000012  002402          MOV     #10.,ITCOUN     ;LOAD THE ITERATION COUNT
026262                          66$:
026262  104404                          TRAP    C$BSEG
026264  052777  000002  154272          BIS     #BIT1,@RPCS3    ;SET THE BIT1-UNDER-TEST
026272  032777  000002  154264          BIT     #BIT1,@RPCS3    ;DID BIT1 SET IN RPCS3?
026300  001012                          BNE     65$             ;YES, SKIP ERROR DISPATCH
026302  004737  017372                  JSR     PC,BISEXP       ;LOAD FAILING DATA
026306  002564                          RPCS3                   ;FAILING REGISTER
026310  000001                          BIT0                    ;BIT UNDER TEST
026312  104456                          TRAP    C$ERHRD
026314  000044                          .WORD   36
026316  012776                          .WORD   EM22
026320  014172                          .WORD   ERR0
026322  005037  002402                  CLR     ITCOUN          ;RESET FURTHER ITERATIONS
026326                          65$:
026326                          10000$:
026326  104405                          TRAP    C$ESEG
026330  104404                          TRAP    C$BSEG
026332  004737  017672                  JSR     PC,IRLOCK       ;POLL INPUT READY IN RPCS2
026336  005077  154172                  CLR     @RPDB           ;WRITE RPDB WITH 0'S
026342  004737  017706                  JSR     PC,ORLOCK       ;NOW WAIT FOR OUTPUT READY IN RPCS2
026346  005777  154162                  TST     @RPDB           ;NOW DO A ONE WORD READ OF RPDB
026352  004737  017000                  JSR     PC,WAIT         ;WAIT FOR THE RP07 MICROPROCESSOR
026356  032777  140000  154126          BIT     #SC!TRE,@RPCS1  ;LOOK FOR SC AND TRE
```

```
026364  001012                          BNE     67$             ;THEY BOTH SET, GO-ON
026366  004737  017372                  JSR     PC,BISEXP       ;LOAD FAILING DATA
026372  002512                          RPCS1                   ;FAILING REGISTER
026374  140000                          SC!TRE                  ;BIT UNDER TEST
026376  104456                          TRAP    C$ERHRD
026400  000045                          .WORD   37
026402  012776                          .WORD   EM22
026404  014172                          .WORD   ERR0
026406  005037  002402                  CLR     ITCOUN          ;RESET FURTHER ITERATIONS
026412  032777  000400  154102  67$:    BIT     #MDPE,@RPCS2    ;DID WE DETECT PARITY ERROR?
026420  001012                          BNE     68$             ;YES, GO-ON
026422  004737  017372                  JSR     PC,BISEXP       ;LOAD FAILING DATA
026426  002522                          RPCS2                   ;FAILING REGISTER
026430  000400                          MDPE                    ;BIT UNDER TEST
026432  104456                          TRAP    C$ERHRD
026434  000046                          .WORD   38
026436  012776                          .WORD   EM22
026440  014172                          .WORD   ERR0
026442  005037  002402                  CLR     ITCOUN          ;RESET FURTHER ITERATIONS
026446  052777  000040  154046  68$:    BIS     #CLR,@RPCS2     ;CLEAR OUT THE DEVICE!
026454                          10001$:
026454  104405                          TRAP    C$ESEG
026456  104404                          TRAP    C$BSEG
026460  032777  000002  154076          BIT     #BIT1,@RPCS3    ;NOW CHECK TO SEE THAT #BIT1 DID CLEAR
026466  001412                          BEQ     69$             ;= 0, TEST OK!!
026470  004737  017422                  JSR     PC,BICEXP       ;LOAD FAILING DATA
026474  002564                          RPCS3                   ;FAILING REGISTER
026476  000001                          BIT0                    ;BIT UNDER TEST
026500  104456                          TRAP    C$ERHRD
026502  000047                          .WORD   39
026504  013051                          .WORD   EM23
026506  000000                          .WORD   0
026510  005037  002402                  CLR     ITCOUN          ;RESET FURTHER ITERATIONS
026514                          69$:
026514                          10002$:
026514  104405                          TRAP    C$ESEG
026516  005337  002402                  DEC     ITCOUN          ;ONE LESS ITERATION TO-GO
026522  003257                          BGT     66$             ;TAKE BRANCH IF NOT DONE
029 026524                      L10041:
026524  104401                          TRAP    C$ETST
```

```
                                .SBTTL  TEST 20 IPCK2 TEST
                                
                                ;%      TEST 20 (RH70 TEST ONLY) MDPE TEST 3
                                ;%      :  SET RPCS3:  IPCK2 (BIT2) = 1
                                ;%      :  IF RPCS3:  IPCK2 <> 1
                                ;%      :  :  THEN
                                ;%      :  :  OUTPUT ERROR MESSAGE (BIT DIDN'T SET)
                                ;%      :  :  ELSE
                                ;%      :  :  IF RPCS2:  IR <> 1
                                ;%      :  :  :  THEN
                                ;%      :  :  :  WAIT FOR RPCS2:  IR TO SET
                                ;%      :  :  ENDIF
                                ;%      :  WRITE DATA TO RPDB
                                ;%      :  ENDIF
                                ;%      :  IF ((RPCS1:  TRE) AND RPCS1:  SC) AND (RPCS2:  MCPE)) <> 1
                                ;%      :  :  THEN
                                ;%      :  :  OUTPUT ERROR MESSAGE (UNDETECTED PARITY ERROR)
                                ;%      :  :  ELSE
                                ;%      :  :  SET RPCS2:  CLR = 1
                                ;%      :  :  IF ((RPCS1:  SC) OR (RPCS1:  TRE) OR (RPCS2:  MCPE)) = 1
                                ;%      :  :  :  THEN
                                ;%      :  :  :  OUTPUT ERROR MESSAGE (ERROR STATUS FAILED TO CLEAR)
                                ;%      :  :  ENDIF
                                ;%      :  ENDIF
                                ;%      END TEST 20
                                
026526                          T20::
026526  005737  002504                  TST     RHTYPE          ;IS THE CONTROLLER AN RH70
026532  003002                          BGT     64$             ;IF > 0, YES,
026534  104432                          TRAP    C$EXIT
026536  000304                          .WORD   L10042-.
026540  005037  002404          64$:    CLR     ERRWD1          ;SET THE MODULE CALLOUT
026544  012737  000002  002406          MOV     #BIT1,ERRWD2    ;FOR THIS TEST
026552  012737  000012  002402          MOV     #10.,ITCOUN     ;LOAD THE ITERATION COUNT
026560                          66$:
026560  104404                          TRAP    C$BSEG
026562  052777  000004  153774          BIS     #BIT2,@RPCS3    ;SET THE BIT2-UNDER-TEST
026570  032777  000004  153766          BIT     #BIT2,@RPCS3    ;DID BIT2 SET IN RPCS3?
026576  001012                          BNE     65$             ;YES, SKIP ERROR DISPATCH
026600  004737  017372                  JSR     PC,BISEXP       ;LOAD FAILING DATA
026604  002564                          RPCS3                   ;FAILING REGISTER
026606  000001                          BIT0                    ;BIT UNDER TEST
026610  104456                          TRAP    C$ERHRD
026612  000050                          .WORD   40
026614  012776                          .WORD   EM22
026616  014172                          .WORD   ERR0
026620  005037  002402                  CLR     ITCOUN          ;RESET FURTHER ITERATIONS
026624                          65$:
026624                          10000$:
026624  104405                          TRAP    C$ESEG
026626  104404                          TRAP    C$BSEG
026630  004737  017672                  JSR     PC,IRLOCK       ;POLL INPUT READY IN RPCS2
026634  005077  153674                  CLR     @RPDB           ;WRITE RPDB WITH 0'S
026640  004737  017672                  JSR     PC,IRLOCK       ;WAIT FOR IR TO SET AGAIN
026644  005077  153664                  CLR     @RPDB           ;WRITE RPDB = 0, AGAIN
026650  004737  017706                  JSR     PC,ORLOCK       ;NOW WAIT FOR OUTPUT READY IN RPCS2
026654  005777  153654                  TST     @RPDB           ;NOW DO A ONE WORD READ OF RPDB
```

```
026660  004737  017706                  JSR     PC,ORLOCK       ;WAIT FOR OUTPUT READY TO SET IN RPCS2 AGAIN!
026664  005777  153644                  TST     @RPDB           ;DO A SECOND READ OF RPDB
026670  004737  017000                  JSR     PC,WAIT         ;WAIT FOR THE RP07 MICROPROCESSOR
026674  032777  140000  153610          BIT     #SC!TRE,@RPCS1  ;LOOK FOR SC AND TRE
026702  001012                          BNE     67$             ;THEY BOTH SET, GO-ON
026704  004737  017372                  JSR     PC,BISEXP       ;LOAD FAILING DATA
026710  002512                          RPCS1                   ;FAILING REGISTER
026712  140000                          SC!TRE                  ;BIT UNDER TEST
026714  104456                          TRAP    C$ERHRD
026716  000051                          .WORD   41
026720  012776                          .WORD   EM22
026722  014172                          .WORD   ERR0
026724  005037  002402                  CLR     ITCOUN          ;RESET FURTHER ITERATIONS
026730  032777  000400  153564  67$:    BIT     #MDPE,@RPCS2    ;DID WE DETECT PARITY ERROR?
026736  001012                          BNE     68$             ;YES, GO-ON
026740  004737  017372                  JSR     PC,BISEXP       ;LOAD FAILING DATA
026744  002522                          RPCS2                   ;FAILING REGISTER
026746  000400                          MDPE                    ;BIT UNDER TEST
026750  104456                          TRAP    C$ERHRD
026752  000052                          .WORD   42
026754  012776                          .WORD   EM22
026756  014172                          .WORD   ERR0
026760  005037  002402                  CLR     ITCOUN          ;RESET FURTHER ITERATIONS
026764  052777  000040  153530  68$:    BIS     #CLR,@RPCS2     ;CLEAR OUT THE DEVICE!
026772                          10001$:
026772  104405                          TRAP    C$ESEG
026774  104404                          TRAP    C$BSEG
026776  032777  000004  153560          BIT     #BIT2,@RPCS3    ;NOW CHECK TO SEE THAT #BIT2 DID CLEAR
027004  001412                          BEQ     69$             ;= 0, TEST OK!!
027006  004737  017422                  JSR     PC,BICEXP       ;LOAD FAILING DATA
027012  002564                          RPCS3                   ;FAILING REGISTER
027014  000001                          BIT0                    ;BIT UNDER TEST
027016  104456                          TRAP    C$ERHRD
027020  000053                          .WORD   43
027022  013051                          .WORD   EM23
027024  000000                          .WORD   0
027026  005037  002402                  CLR     ITCOUN          ;RESET FURTHER ITERATIONS
027032                          69$:
027032                          10002$:
027032  104405                          TRAP    C$ESEG
027034  005337  002402                  DEC     ITCOUN          ;ONE LESS ITERATION TO-GO
027040  003247                          BGT     66$             ;TAKE BRANCH IF NOT DONE
29 027042
027042  104401                  L10042: TRAP    C$ETST
```

```
                                .SBTTL  TEST 21 IPCK3 TEST

                                ;%      TEST 21 (RH70 TEST ONLY) MDPE TEST 4
                                ;%      :  SET RPCS3:  IPCK3 (BIT 03) = 1
                                ;%      :  IF RPCS3:  IPCK3 <> 1
                                ;%      :  :  THEN
                                ;%      :  :  OUTPUT ERROR MESSAGE (BIT FAILED TO SET)
                                ;%      :  :  ELSE
                                ;%      :  :  IF RPCS2:  IR <> 1
                                ;%      :  :  :  THEN
                                ;%      :  :  :  WAIT FOR RPCS2:  IR TO SET
                                ;%      :  :  ENDIF
                                ;%      :  :  ELSE
                                ;%      :  :  WRITE DATA TO RPDB
                                ;%      :  :  WAIT FOR RPCS2:  IR TO SET AGAIN (USING A TIMER)
                                ;%      :  :  WRITE RPDB WITH DATA AGAIN
                                ;%      :  ENDIF
                                ;%      :  IF ((RPCS1:  SC) AND (RPCS1:  TRE) AND (RPCS2:  MCPE)) <> 1
                                ;%      :  :  THEN
                                ;%      :  :  OUTPUT ERROR MESSAGE (UNDETECTED PARITY ERROR)
                                ;%      :  :  ELSE
                                ;%      :  :  SET RPCS2:  CLR = 1
                                ;%      :  ENDIF
                                ;%      :  IF ((RPCS1:  SC) OR (RPCS1:  TRE) OR (RPCS2:  MCPE)) = 1
                                ;%      :  :  THEN
                                ;%      :  :  OUTPUT ERROR MESSAGE (ERROR STATUS FAILED TO CLEAR)
                                ;%      :  ENDIF
                                ;%      END TEST 21

027044                          T21::
027044  005737  002504                  TST     RHTYPE          ;IS THE CONTROLLER AN RH70?
027050  003002                          BGT     64$             ;IF > 0, YES,
027052  104432                          TRAP    C$EXIT
027054  000304                          .WORD   L10043-.
027056  005037  002404          64$:    CLR     ERRWD1          ;SET THE MODULE CALLOUT
027062  012737  000002  002406          MOV     #BIT1,ERRWD2    ;FOR THIS TEST
027070  012737  000012  002402          MOV     #10.,ITCOUN     ;LOAD THE ITERATION COUNT
027076                          66$:
027076  104404                          TRAP    C$BSEG
027100  052777  000010  153456          BIS     #BIT3,@RPCS3    ;SET THE BIT3-UNDER-TEST
027106  032777  000010  153450          BIT     #BIT3,@RPCS3    ;DID BIT3 SET IN RPCS3?
027114  001012                          BNE     65$             ;YES, SKIP ERROR DISPATCH
027116  004737  017372                  JSR     PC,BISEXP       ;LOAD FAILING DATA
027122  002564                          RPCS3                   ;FAILING REGISTER
027124  000001                          BIT0                    ;BIT UNDER TEST
027126  104456                          TRAP    C$ERHRD
027130  000054                          .WORD   44
027132  012776                          .WORD   EM22
027134  014172                          .WORD   ERR0
027136  005037  002402                  CLR     ITCOUN          ;RESET FURTHER ITERATIONS
027142                          65$:
027142                          10000$:
027142  104405                          TRAP    C$ESEG
027144  104404                          TRAP    C$BSEG
027146  004737  017672                  JSR     PC,IRLOCK       ;POLL INPUT READY IN RPCS2
027152  005077  153356                  CLR     @RPDB           ;WRITE RPDB WITH 0'S
027156  004737  017672                  JSR     PC,IRLOCK       ;WAIT FOR IR TO SET AGAIN
```

```
027162  005077  153346                  CLR     @RPDB           ;WRITE RPDB = 0, AGAIN
027166  004737  017706                  JSR     PC,ORLOCK       ;NOW WAIT FOR OUTPUT READY IN RPCS2
027172  005777  153336                  TST     @RPDB           ;NOW DO A ONE WORD READ OF RPDB
027176  004737  017706                  JSR     PC,ORLOCK       ;WAIT FOR OUTPUT READY TO SET IN RPCS2 AGAIN!
027202  005777  153326                  TST     @RPDB           ;DO A SECOND READ OF RPDB
027206  004737  017000                  JSR     PC,WAIT         ;WAIT FOR THE RP07 MICROPROCESSOR
027212  032777  140000  153272          BIT     #SC!TRE,@RPCS1  ;LOOK FOR SC AND TRE
027220  001012                          BNE     67$             ;THEY BOTH SET, GO-ON
027222  004737  017372                  JSR     PC,BISEXP       ;LOAD FAILING DATA
027226  002512                          RPCS1                   ;FAILING REGISTER
027230  140000                          SC!TRE                  ;BIT UNDER TEST
027232  104456                          TRAP    C$ERHRD
027234  000055                          .WORD   45
027236  012776                          .WORD   EM22
027240  014172                          .WORD   ERR0
027242  005037  002402                  CLR     ITCOUN          ;RESET FURTHER ITERATIONS
027246  032777  000400  153246  67$:    BIT     #MDPE,@RPCS2    ;DID WE DETECT PARITY ERROR?
027254  001012                          BNE     68$             ;YES, GO-ON
027256  004737  017372                  JSR     PC,BISEXP       ;LOAD FAILING DATA
027262  002522                          RPCS2                   ;FAILING REGISTER
027264  000400                          MDPE                    ;BIT UNDER TEST
027266  104456                          TRAP    C$ERHRD
027270  000056                          .WORD   46
027272  012776                          .WORD   EM22
027274  014172                          .WORD   ERR0
027276  005037  002402                  CLR     ITCOUN          ;RESET FURTHER ITERATIONS
027302  052777  000040  153212  68$:    BIS     #CLR,@RPCS2     ;CLEAR OUT THE DEVICE!
027310                          10001$:
027310  104405                          TRAP    C$ESEG
027312  104404                          TRAP    C$BSEG
027314  032777  000010  153242          BIT     #BIT3,@RPCS3    ;NOW CHECK TO SEE THAT #BIT3 DID CLEAR
027322  001412                          BEQ     69$             ;= 0, TEST OK!!
027324  004737  017422                  JSR     PC,BICEXP       ;LOAD FAILING DATA
027330  002564                          RPCS3                   ;FAILING REGISTER
027332  000001                          BIT0                    ;BIT UNDER TEST
027334  104456                          TRAP    C$ERHRD
027336  000057                          .WORD   47
027340  013051                          .WORD   EM23
027342  000000                          .WORD   0
027344  005037  002402                  CLR     ITCOUN          ;RESET FURTHER ITERATIONS
027350                          69$:
027350                          10002$:
027350  104405                          TRAP    C$ESEG
027352  005337  002402                  DEC     ITCOUN          ;ONE LESS ITERATION TO-GO
027356  003247                          BGT     66$             ;TAKE BRANCH IF NOT DONE
32 027360                       L10043:
027360  104401                          TRAP    C$ETST
```

```
                                        .SBTTL  TEST 22 INTERRUPT TEST #1
                                        ;%      TEST 22 INTERRUPT TEST 1
                                        ;%      : WRITE RPCS1:  RDY (BIT 07) = 1
                                        ;%      : IF RPCS1:  RDY <> 1
                                        ;%      : : THEN
                                        ;%      : : OUTPUT ERROR MESSAGE (RPCS1:  RDY STUCK AT 0)
                                        ;%      : ENDIF
                                        ;%      : SET PROCESSOR PRIORITY = 7 DOWNTO THE DEVICE PRIORITY, ONE LEVEL AT A TIME
                                        ;%      : SET RPCS1:  RDY AND RPCS1:  IE = 1
                                        ;%      : IF INTERRUPT IS RECEIVED
                                        ;%      : : THEN
                                        ;%      : : OUTPUT ERROR MESSAGE (RHXX INTERRUPTED TO WRONG PRIORITY)
                                        ;%      : ENDIF
                                        ;%      END TEST 22

027362                                  T22::
027362  005037  002404                        CLR     ERRWD1          ;CREATE THE MODULE CALLOUT
027366  012737  000002  002406                MOV     #BIT1,ERRWD2    ;FOR THIS TEST
027374  012737  000012  002402                MOV     #10.,ITCOUN     ;LOAD THE ITERATION COUNT
027402                                  1$:
027402  104404                          1$:     TRAP    C$BSEG
027404  005037  002462                        CLR     INTFLG          ;RESET THE INTERRUPT STATUS FLAG
027410  052777  000200  153074                BIS     #RDY,@RPCS1     ;SET RDY = 1 IN RPCS1
027416  032777  000200  153066                BIT     #RDY,@RPCS1     ;IS IT = 1 ?
027424  001012                                BNE     2$              ;YES, SKIP ERROR DISPATCH
027426  004737  017372                        JSR     PC,BISEXP       ;LOAD UP THE ERROR POINTERS
027432  002512                                RPCS1                   ;THIS REGISTER
027434  000200                                RDY                     ;THIS BIT
027436  104456                                TRAP    C$ERHRD
027440  000060                                .WORD   48
027442  012776                                .WORD   EM22
027444  014172                                .WORD   ERR0
027446  005037  002402                        CLR     ITCOUN          ;RESET THE ITERATION COUNTER
027452                                  2$:
027452                                  10000$:
027452  104405                          10000$: TRAP    C$ESEG
027454  012746  000340                        MOV     #PRI07,-(SP)
027460  012746  020630                        MOV     #INTSRV,-(SP)
027464  013746  002476                        MOV     RPVEC,-(SP)
027470  012746  000003                        MOV     #3,-(SP)
027474  104437                                TRAP    C$SVEC
027476  062706  000010                        ADD     #10,SP
027502  012702  000340                        MOV     #PRI07,R2       ;SET THE PRIORITY TO 7
027506                                  3$:
027506  104404                          3$:     TRAP    C$BSEG
027510  010200                                MOV     R2,R0
027512  104441                                TRAP    C$SPRI
027514  052777  000300  152770                BIS     #RDY!IE,@RPCS1  ;FORCE AN INTERRUPT, BUT DON'T HONOR IT!
027522  012727  000020                        MOV     #20,(PC)+
027526  000000                                .WORD   0
027530  013727  002116                        MOV     L$DLY,(PC)+
027534  000000                                .WORD   0
027536  005367  177772                        DEC     -6(PC)
027542  001375                                BNE     .-4
027544  005367  177756                        DEC     -22(PC)
027550  001367                                BNE     .-20
```

```
     38 027552  005737  002462                TST     INTFLG          ;IF INTFLG > 0, WRONG PRIORITY!!
     39 027556  001406                      BEQ     4$              ;IT'S OK IF ZERO!
     40 027560  104456                      TRAP    C$ERHRD
        027562  000061                      .WORD   49
        027564  013126                      .WORD   EM24
        027566  000000                      .WORD   0
     41 027570  005037  002402              CLR     ITCOUN          ;NO ITERATIONS NECESSARY
     42 027574                        4$:
        027574                        10001$:
        027574  104405                      TRAP    C$ESEG
     43 027576  162702  000040              SUB     #40,R2          ;REDUCE THE PRIORITY LEVEL
     44 027602  020237  002500              CMP     R2,RPVEC+2      ;AT THE DEVICE PRIORITY YET?
     45 027606  103337                      BHIS    3$              ;NOT IF HIGHER OR SAME...
     46 027610  052777  000040  152704      BIS     #CLR,@RPCS2     ;NOW DISARM INTERRUPTS
     47 027616  005337  002402              DEC     ITCOUN          ;ONE LESS
     48 027622  003267                      BGT     1$              ;DO UNTIL <= 0
     49 027624  013700  002476              MOV     RPVEC,R0
        027630  104436                      TRAP    C$CVEC
     50 027632                        L10044:
        027632  104401                      TRAP    C$ETST
```

```
                                        .SBTTL  TEST 23 INTERRUPT TEST #2
                                        ;%      TEST 23 INTERRUPT TEST 2
                                        ;%      :  WRITE RPCS2:  CLR = 1
                                        ;%      :  SET PROCESSOR PRIORITY = 0
                                        ;%      :  IF ((RPCS1:  SC) OR (RPDS:  ATA)) = 1
                                        ;%      :  :  THEN
                                        ;%      :  :  OUTPUT ERROR MESSAGE (PERSISTENT ATA OR SC-CANNOT PERFORM INTERRUPT TEST)
                                        ;%      :  :  EXIT TEST 19
                                        ;%      :  ENDIF
                                        ;%      :  WRITE RPCS1:  IE = 1
                                        ;%      :  IF RHXX INTERRUPTS
                                        ;%      :  :  THEN
                                        ;%      :  :  OUTPUT ERROR MESSAGE (RECEIVED FALSE INTERRUPT)
                                        ;%      :  ENDIF
                                        ;%      END TEST 23

027634                                  T23::
027634  012737  016000  002404                MOV     #BIT10!BIT11!BIT12,ERRWD1;J11-J13 CALLOUT
027642  012737  000025  002406                MOV     #BIT1!BIT2!BIT8,ERRWD2;CONTROLLER, CABLE, TERMINATOR
027650  012737  000012  002402                MOV     #10.,ITCOUN     ;LOAD THE ITERATION COUNT
027656                                  1$:
027656  104404                              TRAP    C$BSEG
027660  005037  002462                      CLR     INTFLG          ;RESET THE INTERRUPTS RECEIVED FLAG
027664  052777  000040  152630            BIS     #CLR,@RPCS2     ;CLEAR OUT THE CONTROLLER
027672  013777  002506  152622            MOV     DRVNO,@RPCS2    ;LOAD THE DRIVE NUMBER
027700  032777  160000  152604            BIT     #SC!TRE!MCPE,@RPCS1;DO WE HAVE A SPECIAL CONDITION, MCPE, OR TRANSFER ERROR?
027706  001412                              BEQ     2$              ;IF ZERO, NO!!
027710  004737  017422                      JSR     PC,BICEXP       ;LOAD THE ERROR POINTERS
027714  002512                              RPCS1                   ;THIS REGISTER FAILED,
027716  160000                              SC!TRE!MCPE             ;THIS DATA SHOULD BE CLEAR
027720  104456                              TRAP    C$ERHRD
027722  000062                              .WORD   50
027724  012562                              .WORD   EM16
027726  014172                              .WORD   ERR0
027730  104432                              TRAP    C$EXIT
027732  000146                              .WORD   L10045-.
027734                                  2$:
027734                                  10000$:
027734  104405                              TRAP    C$ESEG
027736  012746  000340                      MOV     #PRI07,-(SP)
027742  012746  020630                      MOV     #INTSRV,-(SP)
027746  013746  002476                      MOV     RPVEC,-(SP)
027752  012746  000003                      MOV     #3,-(SP)
027756  104437                              TRAP    C$SVEC
027760  062706  000010                      ADD     #10,SP
027764  104404                              TRAP    C$BSEG
027766  012700  000000                      MOV     #0,R0
027772  104441                              TRAP    C$SPRI
027774  012777  000100  152510            MOV     #IE,@RPCS1      ;ARM THE DEVICE, BUT DON'T EXPECT AN INTERRUPT
030002  012727  000020                      MOV     #20,(PC)+
030006  000000                              .WORD   0
030010  013727  002116                      MOV     L$DLY,(PC)+
030014  000000                              .WORD   0
030016  005367  177772                      DEC     -6(PC)
030022  001375                              BNE     .-4
030024  005367  177756                      DEC     -22(PC)
```

```
     030030  001367                          BNE     .-20
39   030032  005737  002462                  TST     INTFLG          ;THIS SHOULD = 0, FOR NO INTERRUPTS
40   030036  001406                          BEQ     3$              ;IS ZERO, TEST OK!
41   030040  104456                          TRAP    C$ERHRD
     030042  000063                          .WORD   51
     030044  013167                          .WORD   EM25
     030046  014172                          .WORD   ERR0
42   030050  005037  002402                  CLR     ITCOUN          ;RESET FURTHER ITERATIONS
43   030054                          3$:
     030054                          10001$:
     030054  104405                          TRAP    C$ESEG
44   030056  052777  000040  152436          BIS     #CLR,@RPCS2     ;DISARM INTERRUPTS
45   030064  005337  002402                  DEC     ITCOUN          ;ONE LESS ITERATION
46   030070  003272                          BGT     1$              ;IF > 0, DO AGAIN
47   030072  013700  002476                  MOV     RPVEC,R0
     030076  104436                          TRAP    C$CVEC
48   030100                          L10045:
     030100  104401                          TRAP    C$ETST
```

```
                                .SBTTL  TEST 24 INTERRUPT TEST #3
                                ;
                                ;%      TEST 24 INTERRUPT TEST 3
                                ;%      :  SET RPCS2:  CLR = 1
                                ;%      :  SET ((RPCS1:  IE) AND (RPCS1:  RDY)) = 1
                                ;%      :  CLEAR PROCESSOR STATUS
                                ;%      :  IF INTERRUPT DOESN'T OCCUR
                                ;%      :  :  THEN
                                ;%      :  :  OUTPUT ERROR MESSAGE (DEVICE FAILED TO INTERRUPT)
                                ;%      :  ENDIF
                                ;%      END TEST 24
                                ;
030102                          T24::
030102  012737  000010  002402          MOV     #10.,ITCOUN     ;LOAD THE ITERATION COUNTER
030110  012746  000340                  MOV     #PRI07,-(SP)
030114  012746  020630                  MOV     #INTSRV,-(SP)
030120  013746  002476                  MOV     RPVEC,-(SP)
030124  012746  000003                  MOV     #3,-(SP)
030130  104437                          TRAP    C$SVEC
030132  062706  000010                  ADD     #10,SP
030136                          1$:
030136  104404                          TRAP    C$BSEG
030140  005037  002462                  CLR     INTFLG          ;RESET THE INTERRUPTS RECEIVED MARKER
030144  052777  000040  152350          BIS     #CLR,@RPCS2     ;FLUSH OUT THE CONTROLLER
030152  013777  002506  152342          MOV     DRVNO,@RPCS2    ;LOAD THE DRIVE NUMBER TO AVOID A TRANSFER ERROR!
030160  005737  002500                  TST     RPVEC+2         ;GET THE DEVICE PRIORITY
030164  001002                          BNE     2$              ;IT'S > ZERO, SET UP TO LOWER THE PROCESSOR STATUS
030166  005046                          CLR     -(SP)           ;IT'S AT PRIORITY 0!
030170  000404                          BR      3$              ;GO NOW!
030172  013746  002500          2$:     MOV     RPVEC+2,-(SP)   ;GET THE PRIORITY
030176  162716  000040                  SUB     #40,(SP)        ;AND LOWER IT
030202                          3$:
030202  012600                          MOV     (SP)+,R0
030204  104441                          TRAP    C$SPRI
030206  052777  000300  152276          BIS     #RDY!IE,@RPCS1  ;FORCE AN INTERRUPT!!
030214  012727  000020                  MOV     #20,(PC)+
030220  000000                          .WORD   0
030222  013727  002116                  MOV     L$DLY,(PC)+
030226  000000                          .WORD   0
030230  005367  177772                  DEC     -6(PC)
030234  001375                          BNE     .-4
030236  005367  177756                  DEC     -22(PC)
030242  001367                          BNE     .-20
030244  005737  002462                  TST     INTFLG          ;IF WE RECEIVED AN INTERRUPT. THIS > 0
030250  003006                          BGT     4$              ;GOT IT, TEST OK!
030252  104456                          TRAP    C$ERHRD
030254  000064                          .WORD   52
030256  013224                          .WORD   EM26
030260  000000                          .WORD   0
030262  005037  002402                  CLR     ITCOUN          ;NO ITERATIONS NECESSARY
030266                          4$:
030266                          10000$:
030266  104405                          TRAP    C$ESEG
030270  052777  000040  152224          BIS     #CLR,@RPCS2     ;NOW REMOVE ALL INTERRUPT STATUS
030276  005337  002402                  DEC     ITCOUN          ;ONE PASS ITERATION TO GO
030302  003315                          BGT     1$              ;IF > 0, DO AGAIN
030304  013700  002476                  MOV     RPVEC,R0
```

```
            030310  104436                          TRAP    C$CVEC
      38                                                    ;SET PRIORITY TO 7
      39 030312  012700  000340                       MOV     #PRI07,R0
         030316  104441                               TRAP    C$SPRI
      40 030320                          L10046:
         030320  104401                               TRAP    C$ETST
```

```
                                .SBTTL  TEST 25 BASIC DRIVE TEST
                                ;
                                ;%      TEST 25 (RP07 REMOTE REGISTER TESTS)-BASIC DRIVE SELECT TEST
                                ;%      :  CHECK MASSBUS INTERFACE SWITCH TEST LOCATION 'SWTTST'
                                ;%      :  IF 'SWTTST' = 0
                                ;%      :  :  THEN EXIT TEST
                                ;%      :  ENDIF
                                ;%      :  PRINT MESSAGE ASKING USER TO DISCONNECT THE DRIVE-UNDER-TEST
                                ;%      :  FROM THE MASSBUS BY USING THE DISABLE SWITCH
                                ;%      :  THIS TEST CANNOT BE RUN REMOTELY.
                                ;%      :  SET RPCS2.  CLR = 1
                                ;%      :  LOAD THE DRIVE-UNDER-TEST DEVICE NUMBER INTO RPCS2
                                ;%      :  IF REGISTER 06 (RPDT) <> 0
                                ;%      :  :  THEN
                                ;%      :  :  OUTPUT ERROR MESSAGE (DUAL RESPONSE FOUND)
                                ;%      :  :  OUTPUT FAULT LIST = ANOTHER DRIVE RESPONDING,
                                ;%      :  :  RHXX, CABLES, DRIVE SELECT, XMIT ERS-RECEIVERS FOR DRIVE,
                                ;%      :  :  J11 / J13, TERMINATOR
                                ;%      :  ENDIF
                                ;%      END TEST 25
                                ;
030322                          T25::
030322  005737  002332                  TST     SWTTST          ;SHOULD WE DO MASSBUS INTERFACE SWITCH TEST ?
030326  001002                          BNE     1$              ;BR IF = 1, YES
030330  104432                          TRAP    C$EXIT
030332  00016                           .WORD   L10047-.
030334                          1$:
030334  104450                          TRAP    C$MANI
030336  103402                          BCS     2$
030340  104432                          TRAP    C$EXIT
030342  000150                          .WORD   L10047-.
030344                          2$:                             ;TYPE 'PLACE INTERFACE SWITCH A12-S01 IN DOWN POSITION (L)
030344  104443                          TRAP    C$GMAN
030346  000404                          BR      10000$
030350  002464                          .WORD   UNABLE
030352  000120                          .WORD   T$CODE
030354  011607                          .WORD   MESG13
030356  000001                          .WORD   1
030360                          10000$:
030360  005737  002464                  TST     UNABLE          ;DID OPERATOR RESPOND YES?
030364  003002                          BGT     3$              ;IF > 0, YES
030366  104432                          TRAP    C$EXIT
030370  000122                          .WORD   L10047-.
030372                          3$:
030372  104404                          TRAP    C$BSEG
030374  013777  002506  152120          MOV     DRVNO,@RPCS2    ;LOAD THE DRIVE NUMBER
030402  005777  152132                  TST     @RPDT           ;LOOK AT THE DRIVE TYPE REGISTER
030406  001422                          BEQ     4$              ;SHOULD BE ALL 0'S
030410  013777  002540  002456          MOV     RPDT,TESTRG     ;FAILING REGISTER
030416  017737  152116  002452          MOV     @RPDT,RCVED     ;FAILING DATA
030424  005037  002454                  CLR     EXPTED          ;EXPECTED DATA
030430  012737  016000  002404          MOV     #BIT10!BIT11!BIT12,ERRWD1       ;MARK J11, J12 & J13 FOR CALLOUT
030436  012737  030424  002406          MOV     #BIT!BIT2!BIT4!BIT8,ERRWD2      ;MARK RH, CABLE, TERMINATOR,  ANOTHER DRIVE
030444  104456                          TRAP    C$ERHRD
030446  000065                          .WORD   53
030450  012523                          .WORD   EM15
030452  014172                          .WORD   ERR0
```

```
030454                        4$:
030454                        10001$:
030454  104405                        TRAP    C$ESEG
030456                        5$:                             ;TYPE 'PLACE ..TERFACE SWITCH A12-S01 IN  UP  POSITION (L)
030456  104443                        TRAP    C$GMAN
030460  000404                        BR      10002$
030462  002464                        .WORD   UNABLE
030464  000120                        .WORD   T$CODE
030466  011667                        .WORD   MESG14
030470  100000                        .WORD   100000
030472                        10002$:
030472  005737  002464                TST     UNABLE          ;DID OPERATOR RESPOND YES ?
030476  002403                        BLT     6$              ;IF < 0, YES
030500  004737  017000                JSR     PC,WAIT         ;SPIN FOR A STALL LOOP
030504  000764                        BR      5$              ;NOW ASK THE QUESTION AGAIN!

030506  005037  002464        6$:     CLR     UNABLE          ;INITIALIZE THIS
030512                        L10047:
030512  104401                        TRAP    C$ETST
```

```
                                        .SBTTL TEST 26  DEMAND AND TRANSFER TEST
                                        ;
                                        ;%      TEST 26   DEMAND AND TRANSFER TEST
                                        ;%      :  LOAD THE DRIVE-UNDER-TEST'S NUMBER INTO RPCS2
                                        ;%      :  READ RPDT REGISTER
                                        ;%      :  IGNORE DATA AND ERRORS
                                        ;%      :  IF REGISTER DOESN'T RESPOND
                                        ;%      :  :  THEN
                                        ;%      :  :  OUTPUT ERROR MESSAGE (DEMAND AND TRANSFER LOGIC NOT WORKING)
                                        ;%      :  :  OUTPUT FAULT LOCATION MAY, CABLES, J11 / J13, REMOTE POSSIBILITY OF
                                        ;%      :  :  JCB, CTOD  REGISTER SELECT LINES, DISABLE SWITCH, TERMINATOR.
                                        ;%      :  ENDIF
                                        ;%      END TEST 26
                                        ;
030514                                  T26::
030514  012737  000012  002402          1$:     MOV     #10.,ITCOUN     ;LOAD THE ITERATION COUNT
030522
030522  104404                          L10000: TRAP    C$BSEG
030524  013777  002506  151770                  MOV     DRVNO,          ;LOAD THE DRIVE NUMBER
030532  017737  152002  002452                  MOV     RPDT, RCVED     ;LOOK AT RPDT
030540  005737  002452                          TST     RCVED           ;IF IT IS > 0, DRIVE IS THERE
030544  001022                                  BNE     2$              ;> 0, OK
030546  012737  020042  002454                  MOV     #20042,EXPTED   ;CREATE THE CORRECT DRIVE TYPE CONTENTS
030554  013737  002540  002456                  MOV     RPDT, TESTRG    ;GET THE FAILING REGISTER
030562  012737  012200  002404                  MOV #BIT7!BIT10!BIT12,ERRWD1;SET MODULE CALLOUT MASK
030570  012737  000416  002406                  MOV #BIT1!BIT2!BIT3!BIT8,ERRWD2;FOR BOTH WORDS
030576  104456                                  TRAP    C$ERHRD
030600  000066                                  .WORD   54
030602  012776                                  .WORD   EM22
030604  014172                                  .WORD   ERR
030606  005037  002402                          CLR     ITCOUN          ;RESET THE ITERATION COUNT
030612                                  2$:     
030612  104405                          10000$: TRAP    C$ESEG
030614  005337  002402                          DEC     ITCOUN          ;ONE LESS ITERATION
030620  003340                                  BGT     1$              ;IF >0, DO AGAIN
030622                                  L10050: 
030622  104401                          10$:    TRAP    C$ETST
```

```
                                        .SBTTL  TEST 27 UNIQUE UNIT UNDER TEST
                                        ;
                                        ;%      TEST 27 UNIQUE UNIT UNDER TEST
                                        ;%      : WRITE  #46 TO RPCS1 FOR THE DRIVE UNDER TEST
                                        ;%      : WRITE DATA PATTERN #4 TO RPCS1 FOR ALL OTHER DRIVES ON THE BUS
                                        ;%      : IF RPCS1 FOR THE DRIVE UNDER TEST <> #46
                                        ;%      : : THEN
                                        ;%      : : OUTPUT ERROR MESSAGE (DRIVE SELECT LOGIC FAILURE)
                                        ;%      . : OUTPUT FAULT LIST:  RHXX, CABLE,  11/J13, TERMINATOR
                                        ;%      : ENDIF
                                        ;%      END TEST 27
                                        ;
030624                                  T27::
030624  012737  000012  002402                MOV     #10.,ITCOUN     ;LOAD THE ITERATION COUNT
030632                                  1$:
030632  04404                                 TRAP    C$BSEG
030634  13777   002506  151660                MOV     DRVNO,@RPCS2    ;LOAD THE DRIVE UNDER TEST
030642  012777  000046  151642                MOV     #46,@RPCS1      ;SET SOME COMMAND FUNCTION BITS
030650  005002                                CLR     R2              ;SET UP TO DO ALL DRIVES
030652  020237  002506          2$.           CMP     R2,DRVNO        ;DRIVE UNDER TEST?
030656  001405                                BEQ     3$              ;IF SO, WE ALREADY WROTE IT.
030660  010277  151636                        MOV     R2,@RPCS2       ;LOAD THIS DRIVE #
030664  013777  002352  151620                MOV     PATT4,@RPCS1    ;AND WRITE A PATTERN
030672  005202                          3$:   INC     R2              ;NEXT DRIVE
030674  020227  000010                        CMP     R2,#10          ;DONE
030700  103764                                BLO     2$              ;IF <10, NO
030702  013777  002506  151612                MOV     DRVNO,@RPCS2    ;RELOAD ORIGINAL DRIVE UNDER TEST
030710  012737  000046  002454                MOV     #46,EXPTED      ;CREATE DATA FILE
030716  017737  151570  002452                MOV     @RPCS1,RCVED    ;GET RESULTS
030724  012702  000046                        MOV     #46,R2          ;AND STRIP UNUSED DATA
030730  005102                                COM     R2              ;FOR A POSSIBLE ERROR REPORT
030732  040237  002452                        BIC     R2,RCVED        ;DATA SHOULD MATCH NOW
030736  023737  002454  002452                CMP     EXPTED,RCVED    ;DO THE COMPARISON
030744  001417                                BEQ     4$              ;IF EQUAL, IT'S OK
030746  013737  002512  002456                MOV     RPCS1,TESTRG    ;LOG FAILING REGISTER
030754  012737  012000  002404                MOV     #BIT10!BIT12,ERRWD1 ;FORM MODULE CALL-OUT
030762  012737  000406  002406                MOV     #BIT1!BIT2!BIT8, ERRWD2 ;BOTH WORDS
030770  104456                                TRAP    C$ERHRD
030772  000076                                .WORD   62
030774  012454                                .WORD   EM14
030776  014172                                .WORD   ERRO
031000  005037  002402                        CLR     ITCOUN          ;ITERATIONS = 0
031004                                  4$:
031004                                  10000$:
031004  104405                                TRAP    C$FSEG
031006  005337  002402                        DEC     ITCOUN          ;ONE LESS ITERATION
031012  003307                                BGT     1$              ;DO UNTIL <= 0
031014                                  L 0051:
031014  104401                                TRAP    C$ETST
```

```
                                .SBTTL TEST 28  RPDT REGISTER TEST
                                ;
                                ;%      TEST 28 TEST DRIVE TYPE REGISTER
                                ;%      :  SET RPCS2:  CLR = 1
                                ;%      :  LOAD DRIVE-UNDER-TEST'S NUMBER INTO RPCS2
                                ;%      :  READ RPDT
                                ;%      :  IF RPDT DOESN'T = ONE OF THE FOLLOWING:  20042, 24042
                                ;%      :  :  THEN
                                ;%      :  :  OUTPUT ERROR MESSAGE (RP07 NOT FOUND, RPDT = (RPDT CONTENTS))
                                ;%      :  :  OUTPUT FAULT LIST:  RHXX, CABLES, J11/J13, J12, CTOD, RS, MASSBUS,
                                ;%      :  :  J08, TERMINATOR.
                                ;%      :  ENDIF
                                ;%      END TEST 28
                                ;
031016                          T28::
031016  012737  000012  002402          MOV     #10.,ITCOUN     ;LOAD THE ITERATION COUNT
031024                          1$:
031024  104404                          TRAP    C$BSEG
031026  052777  000040  151466          BIS     #CLR,@RPCS2     ;START OUT WITH AN INITIALIZED CONTROLLER
031034  053777  002506  151460          BIS     DRVNO,@RPCS2    ;LOAD THE DRIVE #
031042  017737  151472  002452          MOV     @RPDT,RCVED     ;GET RPDT AND STORE IT
031050  012737  020042  002454          MOV     #20042,EXPTED   ;CREATE EXPECTED DATA
031056  032737  004000  002452          BIT     #DRQ, RCVED     ;DUAL PORTED?
031064  001403                          BEQ     2$              ;NO, IF NOT SET!
031066  052737  004000  002454          BIS     #DRQ, EXPTED    ;SET DUAL-PORT
031074  023737  002452  002454  2$:     CMP     RCVED, EXPTED   ;DOES DATA MATCH?
031102  001417                          BEQ     3$              ;YES, TEST OK!
031104  013737  002540  002436          MOV     RPDT, TESTRG    ;AND LOAD FAILING REGISTER
031112  012737  016200  002404          MOV #BIT7!BIT10!BIT11!BIT12, ERRWD1;CREATE MODULE CALLOUT LIST
031120  012737  000406  002406          MOV #BIT1!BIT2!BIT8, ERRWD2;FOR BOTH MASK WORDS
031126  104456                          TRAP    C$LRHRD
031130  000067                          .WORD   55
031132  012454                          .WORD   EM14
031134  014172                          .WORD   ERRO
031136  005037  002402                  CLR     ITCOUN          ;RESET FURTHER ITERATIONS
031142                          3$:
031142                          10C00$:
031142  104405                          TRAP    C$ESEG
031144  005337  002402                  DEC     ITCOUN          ;ONE LESS ITERATION
031150  003325                          BGT     1$              ;IF >0, DO AGAIN
031152                          L10052:
031152  104401                          TRAP    C$ETST
```

```
                                .SBTTL TEST 29  RPDA READ WRITE TEST

                                ;%      TEST 29 RPDA READ WRITE TEST
                                ;%      :  WRITE RPDA WITH DATA PATTERNS 1-4, ONE AT A TIME
                                ;%      :  IF RPDA DATA DOESN'T MATCH EXPECTED
                                ;%      :  :  THEN
                                ;%      :  :  OUTPUT ERROR MESSAGE (RPDA BIT(S) UNDER TEST DON'T MATCH EXPECTED)
                                ;%      :  :  OUTPUT FAULT LIST:  RHXX, CABLES, STUCK DATA BITS, J11/J13,
                                ;%      :  :  CTOD STUCK AT 0, J12, J8, TERMINATOR
                                ;%      :  ENDIF
                                ;%      :  WRITE RPDA WITH DATA PATTERN #4
                                ;%      :  IF RPDA DOESN'T = 0
                                ;%      :  :  THEN
                                ;%      :  :  OUTPUT ERROR MESSAGE (RPDA BITS STUCK AT 1)
                                ;%      :  :  OUTPUT FAULT LIST:  RHXX, CABLES, STUCK DATA BITS, J11/J13,
                                ;%      :  :  J12, REMOTE POSSIBILITY OF J8, TERMINATOR
                                ;%      :  ENDIF
                                ;%      END TEST 29

031154                          T29::
031154  012737  000012  002402          MOV     #10.,ITCOUN     ;LOAD THE ITERATION COUNT
031162  012737  016200  002404          MOV     #BIT7!BIT10!BIT11!BIT12,ERRWD1;CREATE THE MODULE CALLOUT
031170  012737  000406  002406          MOV     #BIT1!BIT2!BIT8,ERRWD2;FOR BOTH MODULES
031176  004737  016662          1$:     JSR     PC,SEIZE        ;LOAD THE DRIVE UNDER TEST
031202  004737  017744                  JSR     PC,SETUP        ;LOAD I/O POINTERS
031206  004256                          TST28                   ;FROM THIS TABLE
031210  013737  002444  002436  64$:    MOV     SRCTMP,TEMP     ;SET UP FOR POSSIBLE LOOP
031216  104404                          TRAP    C$BSEG
031220  004737  020034                  JSR     PC,FLOAT        ;FLOAT THE PATTERN
031224  000403                          BR      65$             ;PATTERN FLOATED OK, SKIP ERROR DSPATCH
031226  013737  002436  002444          MOV     TEMP,SRCTMP     ;RESTORE THE OLD DATA PATTERN FOR ERROR LOOP
031234                          65$:
031234                          10000$:
031234  104405                          TRAP    C$ESEG
031236  005737  002446                  TST     MASK            ;IF MASK = 0, WE'RE DONE
031242  001362                          BNE     64$
031244  004737  020330                  JSR     PC,CONSET       ;GET NEXT PATTERN
031250  005737  002434                  TST     PATCNT          ;IF PATTERN COUNT UNDERFLOWED, DONE!
031254  002355                          BGE     64$             ;NOT DONE YET, GO-ON
031256  104404                          TRAP    C$BSEG
031260  004737  020202                  JSR     PC,COMPAR       ;WRITE THE NEXT PATTERN
031264  002352                          PATT4                   ;WHICH IS PATTERN #4
031266                          10001$:
031266  104405                          TRAP    C$ESEG
031270  104404                          TRAP    C$BSEG
031272  104404                          TRAP    C$BSEG
031274  004737  020202                  JSR     PC,COMPAR       ;DO ANOTHER DATA COMPARISON
031300  002350                          PATT3                   ;USING PATTERN #3
031302                          10003$:
031302  104405                          TRAP    C$ESEG
031304  004737  017572                  JSR     PC,LDZERO       ;WRITE RPDA TO 0 TO CLEAR IT!
031310                          10002$:
031310  104405                          TRAP    C$ESEG
031312  005337  002402                  DEC     ITCOUN          ;ONE LESS ITERATION
031316  003327                          BGT     1$              ;DO UNTIL <= 0!
031320                          L10053:
031320  104401                          TRAP    C$LIST
```

```
                                        .SBTTL TEST 30  PARITY BIT TRANSITION TEST
                                        ;
                                        ;%      TEST 30 PARITY BIT TRANSITION TEST
                                        ;%      :  WRITE RPDA USING DATA PATTERN 4
                                        ;%      :  IF ((TRE) OR (MCPE)) = 1
                                        ;%      :  :  THEN
                                        ;%      :  :  OUTPUT ERROR MESSAGE (DETECTED FALSE PARITY ERROR)
                                        ;%      :  :  OUTPUT FAULT LIST:   RHXX, CABLES, J11/J13, J12, J08, TERMINATOR
                                        ;%      :  ENDIF
                                        ;%      :  WRITE RPDA USING DATA PATTERN #1, ONCE.
                                        ;%      :  IF ((TRE) OR (MCPE)) = 1
                                        ;%      :  :  THEN
                                        ;%      :  :  OUTPUT ERROR MESSAGE (DETECTED FALSE PARITY ERROR)
                                        ;%      :  :  OUTPUT FAULT LIST:   RHXX, CABLES, J11/J13, J12, J08, TERMINATOR
                                        ;%      :  ENDIF
                                        ;%      END TEST 30
                                        ;
031322                                  T30::
031322  012737  000012  002402                  MOV     #10.,ITCOUN     ;LOAD THE ITERATION COUNT
031330                                  1$:
031330  104404                                  TRAP    C$BSEG
031332  012703  002352                          MOV     #PATT4,R3       ;GET THE ZEROS PATTERN
031336  012702  000002                          MOV     #2,R2           ;DO THE OPERATION TWICE
031342  004737  016662                          JSR     PC,SEIZE        ;FLUSH ERRORS AND GET THE DRIVE
031346  014377  151146                  2$:     MOV     -(R3),@RPDA     ;LOAD THE PATTERN
031352  004737  017000                          JSR     PC,WAIT         ;WAIT FOR ANY ERRORS TO SET
031356  032777  060000  151126                  BIT     #TRE!MCPE,@RPCS1;ERRORS?
031364  001420                                  BEQ     3$              ;NOT IF =0, TEST OK!
031366  004737  017422                          JSR     PC,BICEXP       ;FORM DATA REPORT
031372  002512                                  RPCS1                   ;FORM DATA REPORT
031374  060000                                  TRE!MCPE                ;THESE BITS FAILED TO BE CLEAR
031376  012737  016200  002404                  MOV     #BIT7!BIT10!BIT11!BIT12,ERRWD1;FORM MODULE CALLOUT MASK
031404  012737  000406  002406                  MOV     #BIT1!BIT2!BIT8,ERRWD2;BOTH WORDS
031412  104456                                  TRAP    C$ERHRD
031414  000070                                  .WORD   56
031416  013051                                  .WORD   EM23
031420  014172                                  .WORD   ERR0
031422  005037  002402                          CLR     ITCOUN          ;RESET THE ITERATON COUNT
031426  005743                          3$:     TST     -(R3)           ;MOVE POINTER BACK
031430  005302                                  DEC     R2              ;DO SECOND TIME
031432  003345                                  BGT     2$              ;IF R2=0, DONE
031434                                  10000$:
031434  104405                                  TRAP    C$ESEG
031436  005337  002402                          DEC     ITCOUN          ;ONE LESS ITERATION
031442  003332                                  BGT     1$              ;IF <= 0, DONE!!
031444                                  L10054:
031444  104401                                  TRAP    C$ETST
```

```
                                        .SBTTL TEST 31  FLOATING DATA PARITY TEST
                                        ;%      TEST 31 FLOATING ONES AND ZEROS PARITY TEST
                                        ;%      :  WRITE RPDA USING DATA PATTERNS 1 TO 9, ONE AT A TIME
                                        ;%      :  IF RPER1:  PAR = 1 AFTER ANY WRITE OR ANY READ TO RPDA
                                        ;%      :  :  THEN
                                        ;%      :  :  OUTPUT ERROR MESSAGE (DETECTED FALSE PARITY ERROR)
                                        ;%      :  :  OUTPUT FAULT LIST:  RHXX (PARITY NETWORK), DRIVE (PARITY NETWORK), J12, J08.
                                        ;%      :  ENDIF
                                        ;%      END TEST 31

031446                                  T31::
031446  012737  000012  002402                MOV     #10.,ITCOUN     ;LOAD THE ITERATION COUNT
031454                                  1$:
031454  104404                                TRAP    C$BSEG
031456  012702  000011                        MOV     #9.,R2          ;DO FOR 9 PATTERNS
031462  012703  002344                        MOV     #PATT1,R3       ;GET FIRST PATTERN
031466  004737  016662                        JSR     PC,SEIZE        ;FLUSH ERRORS AND GET THE DRIVE
031472  012377  151022                2$:     MOV     (R3)+,@RPDA     ;WRITE PATTERN TO RPDA
031476  032777  000010  151022                BIT     #PAR,@RPER1     ;PARITY ERROR?
031504  001006                                BNE     3$              ;IF =1, YES - IT'S NOT OK
031506  005777  151006                        TST     @RPDA           ;READ THE REGISTER JUST WRITTEN
031512  032777  000010  151006                BIT     #PAR,@RPER1     ;DID READ CAUSE ERRORS?
031520  001420                                BEQ     4$              ;IF PAR = 0, NO!
031522  004737  017422                3$:     JSR     PC,BICEXP       ;FORM DATA REPORT
031526  002526                                RPER1                   ;FAILING REGISTER
031530  000010                                PAR                     ;THIS BIT FAILED TO CLEAR
031532  012737  004200  002404                MOV     #BIT7!BIT11,ERRWD1;FORM MODULE CALL OUT MASK
031540  012737  000002  002406                MOV     #BIT1,ERRWD2    ;BOTH WORDS
031546  104456                                TRAP    C$ERHRD
031550  000071                                .WORD   57
031552  013051                                .WORD   E.23
031554  014172                                .WORD   ERRO
031556  005037  002402                        CLR     ITCOUN          ;RESET FURTHER ITERATIONS
031562  005302                        4$:     DEC     R2              ;REDUCE ITERATIONS
031564  003342                                BGT     2$              ;>0, DO AGAIN...
031566                                  10000$:
031566  104405                                TRAP    C$ESEG
031570  005337  002402                        DEC     ITCOUN          ;ONE LESS ITERATION
031574  003327                                BGT     1$              ;IF <= 0, DONE
031576                                  L10055:
031576  104401                                TRAP    C$ETST
```

```
                                        .SBTTL  TEST 32 REGISTER SELECT TEST #1
                                        ;%      TEST 32 REGISTER SELECT TEST 1
                                        ;%      :  USE DATA PATTERN #7
                                        ;%      :  WRITE REGISTERS:  RPCS1, RPDA, RPDC, RPOF, ONE AT A TIME.
                                        ;%      :  READ EACH REGISTER AFTER WRITING IT
                                        ;%      :  IF REGISTER UNDER TEST DOESN'T MATCH TEST DATA
                                        ;%      :  :  THEN
                                        ;%      :  :  OUTPUT ERROR MESSAGE (BIT(S) FAILED TO SET)
                                        ;%      :  :  OUTPUT FAULT LIST:  RHXX, CABLES, J11/J13, J12, J08, TERMINATOR
                                        ;%      :  ENDIF
                                        ;%      END TEST 32
031600                                  T32::
031600  013737  002360  002450          MOV     PATT7,MSK       ;CREAT BIT MASK
031606  005137  002450                  COM     MSK             ;UNUSED BITS = 1
031612  012737  016200  002404          MOV     #BIT7!BIT10!BIT11!BIT12,ERRWD1;CREATE THE MODULE CALLOUT
031620  012737  000406  002406          MOV     #BIT1!BIT2!BIT8,ERRWD2;FOR BOTH MASKS
031626  004737  016662                  JSR     PC,SEIZE        ;FLUSH ERRORS AND GET THE DRIVE
031632  012737  000012  002402          MOV     #10.,ITCOUN     ;LOAD THE ITERATION COUNT
031640                                  1$:
031640  104404                          TRAP    C$BSEG
031642  013701  002512                  MOV     RPCS1,R1        ;GET THE FIRST ADDRESS
031646  010137  002440          2$:     MOV     R1,SNK          ;LOAD TEST REGISTER POINTER
031652  004737  020202                  JSR     PC,COMPAR       ;DO THE COMPARISON
031656  002360                          PATT7                   ;USING THIS DATA
031660  020137  002520                  CMP     R1,RPDA         ;SEE CURRENT REGISTER
031664  103003                          BHIS    3$              ;WE ALREADY DID RPCS1 & RPDA!
031666  062701  000006                  ADD     #6,R1           ;DO RPDA NEXT
031672  000765                          BR      2$              ;GO!
031674  020137  002544          3$:     CMP     R1,RPOF         ;DID WE DO RPOF?
031700  103003                          BHIS    4$              ;YES, SKIP NEXT
031702  062701  000024                  ADD     #24,R1          ;DO # RPOF NOW
031706  000757                          BR      2$              ;GO!
031710  020137  002546          4$:     CMP     R1,RPDC         ;DONE?
031714  001403                          BEQ     5$              ;IF EQUAL, YES
031716  062701  000002                  ADD     #2, P1          ;DO RPDC NOW!
031722  000751                          BR      2$              ;GO
031724                                  5$:
031724                                  10000$:
031724  104405                          TRAP    C$ESEG
031726  005337  002402                  DEC     ITCOUN          ;ONE LESS ITERATION
031732  003342                          BGT     1$              ;IF <= 0, DONE!!
031734                                  L10056:
031734  104401                          TRAP    C$ETST
```

```
                                        .SBTTL  TEST 33 REGISTER SELECT TEST #2
                                        ;%      TEST 33 REGISTER SELECT TEST 2
                                        ;%      : USE DATA PATTERN #7
                                        ;%      : WRITE REGISTERS:  RPCS1, RPDA, RPDC, RPOF, ONE AT A TIME.
                                        ;%      : WRITE ALL OTHER REGISTERS WITH 0'S
                                        ;%      : IF WRITING ALL OTHER REGISTERS WITH 0'S CHANGED THE REGISTER UNDER TEST
                                        ;%      : : THEN
                                        ;%      : : OUTPUT ERROR MESSAGE (REGISTER SELECT LINES CROSSED)
                                        ;%      : : OUTPUT FAULT LIST:  RH11, CABLE, J11/J13, J12, J08,TERMINATOR
                                        ;%      : ENDIF
                                        ;%      END TEST 33

031736                                  T33::
031736  012737  016200  002404                  MOV     #BIT7!BIT'0!BIT11!BIT12,ERRWD1;CREATE THE MODULE CALLOUT
031744  012737  000406  002406                  MOV     #BIT1!BIT2!BIT8,ERRWD2;FOR BOTH MASKS
031752  013702  002360                          MOV     PATT7,R2        ;GET THE TEST PATTERN
031756  004737  016662                          JSR     PC,SEIZE        ;GET THE DRIVE, FIRST FLUSH ERRORS!
031762  012737  000012  002402                  MOV     #10.,ITCOUN     ;LOAD THE ITERATION COUNT
031770                                  1$:
031770  104404                                  TRAP    C$BSEG
031772  012701  004272                          MOV     #TST33,R1       ;GET FILE OF REGISTERS
031776  013137  002440                  2$:     MOV     @(R1)+,SNK      ;GET THE TEST REGISTER
032002  010277  150432                          MOV     R2,@SNK         ;WRITE THE TEST PATTERN TO THE REGISTER
032006  023737  002440  002546                  CMP     SNK,RPDC        ;DONE WRITING REGISTERS YET?
032014  103770                                  BLO     2$              ;NOT DONE YET, DO MORE
032016  012703  000024                          MOV     #20.,R3         ;GET THE ITERATION COUNT
032022  012701  004272                          MOV     #TST33,R1       ;GET FILE OF REGISTERS AGAIN
032026  013704  002512                          MOV     RPCS1,R4        ;GET START OF REGISTER FILE
032032  020471  000000                  3$:     CMP     R4,@(R1)        ;SHOULD WE CLEAR THIS REGISTER?
032036  001411                                  BEQ     5$              ;IF THEY MATCH, NO
032040  005024                                  CLR     (R4)+           ;WRITE THIS REGISTER TO A 0
032042  020437  002524                          CMP     R4,RPDS         ;DID WE JUST WRITE RPCS2?
032046  001002                                  BNE     4$              ;IF <> , NO..
032050  004737  016662                          JSR     PC,SEIZE        ;GET THE DRIVE AGAIN!
032054  005303                          4$:     DEC     R3              ;REDUCE THE ITERATION COUNT
032056  003365                                  BGT     3$              ;DO UNTIL EQUAL TO 0
032060  000402                                  BR      6$              ;TAKE THIS BRANCH WHEN DONE..
032062  022421                          5$:     CMP     (R4)+,(R1)+     ;POP THE POINTERS
032064  000773                                  BR      4$              ;GO ON
032066  012701  004272                  6$:     MOV     #TST33,R1       ;GET FILE REGISTERS AGAIN
032072  010237  002450                          MOV     R2,MSK          ;GET THE TESTING PATTERN
032076  005137  002450                          COM     MSK             ;DON'T CARE BITS EQUAL 1
032102  013137  002440                  7$:     MOV     @(R1)+,SNK      ;GET THE RESULTS
032106  004737  020202                          JSR     PC,COMPAR       ;CHECK THE DATA FOR CORRECTNESS
032112  002360                                  PATT7                   ;USING THIS DATA PATTERN
032114  023737  002440  002546          8$:     CMP     SNK,RPDC        ;DONE YET??
032122  103767                                  BLO     7$              ;NOT YET, IF LOWER
032124                                  10000$:
032124  104405                                  TRAP    C$ESEG
032126  005337  002402                          DEC     ITCOUN          ;ONE LESS ITERATION
032132  003316                                  BGT     1$              ;IF <= 0, DONE!!
032134                                  L10057:
032134  104401                                  TRAP    C$ETST
```

```
                                .SBTTL  TEST 34 RPMR1 DATA TEST
                                ;
                                ;%      TEST 34 RPMR1 DATA TEST
                                ;%      :  USE DATA PATTF NS 1 TO 9, ONE AT A TIME
                                ;%      :  BITS TO TEST   0 TO 15
                                ;%      :  IF RPMR1 DOESN'T MATCH TEST DATA
                                ;%      :  :  THEN
                                ;%      :  :  OUTPUT ERROR MESSAGE (BIT(S) UNDER TEST FAILED TO SET)
                                ;%      :  :  OUTPUT FAULT LIST:  J08
                                ;%      :  :  ELSE
                                ;%      :  :  WRITE RPMR1 = 0
                                ;%      :  :  IF RPMR1 <> 0
                                ;%      :  :  :  THEN
                                ;%      :  :  :  OUTPUT ERROR MESSAGE (BIT(S) UNDER TEST FAILED TO CLEAR)
                                ;%      :  :  :  OUTPUT FAULT LIST:  J08
                                ;%      :  :  ENDIF
                                ;%      :  ENDIF
                                ;%      END TEST 34
                                ;
 032136                         T34::
 032136  012737  000200  002404         MOV     #BIT7,ERRWD1    ;CREATE THE MODULE CALLOUT
 032144  005037  002406                 CLR     ERRWD2          ;FOR BOTH MASKS
 032150  004737  016662                 JSR     PC,SETZE        ;FLUSH ERRORS AND GET THE DRIVE
 032154  012737  000012  002402         MOV     #10.,ITCOUN     ;LOAD THE ITERATION COUN
 032162                         1$:
 032162  004737  017744                 JSR     PC,SETUP        ;LOAD I/O POINTERS
 032166  004302                         TST34                   ;FROM THIS TABLE
 032170  013737  002444  002436  64$:   MOV     SRCTMP,TEMP     ;SET UP  OR POSSIBLE LOOP
 032176  104404                         TRAP    C$BSEG
 032200  004737  020034                 JSR     PC,FLOAT        ;FLOAT THE PATTERN
 032204  000403                         BR      65$             ;PATTERN FLOATED OK, SKIP ERROR DSPATCH
 032206  013737  002436  002444         MOV     TEMP,SRCTMP     ;RESTORE THE OLD DATA PATTERN FOR ERROR LOOP
 032214                         65$:
 032214                         10000$:
 032214  104405                         TRAP    C$ESEG
 032216  005737  002446                 TST     MASK            ;IF MASK = 0, WE'RE DONE
 032222  001362                         BNE     64$
 032224  004737  020330                 JSR     PC,CONSET       ;GET NEXT  ATTERN
 032230  005737  002434                 TST     PATCNT          ;IF PATTERN COUNT UNDERFLOWED, DONE!
 032234  002355                         BGE     64$             ;NOT DON  YET, GO-ON
 032236  104404                         TRAP    C$BSEG
 032240  004737  020202                 JSR     PC,COMPAR       ;WRITE THE NEXT PATTERN
 032244  002352                         PATT4                   ;WHICH IS PATTERN #4
 032246                         10001$:
 032246  104405                         TRAP    C$ESEG
 032250  104404                         TRAP     $BSEG
 032252  104404                         TRAP     $BSEG
 032254  004737  020202                 JSR      C,COMPAR       ;DO ANOTHER DATA COMPARISON
 032260  002350                         PATT3                   ;USING PATTERN #3
 032262                         10003$:
 032262  104405                         TRAP    C$ESEG
 032264  004737  017572                 JSR     PC,LDZERO       ;WRITE RPMR1 TO 0 TO CLEAR IT!
 032270                         10002$:
 032270  104405                         TRAP    C$ESEG
 032272  005337  002402                 DEC     ITCOUN          ;ONE LESS ITERATION
 032276  003331                         BGT     1$              ;IF <= 0, DONE
 032300                         L10060:
```

```
        032300  104401                          TRAP    C$ETST
```

```
                                .SBTTL  TEST 35 MASSBUS INTIALIZE DRIVE CLEAR TEST
                                ;
                                ;%      TEST 35 MASSBUS INITIALIZE/DRIVE CLEAR RPMR1:  DMD BIT TEST
                                ;%      :  SET RPMR1:  DMD = 1
                                ;%      :  SET RPCS2:  CLR = 1
                                ;%      :  IF RPMR1:  DMD = 0
                                ;%      :  :  THEN
                                ;%      :  :  MARK THE EVENT
                                ;%      :  ENDIF
                                ;%      :  SET RPMR1:  DMD = 1 AGAIN
                                ;%      :  ISSUE DRIVE CLEAR COMMAND
                                ;%      :  IF RPMR1:  DMD = 0
                                ;%      :  :  THEN
                                ;%      :  :  MARK THIS EVENT
                                ;%      :  ENDIF
                                ;%      :  IF RPMR1:  DMD DIDN'T CLEAR WITH EITHER EVENT
                                ;%      :  :  THEN
                                ;%      :  :  OUTPUT ERROR MESSAGE (RPMR1:  DMD NOT CLEARED BY RPCS2:  CLR OR DRIVE CLEAR)
                                ;%      :  :  OUTPUT FAULT LIST:  J12, J08.
                                ;%      :  ENDIF
                                ;%      :  IF RPMR1:  DMD IS CLEARED BY DRIVE CLEAR COMMAND, BUT NOT RPCS2:  CLR
                                ;%      :  :  THEN
                                ;%      :  :  OUTPUT ERROR MESSAGE (RPMR1:  CLEARED BY DRIVE CLEAR BUT NOT RPCS2:  CLR)
                                ;%      :  :  OUTPUT FAULT LIST:  J12, CABLE, RHXX.
                                ;%      :  ENDIF
                                ;%      :  IF RPMR1:  DMD CLEARED BY RPCS2:  CLR BUT NOT DRIVE CLEAR COMMAND
                                ;%      :  :  THEN
                                ;%      :  :  OUTPUT ERROR MESSAGE (RPMR1:  CLEARED BY RPCS2:  CLR BUT NOT DRIVE CLEAR COMMA
                                ;%      :  :  OUTPUT FAULT LIST:  J11, J12.
                                ;%      :  ENDIF
                                ;%      END TEST 35
                                ;
032302                          T35::
032302  005037  002466                  CLR     ERST T          ;ERROR STATUS=0 FOR START-UP
032306  012737  000012  002402          MOV     #10.,ITCOUN     ;LOAD THE ITERATION COUNT
032314                          1$:
032314  104404                          TRAP    C$BSEG
032316  013777  002506  1501.6          MOV     DRVNO,@  CS2    ;LOAD THE DRIVE-UNDER-TEST
032324  052777  100000  150204          BIS     #DMD,@RP  0     ;SET RPMR1-DMD=1
032332  052777  000040  150162          BIS     #CLR,@RF        ;TRY TO CLEAR IT USING A CONTROLLER CL
032340  013777  002506  150154          MOV     DRVNO,@R    2   ;RELOAD THE DRIVE NUMBER
032346  032777  100000  150162          BIT     #DMD,@RPMR1     ;DID IT CLEAR?
032354  001403                          BEQ     2$              ;YES, SKIP NEXT
032356  152737  000377  002466          BISB    #377,ERSTAT     ;MARK THIS FAILED STATE
032364  013777  002506  150130  2$:     MOV     DRVNO,@RPCS2    ;LOAD THE DRIVE #
032372  052777  100000  150136          BIS     #DMD,@RPMR1     ;SET RPMR1-DMD=1
032400  012777  000011  150104          MOV     #DRCLR,@RPCS1   ;ISSURE A DRIVE CLEAR COMMAND
032406  032777  100000  150122          BIT     #DMD,@RPMR1     ;DID DMD CLEAR?
032414  001403                          BEQ     3$              ;IF  , YES
032416  15  37  0003 7  002467          BISB    #377,ERSTAT 1     'ARK THE FAILED STATE
032424  0057  7  002466          3$:     TST     ERSTAT            EST PASS?
032430  001445                          BEQ     7$              ;IF 0 YES
032432  012737  004000  002404          MOV     #BIT11,ERRWD1   ;LOAD PART OF THE MODULE CALL OUT
032440  022737  000377  002466          CMP     #377,ERSTAT     ;NOW DETERMINE WHAT FAILED
032446  001415                          BEQ     5$              ;DRIVE CLEAR COMMAND WORKED, RH CLR FAILED
032450  005037  002406                  CLR     ERRWD2          ;FORM FURTHER MODULE CALL-OUT
032454  105737  002466                  TSTB    ERSTAT          ;FURTHER CHECK RESULTS
```

```
                                                BEQ     4$                  ;RHCLR WORKED, DRIVE CLEAR FAILED
                                                BIS     #BIT7,ERR )1        ;NOTHING WORKED, DRIVE CLEAR OR RHCLR
                                                BR      6$                  ;REPORT THE ERR
                                        4$:     BIS     #BIT10!BIT12,ERRWD1 ;CREATE        CALL-OUT
                                                BR      6$                  ;REPORT IT
                                        5$:     MOV     #BIT1!BIT2,ERRWD2   ;CREAT  M   LE CALL-OUT
                                        6$:     MOV     RP.R1,TESTRG        ;FORM   UT DATA
                                                CLR     EXPTED              ;EXPECTED DATA
                                                MOV     *DMD,RCVED          ;RECEIVED DATA
                                                TRAP    C$ERHRD
                                                .WORD   61
                                                .WORD   EM23
                                                .WORD   ERRO
                                                CLR     ITCOUN              ;NO ITERATIONS
                                        7$:
                                        10000$:
                                                T       C$ESEG
                                                CLR     ERSTAT              ;ERSTAT=0
                                                DEC     ITCOUN              ;ONE LESS ITERATION
                                                BGT     1$                  ;IF <= 0, DONE!
                                        L10061:
                                                TRAP    C$ETST
```

```
                                .SBTTL  TEST 36 PARITY INITIALIZE TEST
                                ;
                                ;%      TEST 36 PARITY INITIALIZE TEST
                                ;%      :  SET RPCS2:  CLR = 1
                                ;%      :  IF (RPER1:  PAR) = 1
                                ;%      :  .  THEN
                                ;%      :  :  OUTPUT ERROR MESSAGE (DETECTED FALSE PARITY ERROR)
                                ;%      :  :  OUTPUT FAULT LIST:  J12, J09, J10.  (CURRENT STATE OF 2901 = ?? )
                                ;%      :  ENDIF
                                ;%      :  IF (RPER1:  ILF) = 1
                                ;%      :  :  THEN
                                ;%      :  :  OUTPUT ERROR MESSAGE (DETECTED FALSE ILLEGAL FUNCTION ERROR)
                                ;%      :  :  OUTPUT FAULT LIST:  J12, J09, J10, (2901 ??)
                                ;%      :  ENDIF
                                ;%      END TEST 36
                                ;
032562                          T36::
032562  012737  000012  002402          MOV     #10.,ITCOUN     ;LOAD THE ITERATION COUNT
032570                          1$:
032570  104404                          TRAP    C$BSEG
032572  004737  016662                  JSR     PC,SEIZE        ;GET CONTROL OF THE DRIVE
032576  013737  002526  002456          MOV     RPER1,TESTRG    ;FORM REPORT DATA
032604  005037  002454                  CLR     EXPTED          ;EXPTECTED=0
032610  005037  002452                  CLR     RCVED           ;RECEIVED=?
032614  032777  000010  147704          BIT     #PAR,@RPER1     ;IS PARITY ERROR=1?
032622  001403                          BEQ     2$              ;IF 0, NO
032624  052737  000010  002452          BIS     #PAR,RCVED      ;MARK THE ERROR
032632  032777  000001  147712  2$:     BIT     #ILF,@RPER2     ;IS ILLEGAL FUNCTION SET?
032640  001403                          BEQ     3$              ;IF 0, NO
032642  052737  000001  002452          BIS     #ILF,RCVED      ;MARK IT!
032650  005737  002452          3$:     TST     RCVED           ;ERRORS??
032654  001414                          BEQ     4$              ;IF 0, TEST PASSES
032656  012737  012000  002404          MOV     #BIT10!BIT12,ERRWD1 ;FORM MODULE CALLOUT LIST
032664  012737  000005  002406          MOV     #BIT1!BIT2,ERRWD2 ;BOTH WORDS
032672  104456                          TRAP    C$ERHRD
032674  000077                          .WORD   63
032676  013051                          .WORD   EM23
032700  014172                          .WORD   ERR0
032702  005037  002402                  CLR     ITCOUN          ;NO ITERATIONS
032706                          4$:
032706                          10000$:
032706  104405                          TRAP    C$ESEG
032710  005337  002402                  DEC     ITCOUN          ;ONE LESS ITERATION
032714  003325                          BGT     1$              ;IF <= 0, DONE
032716                          L10062:
032716  104401                          TRAP    C$ETST
```

```
                                        .SBTTL  TEST 37 PARITY ERROR DETECTION TEST
                                        ;*      TEST 37 PARITY ERROR DETECTION TEST
                                        ;%      :  SET RPCS2:  PAT = 1
                                        ;%      :  ISSUE A KNOWN ILLEGAL FUNCTION
                                        ;%      :  IF (RPER1:  ILF = 1 AND RPER1:  PAR = 0)
                                        ;%      :  :  THEN
                                        ;%      :  :  OUTPUT ERROR MESSAGE (PARITY ERROR NOT DETECTED.
                                        ;%      :  :  OUTPUT FAULT LIST   J12.
                                        ;%      :  ENDIF
                                        ;%      :  IF ((RPER1:  ILF AND RPER1:  PAR) = 1 OR = 0)
                                        ;%      :  :  THEN
                                        ;%      :  :  OUTPUT ERROR MESSAGE (UNKNOWN FUNCTIONAL SEQUENCE)
                                        ;%      :  :  OUTPUT FAULT LIST:  J09, J10, J12, (2901 GONE ??)
                                        ;%      :  ENDIF
                                        ;%      END TEST 37

032720                                  T37::
032720  012737  000012  002402                MOV     #10.,ITCOUN     ;LOAD THE ITERATION COUNT
032726                                  1$:
032726  104404                              TRAP    C$BSEG
032730  004737  016662                      JSR     PC,SEIZE        ;GET THE DRIVE UNDER TEST
032734  052777  000020  147560              BIS     #PAT,@RPCS2     ;INVERT PARITY, FORCE ERRORS!!
032742  012777  000046  147542              MOV     #46,@RPCS1      ;LOAD AN ILLEGAL FUNCTION CODE (WITHOUT SETTING GO)
032750  012737  000010  002452              MOV     #PAR,RCVED      ;FORM EXPECTED DATA
032756  013737  002452  002454              MOV     RCVED,EXPTED    ;IN CASE OF AN ERROR
032764  005037  002466                      CLR     ERSTAT          ;RESET STATUS MARK
032770  004737  017000                      JSR     PC,WAIT         ;STALL FOR SOME SETTLE TIME
032774  032777  000001  147524              BIT     #ILF,@RPER1     ;DID ILLEGAL FUNCTION SET?
033002  001406                              BEQ     2$              ;IF NOT, GO ON
033004  052737  000001  002452              BIS     #ILF,RCVED      ;LOG THIS ERROR IN THE RECEIVED BUFFER
033012  112737  000377  002466              MOVB    #377,ERSTAT     ;MARK THIS FAILURE
033020  032777  000010  147500  2$:         BIT     #PAR,@RPER1     ;DID PARITY ERROR SET?
033026  001006                              BNE     3$              ;IF SO, GO ON
033030  042737  000010  002452              BIC     #PAR,RCVED      ;LOG FAILING RESULT
033036  112737  000377  002466              MOVB    #377,ERSTAT     ;MARK THIS FAILURE
033044  005737  002466          3$:         TST     ERSTAT          ;ERRORS?
033050  001425                              BEQ     5$              ;IF 0, NO
033052  013737  002526  002456              MOV     RPER1,TESTRG    ;GET FAILING REGISTER
033060  012737  004000  002404              MOV     #BIT11,ERRWD1   ;AND FORM MODULE CALL-OUT
033066  005037  002406                      CLR     ERRWD2          ;BOTH WORDS
033072  023727  002466  000377              CMP     ERSTAT,#377     ;ILLEGAL FUNCTION ONLY SET?
033100  001403                              BEQ     4$              ;IF MATCH, THAT WAS ONLY ERROR
033102  052737  001400  002404              BIS     #BIT8!BIT9,ERRWD1 ;FORM REST OF CALL OUT
033110                                  4$:
033110  104456                              TRAP    C$ERHRD
033112  000100                              .WORD   64
033114  012454                              .WORD   EM14
033116  014172                              .WORD   ERR0
033120  005037  002402                      CLR     ITCOUN          ;NO ITERATIONS NECESSARY
033124                                      ;
033124                                  5000$:
033124  104405                              TRAP    C$ESEG
033126  005037  002466                      CLR     ERSTAT          ;ERSTAT=0
033132  005337  002402                      DEC     ITCOUN          ;ONE LESS ITERATION
033136  003273                              BGT     1$              ;IF <= 0, WE'RE DONE!!
033140                                  L10063:
```

```
033140  1C4401                  TRAP    CSETST
```

```
                                .SBTTL  TEST 38 CORRECT PARITY TEST
                                ;%      TEST 38 CORRECT PARITY TEST
                                ;%      :  LOAD DATA PATTERNS 1 TO 4 INTO RPDA, ONE AT A TIME
                                ;%      :  READ RPDA AFTER EACH WRITE FUNCTION
                                ;%      :  IF ((RPCS1:  MCPE) OR (RPCS1:  TRE) OR (RPER1:  PAR)) = 1
                                ;%      :  :  THEN
                                ;%      :  :  OUTPUT ERROR MESSAGE (PARITY LOGIC MALFUNCTION)
                                ;%      :  :  OUTPUT FAULT LIST:  J11, J12, J13, RHXX, CABLE, TERMINATOR
                                ;%      :  ENDIF
                                ;%      END TEST 38

033142                          T38::
033142  012737  000012  002402          MOV     #10.,ITCOUN     ;LOAD THE ITERATION COUNT
033150                          1$:
033150  104404                          TRAP    C$BSEG
033152  004737  016662                  JSR     PC,SEIZE        ;GET THE DRIVE UNDER TEST
033156  012702  002344                  MOV     #PATT1,R2       ;GET THE PATTERN ADDRESS
033162  012701  000004                  MOV     #4,R1           ;AND THE OVERALL ITERATION COUNT
033166  012277  147326          2$:     MOV     (R2)+,@RPDA     ;WRITE THE DATA
033172  005777  147322                  TST     @RPDA           ;READ THE REGISTER
033176  032777  060000  147306          BIT     #MCPE!TRE,@RPCS1 ;ERROR?
033204  001011                          BNE     3$              ;IF <>0, YES!
033206  004737  017000                  JSR     PC,WAIT         ;STALL FOR SOME SETTLE TIME
033212  032777  000010  147306          BIT     #PAR,@RPER1     ;PARITY ERROR?
033220  001010                          BNE     4$              ;IF <>0, YES
033222  005301                          DEC     R1              ;ONE LESS ITERATION
033224  003360                          BGT     2$              ;IF >0, NOT FINISHED
033226  000431                          BR      6$              ;GET OUT NOW!
033230  004737  017422          3$:     JSR     PC,BICEXP       ;FORM UP THE FAILING DATA
033234  002512                          RPCS1                   ;THIS REGISTER
033236  060000                          MCPE!TRE                ;THESE BITS FAILED TO CLEAR
033240  000410                          BR      5$              ;REPORT THE ERROR
033242  013737  002526  002456  4$:     MOV     RPER1,TESTRG     GET ADDRESS OF FAILING DATA
033250  017737  147252  002452          MOV     @RPER1,RCVED    ;GOT FAILED RESULTS
033256  005037  002454                  CLR     EXPTED          ;FORM EXPECTED DATA
033262  012737  016000  002404  5$:     MOV     #BIT10!BIT11!BIT12,ERRWD1 ;FORM MODULE CALL-OUT
033270  012737  000406  002406          MOV     #BIT1!BIT2!BIT8,ERRWD2    ;BOTH WORDS
033276  104456                          TRAP    C$ERHRD
033300  000101                          .WORD   65
033302  013051                          .WORD   EM23
033304  014172                          .WORD   ERR0
033306  005037  002402                  CLR     ITCOUN          ;NO FURTHER ITERATIONS
033312                          6$:
033312                          10000$:
033312  104405                          TRAP    C$ESEG
033314  005337  002402                  DEC     ITCOUN          ;ONE LESS ITERATION
033320  003313                          BGT     1$              ;IF <= 0, DONE!!
033322                          L10064:
033322  104401                          TRAP    C$ETST
```

```
                                .SBTTL  TEST 39 CLEAR COMPOSITE ERROR TEST

                                ;%      TEST 39 CLEAR COMPOSITE ERROR TEST
                                ;%      :  SET RPCS2:  CLR = 1
                                ;%      :  IF RPDS:  ERR = 1
                                ;%      :  :  THEN
                                ;%      :  :  IF ((RPER1 = 0) AND (RPER2 = 0) AND (RPER3 = 0))
                                ;%      :  :  :  THEN
                                ;%      :  :  :  OUTPUT ERROR MESSAGE (DETECTED A PERMANENT ERROR)
                                ;%      :  :  :  ELSE
                                ;%      :  :  :  OUTPUT ERROR MESSAGE (DETECTED COMPOSITE ERROR)
                                ;%      :  :  ENDIF
                                ;%      :  :  OUTPUT FAULT LIST:  J12
                                ;%      :  ENDIF
                                ;%      END TEST 39

033324                          T39::
033324  012737  000012  002402          MOV     #10.,ITCOUN     ;LOAD THE ITERATION COUNT
033332                          1$:
033332  104404                          TRAP    C$BSEG
033334  004737  016662                  JSR     PC,SEIZE        ;GET THE DRIVE UNDER TEST
033340  032777  040000  147156          BIT     #ERR,@RPDS      ;DID WE RECEIVE A COMPOSITE ERROR?
033346  001435                          BEQ     4$              ;IF 0, TEST OK
033350  004737  017422                  JSR     PC,BICEXP       ;FORM UP ERROR REPORT
033354  002524                          RPDS                    ;THIS REGISTER
033356  040000                          ERR                     ;THIS BIT FAILED TO CLEAR
033360  005037  002406                  CLR     ERRWD2          ;CREATE MODULE CALL OUT
033364  012737  004000  002404          MOV     #BIT11,ERRWD1   ;BOTH WORDS
033372  005777  147130                  TST     @RPER1          ;DID WE HAVE A DETECTABLE HARDWARE BUG?
033376  001013                          BNE     2$              ;IF NOT 0, YES
033400  005777  147146                  TST     @RPER2          ;DID WE HAVE A DETECTABLE HARDWARE BUG??
033404  001010                          BNE     2$              ;IF NOT 0, YES
033406  005777  147142                  TST     @RPER3          ;DID WE HAVE A DETECTABLE HARDWARE BUG?
033412  001005                          BNE     2$              ;IF NOT 0, YES
033414  104456                          TRAP    C$E HRD
033416  000102                          .WORD   66
033420  014075                          .WORD   EM42
033422  014172                          .WORD   ERR0
033424  000404                          BR      3$              ;SKIP NEXT MESSAGE
033426                          2$:
033426  104456                          TRAP    C$ERHRD
033430  000103                          .WORD   67
033432  011747                          .WORD   EM1
033434  014172                          .WORD   ERR0
033436  005037  002402          3$:     CLR     ITCOUN          ;NO FURTHER ITERATIONS NECESSARY
033442                          4$:
033442                          10000$:
033442  104405                          TRAP    C$ESEG
033444  005337  002402                  DEC     ITCOUN          ;ONE LESS ITERATION TO-GO
033450  003330                          BGT     1$              ;IF >0, DO AGAIN
033452                          L10065:
033452  104401                          TRAP    C$ETST
```

```
                                        .SBTTL  TEST 40 COMPOSITE ERROR SET - RESET TEST
                                        ;%      TEST 40 FORCE A COMPOSITE ERROR, THEN CLEAR IT
                                        ;%      :  SET RPCS2:  PAT = 1
                                        ;%      :  WRITE DATA PATTERN #1 TO RPDA
                                        ;%      :  READ RPDA AFTER PERFORMING THE WRITE OPERATION
                                        ;%      :  IF ((RPDS:  ERR) OR (RPER1:  PAR)) = 0
                                        ;%      :  :  THEN
                                        ;%      :  :  OUTPUT ERROR MESSAGE (COMPOSITE ERROR DIDN'T SET WHEN EXPECTED)
                                        ;%      :  :  OUTPUT FAULT LIST:  J09, J10, J12
                                        ;%      :  :  ELSE
                                        ;%      :  :  SET RPCS2:  CLR = 1
                                        ;%      :  :  IF ((RPDS:  ERR) OR (RPER1:  PAR) = 1
                                        ;%      :  :  :  THEN
                                        ;%      :  :  :  OUTPUT ERROR MESSAGE (ERROR STATUS FAILED TO CLEAR)
                                        ;%      :  :  :  OUTPUT FAULT LIST:  J12
                                        ;%      :  :  ENDIF
                                        ;%      :  ENDIF
                                        ;%      END TEST 40

033454                                  T40::
033454  012737  000012  002402                  MOV     #10.,ITCOUN     ;LOAD THE ITERATION COUNT
033462                                  1$:
033462  104404                                TRAP    C$BSEG
033464  004737  016662                        JSR     PC,SEIZE        ;GET THE DRIVE UNDER TEST
033470  052777  000020  147024                BIS     #PAT,@RPCS2     ;INVERT PARITY - FORCE  ERRORS!
033476  013777  002344  147014                MOV     PATT1,@RPDA     ;WRITE A PATTERN
033504  005777  147010                        TST     @RPDA           ;READ THE REGISTER JUST WRITTEN
033510  004737  017000                        JSR     PC,WAIT         ;STALL FOR THE RP07 MICROPROCESSOR
033514  032777  000010  147004                BIT     #PAR,@RPER1     ;DID WE DETECT A PARITY ERROR?
033522  001005                                BNE     2$              ;IF = 1, YES
033524  004737  017372                        JSR     PC,BISEXP       ;FORM THE FAILING DATA
033530  002526                                RPER1                   ;THIS REGISTER FAILED
033532  000010                                PAR                     ;THIS BIT FAILED TO SET
033534  000410                                BR      3$              ;AND REPORT IT
033536  032777  040000  146760  2$:           BIT     #ERR,@RPDS      ;DID WE GET COMPOSITE ERROR?
033544  001017                                BNE     4$              ;IF = 1, YES
033546  004737  017372                        JSR     PC,BISEXP       ;FORM THE ERROR DATA
033552  002524                                RPDS                    ;FORM THE ERROR REPORT
033554  040000                                ERR                     ;FORM THE EXPECTED DATA

033556  012737  005400  002404  3$:           MOV     #BIT8!BIT9!BIT11,ERRWD1 ;FORM MODULE CALL-OUT LIST
033564  005037  002406                        CLR     ERRWD2          ;BOTH WORDS
033570  104456                                TRAP    C$ERHRD
033572  000104                                .WORD   68
033574  012776                                .WORD   EM22
033576  014172                                .WORD   ERR0
033600  005037  002402                        CLR     ITCOUN          ;NO FURTHER ITERATONS NECESSARY
033604  052777  000040  146710  4$:           BIS     #CLR,@RPCS2     ;RESET THE DEVICE
033612  013777  002506  146702                MOV     DRVNO,@RPCS2    ;RELOAD THE DRIVE - UNDER - TEST
033620  032777  000010  146700                BIT     #PAR,@RPER1     ;ERROR STATUS GONE?
033626  001411                                BEQ     5$              ;IF = 0, YES
033630  013737  002526  002456                MOV     RPER1,TESTRG    ;FORM THE ERROR REPORT DATA
033636  017737  146664  002452                MOV     @RPER1,RCVED    ;PAR SET AND SHOULD HAVE CLEARED
033644  005037  002454                        CLR     EXPTED          ;SHOW 0 BITS EXPECTED DATA
033650  000410                                BR      6$              ;AND REPORT THE ERROR
033652  032777  040000  146644  5$:           BIT     #ERR,@RPDS      ;DID COMPOSITE ERROR CLEAR?
```

```
     033660  001417                          BEQ     7$              ;IF 0, YES
     033662  004737  017422                  JSR     PC,BICEXP       ;CREATE THIS INFORMATION
     033666  002524                          RPDS                    ;AND MAKE IT AVAILABLE FOR
     033670  040000                          ERR                     ;AN ERROR MESSAGE

     033672  012737  004000  002404  6$:     MOV     #BIT11,ERRWD1   ;CREATE MODULE CALL OUT
     033700  005037  002406                  CLR     ERRWD2          ;FOR BOTH WORDS
     033704  104456                          TRAP    C$ERHRD
     033706  000105                          .WORD   69
     033710  011747                          .WORD   EM1
     033712  014172                          .WORD   ERR0
     033714  005037  002402                  CLR     ITCOUN          ;RESET THE ITERATION COUNTER
     033720                          7$:
     033720                          10000$:
     033720  104405                          TRAP    C$ESEG
     033722  005337  002402                  DEC     ITCOUN          ;ONE LESS ITERATION TO GO
     033726  003255                          BGT     1$              ;DO UNTIL <= 0
     033730                          L10066:
     033730  104401                          TRAP    C$ETST
```

```
                                .SBTTL  TEST 41 ATA CLEAR TEST
                                
                                ;%      TEST 41 CLEAR ATA TEST
                                ;%      :  SET RPCS2:  CLR = 1
                                ;%      :  IF RPDS:  ATA = 1
                                ;%      :  :  THE
                                ;%      :  :  OUTPUT ERROR MESSAGE (DETECTED FALSE ATA)
                                ;%      :  :  OUTPUT FAULT LIST:  J12
                                ;%      :  ENDIF
                                ;%      END TEST 41
                                
033732                          T41::
033732  012737  000012  002402          MOV     #10.,ITCOUN     ;LOAD THE ITERATION COUNT
033740                          1$:
033740  104404                        TRAP    C$BSEG
033742  004737  016662                JSR     PC,SEIZE        ;GET THE DRIVE UNDER TEST
033746  004737  017000                JSR     PC,WAIT         ;WAIT FOR THE RP07 MICROPROCESSOR
033752  032777  100000  146544        BIT     #ATA,@RPDS      ;DOES THE ATTENTION SUMMARY BIT = 1
033760  001417                        BEQ     2$              ;IF IT DOES, IT'S WRONG.
033762  004737  017422                JSR     PC,BICEXP       ;FORM THE FAILING DATA
033766  002524                        RPDS                    ;THIS REGISTER FAILED
033770  140000                        ATA!ERR                 ;THESE BITS FAILED TO CLEAR
033772  012737  004000  002404        MOV     #BIT11,ERRWD1   ;FORM MODULE CALL - OUT
034000  005037  002406                CLR     ERRWD2          ;BOTH WORDS
034004  104456                        TRAP    C$ERHRD
034006  000106                        .WORD   70
034010  012454                        .WORD   EM14
034012  014172                        .WORD   ERR0
034014  005037  002402                CLR     ITCOUN          ;RESET THE ITERATON COUNTER
034020                          2$:
034020                          10000$:
034020  104405                        TRAP    C$ESEG
034022  005337  002402                DEC     ITCOUN          ;ONE LESS ITERATION
034026  003344                        BGT     1$              ;DO UNTIL <= 0
034030                          L10067:
034030  104401                        TRAP    C$ETST
```

```
                                .SBTTL  TEST 42 ATA SET - RESET TEST
                                ;
                                ;%      TEST 42 SET AND CLEAR ATA BIT
                                ;%      :  SET RPCS2:  PAT = 1
                                ;%      :  WRITE RPDA WITH DATA PATTERN #1, ONCE
                                ;%      :  IF ((RPDS:  ATA) AND (RPDS:  ERR)) <> 1
                                ;%      :  :  THEN
                                ;%      :  :  OUTPUT ERROR MESSAGE (ATA DIDN'T SET WHEN EXPECTED)
                                ;%      :  :  OUTPUT FAULT LIST:  J09, J10
                                ;%      :  :  ELSE
                                ;%      :  :  ISSUE DRIVE CLEAR COMMAND
                                ;%      :  ENDIF
                                ;%      :  IF ((RPDS:  ATA) AND (RPDS:  ERR)) <> 0
                                ;%      :  :  THEN
                                ;%      :  :  OUTPUT ERROR MESSAGE (ATA DIDN'T CLEAR WHEN EXPECTED)
                                ;%      :  :  OUTPUT FAULT LIST:  J12
                                ;%      :  ENDIF
                                ;%      :  SET RPCS2:  PAT = 1
                                ;%      :  WRITE RPDA WITH DATA PATTERN #1, ONCE
                                ;%      :  SET RPCS2:  CLR = 1
                                ;%      :  IF  ((RPDS:  ATA) OR (RPDS:  ERR) <> 0)
                                ;%      :  :  THEN
                                ;%      :  :  OUTPUT ERROR MESSAGE (RPCS2:  CLR DIDN'T CLEAR ATA AS EXPECTED)
                                ;%      :  :  OUTPUT FAULT LIST:  J12
                                ;%      :  ENDIF
                                ;%      END TEST 42
                                ;
034032                          T42::
034032  012737  000012  002402          MOV     #10.,ITCOUN     ;LOAD THE ITERATION COUNTER
034040                          1$:
034040  104404                          TRAP    C$BSEG
034042  004737  016662                  JSR     PC,SEIZE        ;GET THE DRIVE UNDER TEST
034046  052777  000020  146446          BIS     #PAT,@RPCS2     ;INVERT PARITY
034054  013777  002344  146436          MOV     PATT1,@RPDA     ;MOVE DATA TO RPDA
034062  005037  002406                  CLR     ERRWD2          ;FORM SOME MODULE CALL - OUT
034066  004737  017000                  JSR     PC,WAIT         ;WAIT FOR THE RP07 MICROPROCESSOR TO FINISH
034072  032777  140000  146424          BIT     #ATA!ERR,@RPDS  ;DID WE DETECT ATTENTION AND ERROR?
034100  001035                          BNE     2$              ;IF = 1, YES
034102  012737  001400  002404          MOV     #BIT8!BIT9,ERRWD1       ;FORM BALANCE OF MODULE CALL OUT
034110  004737  017372                  JSR     PC,BISEXP       ;SHOW DATA TO ERROR - REPORT
034114  002524                          RPDS                    ;THIS REGISTER
034116  140000                          ATA!ERR                 ;THESE BITS FAILED TO SET
034120  012737  001400  002404          MOV     #BIT8!BIT9,ERRWD1;LOG THE MODULE CALLOUT
034126  000452                          BR      4$              ;REPORT IT!
034130  032777  010000  146366          BIT     #MOL,@RPDS      ;IS THE DRIVE ON-LINE
034136  001016                          BNE     2$              ;YES, IT IS ONLINE!
034140  004737  017326                  JSR     PC,SAVRPR       ;GET THE REGISTER SNAPSHOT
034144  013746  002114                  MOV     L$TEST,-(SP)
034150  012746  006452                  MOV     #MSGMOL,-(SP)
034154  012746  000002                  MOV     #2,-(SP)
034160  010600                          MOV     SP,R0
034162  104417                          TRAP    C$PNTH
034164  062706  000006                  ADD     #6,SP
034170  104432                          TRAP    C$EXIT
034172  000124                          .WORD   L10070-.
034174  013777  002506  146320  2$:     MOV     DRVNO,@RPCS2    ;LOAD THE DRIVE #, CLEAR OUT PARITY INVERT
034202  012777  000011  146302          MOV     #DRCLR,@RPCS1   ;ISSUE A DRIVE CLEAR COMMAND
```

```
     55 034210  032777  140000  146306          BIT     #ATA!ERR,@RPDS  ;CHECK ATTENTION AND ERROR
     56 034216  001016                          BNE     4$              ;THEY'RE SET, ERROR!
     57 034220  052777  000020  146274  3$:     BIS     #PAT,@RPCS2     ;INVERT PARITY
     58 034226  013777  002344  146264          MOV     PATT1,@RPDA     ;WRITE DATA AGAIN
     59 034234  004737  017000                  JSR     PC,WAIT         ;WAIT FOR THE MICRO PROCESSORS
     60 034240  004737  016662                  JSR     PC,SEIZE        ;GET THE DRIVE NOW!
     61 034244  032777  140000  146252          BIT     #ATA!ERR,@RPDS  ;CHECK ATTENTION AND ERROR
     62 034252  001415                          BEQ     5$              ;IF 0, TEST PASSES
     63 034254  004737  017422          4$:     JSR     PC,BICEXP       ;FORM EXPECTED DATA
     64 034260  002524                          RPDS                    ;THIS REGISTER
     65 034262  140000                          ATA!ERR                 ;THESE BITS FAILED TO CLEAR
     66 034264  012737  004000  002404          MOV     #BIT11,ERRWD1   ;LOAD THIS MODULE CALLOUT
     67 034272  104456                          TRAP    C$ERHRD
        034274  000107                          .WORD   71
        034276  012454                          .WORD   EM14
        034300  014172                          .WORD   ERR0
     68 034302  005067  002402                  CLR     ITCOUN          ;NO FURTHER ITERATIONS
     69 034306                          5$:
        034306                          10000$:
        034306  104405                          TRAP    C$ESEG
     70 034310  005337  002402                  DEC     ITCOUN          ;ONE LESS TO-GO
     71 034314  003251                          BGT     1$              ;IF <= 0, WE'RE DONE!
     72 034316                          L10070:
        034316  104401                          TRAP    C$ETST
```

```
                                .SBTTL  TEST 43 RPAS CLEAR TEST
                                ;
                                ;%      TEST 43 CLEAR RPAS REGISTER TEST
                                ;%      :  SET RPCS2:   CLR = 1
                                ;%      :  IF RPAS <> 0
                                ;%      :  :  THEN
                                ;%      :  :  OUTPUT ERROR MESSAGE (RPAS DIDN'T CLEAR WHEN EXPECTED)
                                ;%      :  :  OUTPUT CONTENTS OF RPAS
                                ;%      :  :  OUTPUT FAULT LIST:  J11 / J13, J12, ANOTHER DRIVE
                                ;%      :  ENDIF
                                ;%      END TEST 43
                                ;
 034320                         T43::
 034320  012737  000012  002402         MOV     #10.,ITCOUN     ;LOAD THE ITERATION COUNTER
 034326                         1$:
 034326  104404                         TRAP    C$BSEG
 034330  004737  016662                 JSR     PC,SEIZE        ;GET THE DRIVE UNDER TEST
 034334  005777  146170                 TST     @RPAS           ;RPAS = 0?
 034340  001424                         BEQ     2$              ;IF 0, TEST OK!
 034342  005037  002454                 CLR     EXPTED          ;FORM ERROR DATA
 034346  013737  002530  002456         MOV     RPAS,TESTRG     ;FOR AN ERROR DISPATCH
 034354  017737  146150  002452         MOV     @RPAS,RCVED     ;GET RECEIVED DATA
 034362  012737  016000  002404         MOV     #BIT10!BIT11!BIT12,ERRWD1       ;FORM MODULE CALL OUT
 034370  012737  000020  002406         MOV     #BIT4,ERRWD2    ;BOTH WORDS
 034376  104456                         TRAP    C$ERHRD
 034400  000110                         .WORD   72
 034402  012523                         .WORD   EM15
 034404  014172                         .WORD   ERR0
 034406  005037  002402                 CLR     ITCOUN          ;RESET THE ITERATION COUNTER
 034412                         2$:
 034412                         10000$:
 034412  104405                         TRAP    C$ESEG
 034414  005337  002402                 DEC ITCOUN              ;ONE LESS TO-GO
 034420  003342                         BGT     1$              ;IF >0, WE'RE NOT DONE
 034422                         L10071:
 034422  104401                         TRAP    C$ETST
```

```
                                .SBTTL  TEST 44 RPAS CORRECT POSITION TEST
                                ;%      TEST 44 RPAS CORRECT POSITION DECODE TEST
                                ;%      :  SET RPCS2:  CLR = 1
                                ;%      :  SET RPCS2:  PAT = 1
                                ;%      :  WRITE RPDA WITH DATA PATTERN #1, ONCE
                                ;%      :  IF RPAS:  ATA BIT IS NOT CORRECT POSITION FOR DRIVE UNDER TEST
                                ;%      :  :  THEN
                                ;%      :  :  OUTPUT ERROR MESSAGE (RPAS DECODE LOGIC FAILURE)
                                ;%      :  :  OUTPUT FAULT LIST:  J11 / J13
                                ;%      :  .  ELSE
                                ;%      :     WRITE RPAS WITH EXPECTED RESULTS
                                ;%      :  .  ENDIF
                                ;%      :  SET RPCS2:  PAT = 0
                                ;%      :  IF RPAS:  ATA BIT UNDER TEST <> 0
                                ;%      :  :  THEN
                                ;%      :  :  OUTPUT ERROR MESSAGE (RPAS DECODE LOGIC FAILURE)
                                ;%      :  :  OUTPUT FAULT LIST:  J11 / J13, J12
                                ;%      :  ENDIF
                                ;%      END TEST 44

034424                          T44::
034424  012737  000012  002402          MOV     #10.,ITCOUN     ;LOAD THE ITERATION COUNT
034432                          1$:
034432  104404                  TRAP    C$BSEG
034434  004737  016662          JSR     PC,SEIZE        ;GET THE DRIVE UNDER TEST
034440  052777  000020  146054  BIS     #PAT,@RPCS2     ;INVERT PARITY (FORCE ERRORS)
034446  013777  002344  146044  MOV     PATT1,@RPDA     ;WRITE A PATTERN TO RPDA
034454  004737  017000          JSR     PC,WAIT         ;WAIT FOR THE RP07 MICROPROCESSOR TO FINISH
034460  013737  002400  002454  MOV     BITPOS,EXPTED   ;GET THE EXPECTED DATA
034466  023777  002454  146034  CMP     EXPTED,@RPAS    ;DID CORRECT ATN BIT SET?
034474  001417                  BEQ     2$              ;IF EQUAL OK!
034476  013737  002530  002456  MOV     RPAS,TESTRG     ;FORM REGISTER DATA
034504  017737  146020  002452  MOV     @RPAS,RCVED     ;AND RECEIVED ERROR DATA
034512  012737  012000  002404  MOV     #BIT10!BIT12,ERRWD1     ;NOW GET MODULE CALL - OUT
034520  005037  002406          CLR     ERRWD2          ;BOTH WORDS
034524  104456                  TRAP    C$ERHRD
034526  000111                  .WORD   73
034530  012454                  .WORD   EM14
034532  014172                  .WORD   ERR0
034534  042777  000020  145760  2$:     BIC     #PAT,@RPCS2     ;INVERT PARITY AGAIN
034542  013777  002454  145760  MOV     EXPTED,@RPAS    ;TRY TO CLEAR RPAS
034550  005037  002454          CLR     EXPTED          ;SHOW EXPECTED RESULTS
034554  005777  145750          TST     @RPAS           ;DID RPAS CLEAR?
034560  001421                  BEQ     3$              ;IF SO, SKIP ERROR DISPATCH
034562  013737  002530  002456  MOV     RPAS,TESTRG     ;FORM REGISTER DATA
034570  017737  145734  002452  MOV     @RPAS,RCVED     ;FORM RECEIVED DATA
034576  012737  016000  002404  MOV     #BIT10!BIT11!BIT12,ERRWD1       ;CREATE MODULE LIST
034604  005037  002406          CLR     ERRWD2          ;BOTH WORDS
034610  104456                  TRAP    C$ERHRD
034612  000112                  .WORD   74
034614  013051                  .WORD   EM23
034616  014172                  .WORD   ERR0
034620  005037  002402          CLR     ITCOUN          ;NO LOOPS NECESSARY
034624                          3$:
034624                          10000$:
034624  104405                  TRAP    C$ESEG
```

```
     49 034626  005337  002402                DEC     ITCOUN          ;ONE LESS TO-GO
     50 034632  003277                        BGT     1$              ;IF >0, WE'RE NOT DONE
     51 034634                       L10072:
        034634  104401                        TRAP    C$ETST
```

```
                                .SBTTL  TEST 45 UNIQUE POSITION DECODE TEST
                                ;
                                ;%      TEST 45 RPAS UNIQUE POSITION DECODE TEST
                                ;%      :  SET RPCS2:  CLR = 1
                                ;%      :  SET RPCS2:  PAT = 1
                                ;%      :  WRITE RPDA WITH DATA PATTERN #1, ONCE
                                ;%      :  IF RPAS:  ATA FOR THE DRIVE UNDER TEST <> 1
                                ;%      :  :  THEN
                                ;%      :  :  OUTPUT ERROR MESSAGE (RPAS DECODE LOGIC FAILURE)
                                ;%      :  :  OUTPUT FAULT LIST:  J11/J13
                                ;%      :  ENDIF
                                ;%      :  IF RPDS:  ATA <> 1
                                ;%      :  :  THEN
                                ;%      :  :  OUTPUT ERROR MESSAGE (RPDS:  ATA DIDN'T SET)
                                ;%      :  ENDIF
                                ;%      :  WRITE RPAS WITH THE COMPLIMENT OF THE EXPECTED DATA
                                ;%      :  IF RPAS:  ATA FOR THE DRIVE UNDER TEST = 0
                                ;%      :  :  THEN
                                ;%      :  :  OUTPUT ERROR MESSAGE (RPAS DECODE LOGIC FAILURE)
                                ;%      :  :  OUTPUT FAULT LIST:  J11 / J13
                                ;%      :  ENDIF
                                ;%      END TEST 45
                                ;
034636                          T45::
034636  012737  000012  002402          MOV     #10.,ITCOUN     ;LOAD THE ITERATION COUNT
034644                          1$:
034644  104404                  TRAP    C$BSEG
034646  004737  016662          JSR     PC,SEIZE        ;GET THE DRIVE UNDER TEST
034652  052777  000020  145642  BIS     #PAT,@RPCS2     ;INVERT PARITY (FORCE ERRORS)
034660  013777  002344  145632  MOV     PATT1,@RPDA     ;WORIT RPDA WITH PATTERN1
034666  013737  002400  002454  MOV     BITPOS,EXPTED   ;GET THE CORRECT ATTENTION BIT POSITION
034674  004737  017000          JSR     PC,WAIT         ;WAIT FOR THE RP07 MICROPROCESSOR
034700  023777  002454  145622  CMP     EXPTED,@RPAS    ;MATCH?
034706  001421                  BEQ     2$              ;IF EQUAL, OK!
034710  013737  002530  002456  MOV     RPAS,TESTRG     ;FORM FAILURE DATA
034716  017737  145606  002452  MOV     @RPAS,RCVED     ;AND LOG IT
034724  012737  012000  002404  MOV     #BIT10!BIT12,ERRWD1     ;CREATE MODULE CALL - OUT
034732  005037  002406          CLR     ERRWD2          ;BOTH WORDS
034736  104456                  TRAP    C$ERHRD
034740  000113                  .WORD   75
034742  012454                  .WORD   EM14
034744  014172                  .WORD   ERRO
034746  005037  002402          CLR     ITCOUN          ;NO LOOPS NECESSARY
034752  032777  100000  145544  2$.     BIT     #ATA,@RPDS      ;DID ATA SET?
034760  001012                  BNE     3$              ;IF NOT ZERO, YES!
034762  004737  017372          JSR     PC,BISEXP       ;LOAD THE FAILING INFORMATION
034766  002524                  RPDS                    ;THIS REGISTER FAILED
034770  100000                  ATA                     ;THIS BIT FAILED TO SET
034772  104456                  TRAP    C$ERHRD
034774  000114                  .WORD   76
034776  012776                  .WORD   EM22
035000  014172                  .WORD   ERRO
035002  005037  002402          CLR     ITCOUN          ;NO LOOP NECESSARY
035006  005137  002454          3$:     COM     EXPTED          ;COMPLIMENT THE EXPECTED DATA
035012  013777  002454  145510  MOV     EXPTED,@RPAS    ;AND WRITE TO RPDA (SHOULD DO NOTHING)
035020  005137  002454          COM     EXPTED          ;RE-INVERT EXPECTED DATA
035024  023777  002454  145476  CMP     EXPTED,@RPAS    ;AND SEE IF ATN CLEARD
```

```
 51 035032  001421                          BEQ     4$                ;IF MATCH, IT DID NOT TEST OK!
 52 035034  013737  002530  002456          MOV     RPAS,TESTRG       ;FORM FAILING REGISTER
 53 035042  017737  145462  002452          MOV     @RPAS,RCVED       ;AND FAILING DATA
 54 035050  012737  012000  002404          MOV     #BIT10!BIT12,ERRWD1     ;CREATE MODULE CALLOUT
 55 035056  005037  002406                  CLR     ERRWD2            ;BOTH WORDS
 56 035062  104456                          TRAP    C$ERHRD
    035064  000115                          .WORD   77
    035066  012454                          .WORD   EM14
    035070  014172                          .WORD   ERR0
 57 035072  005037  002402                  CLR     ITCOUN            ;RESET THE ITERATION COUNTER
 58 035076                          4$:
    035076                          10000$:
    035076  104405                          TRAP    C$ESEG
 59 035100  005337  002402                  DEC     ITCOUN            ;ONE LESS ITERATION
 60 035104  003257                          BGT     1$                ;IF > 0, DO AGAIN!!
 61 035106                          L10073:
    035106  104401                          TRAP    C$ETST
```

```
                                        .SBTTL  TEST 46 MASSBUS ATTENTION CLEAR TEST
                                        ;%      TEST 46 CLEAR MASSBUS ATTENTION TEST
                                        ;%      :  SET RPCS2:  CLR = 1
                                        ;%      :  IF ((RPCS1:  SC) OR (ON RH20-''ATTN'') = 1
                                        ;%      :  :  THEN
                                        ;%      :  :  OUTPUT ERROR MESSAGE (DETECTED FALSE SPECIAL CONDITION)
                                        ;%      :  :  OUTPUT FAULT LIST:  CABLE, RHXX, J11/J13, ANOTHER DRIVE, TERMINATOR
                                        ;%      :  ENDIF
                                        ;%      END TEST 46

035110                                  T46::
035110  012737  000012  002402                  MOV     #10.,ITCOUN     ;LOAD THE ITERATION COUNT
035116                                  1$:
035116  104404                                TRAP    C$BSEG
035120  004737  016662                        JSR     PC,SEIZE        ;GET THE DRIVE AFTER PURGING ERRORS!
035124  032777  100000  145360                BIT     #SC,@RPCS1      ;TEST RPCS1 = SPECIAL CONDITION
035132  001420                                BEQ     2$              ;IF 0, TEST OK!
035134  004737  017422                        JSR     PC,BICEXP       ;FORM UP FAILING DATA
035140  002512                                RPCS1                   ;THIS REGISTER
035142  100000                                SC                      ;THIS BIT FAILED TO CLEAR
035144  012737  012000  002404                MOV     #BIT10!BIT12,ERRWD1     ;FORM UP MODULE CALLOUT
035152  012737  000426  002406                MOV     #BIT1!BIT2!BIT4!BIT8,ERRWD2;BOT  WORDS
035160  104456                                TRAP    C$ERHRD
035162  000116                                .WORD   78
035164  012562                                .WORD   EM16
035166  014172                                .WORD   ERR0
035170  005037  002402                        CLR     ITCOUN          ;NO ITERATIONS NECESSARY
035174                                  2$:
035174                                  10000$:
035174  104405                                TRAP    C$ESEG
035176  005337  002402                        DEC     ITCOUN          ;ONE LESS ITERATION TO GO
035202  003345                                BGT     1$              ;IF <= 0, DONE!!
035204                                  L10074:
035204  104401                                TRAP    C$ETST
```

```
                                        .SBTTL  TEST 47 MASSBUS ATTENTION SET/CLEAR TEST
                                        ;
                                        ;%      TEST 47 MASSBUS ATTN SET & CLEAR TEST
                                        ;%      :  SET RPCS2:  CLR = 1
                                        ;%      :  SET RPCS2:  PAT = 1
                                        ;%      :  WRITE RPDA WITH DATA PATTERN #1, ONCE
                                        ;%      :  IF ((RPCS1:  SC) OR (IN RH20-''ATTN'')) <> 1
                                        ;%      :  :  THEN
                                        ;%      :  :  OUTPUT ERROR MESSAGE (FAILED TO DETECT SPECIAL CONDITION WHEN EXPECTED)
                                        ;%      :  :  OUTPUT FAULT LIST:  RHXX, CABLES, J11 / J13, TERMINATOR
                                        ;%      :  ENDIF
                                        ;%      END TEST 47
                                        ;
035206                                  T47::
035206  012737  000012  002402                  MOV     #10.,ITCOUN     ;LOAD THE ITERATION COUNT
035214                                  1$:
035214  104404                                TRAP    C$BSEG
035216  004737  016662                        JSR     PC,SEIZE        ;FLUSH ERRORS THEN GET THE DRIVE
035222  052777  000020  145272                BIS     #PAT,@RPCS2     ;INVERT PARITY (FORCE ERRORS)
035230  013777  002344  145262                MOV     PATT1,@RPDA     ;WRITE RPDA, ONCE
035236  004737  017000                        JSR     PC,WAIT         ;WAIT FOR THE RP07 MICROPROCESSOR
035242  032777  100000  145242                BIT     #SC,@RPCS1      ;DID SPECIAL CONDITION SET?
035250  001020                                BNE     2$              ;IF = 2, YES
035252  004737  017372                        JSR     PC,BISEXP       ;FORM ERROR DATA
035256  002512                                RPCS1                   ;FOR AN ERROR DISPATCH
035260  100000                                SC                      ;THIS BIT FAILED TO SET
035262  012737  012000  002404                MOV     #BIT10!BIT12,ERRWD1     ;FORM MODULE LIST
035270  012737  000406  002406                MOV     #BIT1!BIT2!BIT8,ERRWD2  ;BOTH WORDS
035276  104456                                TRAP    C$ERHRD
035300  000117                                .WORD   79
035302  012725                                .WORD   EM21
035304  014172                                .WORD   ERR0
035306  005037  002402                        CLR     ITCOUN          ;RESET THE ITERATION COUNTER
035312                                  2$:
035312                                  10000$:
035312  104405                                TRAP    C$ESEG
035314  005337  002402                        DEC     ITCOUN          ;ONEW LESS ITERATION
035320  003335                                BGT     1$              ;IF <= 0, DONE
035322                                  L10075:
035322  104401                                TRAP    C$ETST
```

```
                                        .SBTTL  TEST 48 READ-IN-PRESET COMMAND TEST
                                        ;
                                        ;%      TEST 48 READ-IN-PRESET BASIC COMMAND TEST
                                        ;%      :  SET RPCS2:  CLR = 1
                                        ;%      :  ISSUE READ-IN-PRESET COMMAND
                                        ;%      :  IF RPDS:  ERR = 1
                                        ;%      :  :  THEN
                                        ;%      :  :  OUTPUT ERROR MESSAGE (DETECTED FALSE COMPOSITE ERROR)
                                        ;%      :  :  OUTPUT FAULT LIST:  J12
                                        ;%      :  ENDIF
                                        ;%      END TEST 48
                                        ;
035324                                  T48::
035324  012737  000012  002402                  MOV     #10.,ITCOUN     ;LOAD THE ITERATION COUNT
035332  032777  010000  145164                  BIT     #MOL,@RPDS      ;DRIVE ON LINE?
035340  001016                                  BNE     1$              ;IF 1, YES
035342  004737  017326                          JSR     PC,SAVRPR       ;GET THE REGISTER SNAPSHOT
035346  012746  002114                          MOV     L$TEST,-(SP)
035352  012746  006452                          MOV     #MSGMOL,-(SP)
035356  012746  000002                          MOV     #2,-(SP)
035362  010600                                  MOV     SP,R0
035364  104417                                  TRAP    C$PNTF
035366  062706  000006                          ADD     #6,SP
035372  104432                                  TRAP    C$EXIT
035374  000104                                  .WORD   L10076-.
035376                                  1$:
035376  104404                                  TRAP    C$BSEG
035400  004737  016662                          JSR     PC,SEIZE        ;GET THE DRIVE UNDER TEST
035404  012777  000021  145100                  MOV     #RIP,@RPCS1     ;ISSUE THE READ-IN-PRESET
035412  004737  017000                          JSR     PC,WAIT         ;WAIT FOR THE RP07 MICROPROCESSOR
035416  032777  040000  145100                  BIT     #ERR,@RPDS      ;DID IT CAUSE AN ERROR?
035424  001417                                  BEQ     2$              ;IF 0, NO!
035426  004737  017422                          JSR     PC,BICEXP       ;LOAD FAILURE DATA
035432  002524                                  RPDS                    ;THIS REGISTER
035434  040000                                  ERR                     ;THIS BIT FAILED TO STAY CLEAR
035436  012737  004000  002404                  MOV     #BIT11,ERRWD1   ;FORM MODULE CALLOUT
035444  005037  002406                          CLR     ERRWD2          ;FOR BOTH WORDS
035450  104456                                  TRAP    C$ERHRD
035452  000120                                  .WORD   80
035454  013051                                  .WORD   EM23
035456  014172                                  .WORD   ERR0
035460  005037  002402                          CLR     ITCOUN          ;NO ITERATIONS NECESSARY
035464                                  2$:
035464                                  10000$:
035464  104405                                  TRAP    C$ESEG
035466  005337  002402                          DEC     ITCOUN          ;ONE LESS TO-GO
035472  003341                                  BGT     1$              ;UNTIL <= 0!!
035474  004737  017722                          JSR     PC,PRELOD       ;RESET THE DRIVE TO 16 BIT MODE
035500                                  L10076:
035500  104401                                  TRAP    C$ETST
```

```
                                        .SBTTL  TEST 49 RHXX UNIQUE REGISTER TEST
                                        ;%      :  SET RPCS2:  CLR = 1
                                        ;%      :  LOAD DRIVE NUMBER INTO RPCS2
                                        ;%      :  REPEAT
                                        ;%      :  :  WRITE A UNIQUE PATTERN INTO A SELECTED REGISTER
                                        ;%      :  :  REGISTERS TO TEST = RPCS1, RPWC, RPBA, RPDA, RPMR1, RPOF, RPDC
                                        ;%      :  :  OPTIONAL REGISTERS FOR AN RH70 = RPBAE, RPCS3
                                        ;%      :  :  UNTIL ALL REGISTERS HAVE BEEN WRITTEN
                                        ;%      :  ENDREPEAT
                                        ;%      :  IF REGISTER UNDER TEST DOESN'T MATCH EXPECTED DATA
                                        ;%      :  :  THEN
                                        ;%      :  :  OUTPUT ERROR MESSAGE (REGISTER SELECTION FAILURE)
                                        ;%      :  :  OUTPUT FAULT LIST:  RHXX, CABLES, J11, J12, J13, TERMINATOR
                                        ;%      :  ENDIF
                                        ;%      END TEST 49

035502                                  T49::
035502  012737  000012  002402                MOV     #10.,ITCOUN     ;LOAD THE ITERATION COUNT
035510  004737  016662                        JSR     PC,SEIZE        ;LOAD THE DRIVE UNDER TEST
035514  012737  000002  002436          1$:   MOV     #2,TEMP         ;LOAD THE FIRST DATA PATTERN
035522  012702  002652                        MOV     #PSTACK,R2      ;CREATE THE CHECK BUFFER ADDRESS
035526  012701  004330                        MOV     #TST49,R1       ;GET THE FILE OF REGISTERS
035532  012703  000004                        MOV     #4,R3           ;GET THE FIRST SEGMENT COUNT
035536  013146                          2$:   MOV     @(R1)+,-(SP)    ;GET THE INITIAL STATE OF THE REGISTER
035540  017612  000000                        MOV     @(SP),(R2)      ;SAVE IT IN THE IMAGE FILE
035544  053736  002436                        BIS     TEMP,@(SP)+     ;WRITE THE UNIQUE TEST BIT
035550  053722  002436                        BIS     TEMP,(R2)+      ;AND SET THE CORRECT MASK IN THE IMAGE FILE
035554  005237  002436                        INC     TEMP            ;NEXT UNIQUE PATTERN
035560  005303                              DEC     R3              ;REDUCE THE ITERATION COUNT
035562  003365                              BGT     2$              ;IF > 0, KEEP GOING!
035564  012737  000010  002436              MOV     #10,TEMP        ;NEXT PATTERN
035572  012703  000004                        MOV     #4,R3           ;AND THE NEXT SEGMENT COUNT
035576  005737  002504                        TST     RHTYPE          ;WHICH CONTROLLER?
035602  001402                              BEQ     4$              ;IF 0, RH11
035604  062703  000002                        ADD     #2,R3           ;ADD 2 TO THE SEGMENT COUNT TO INCLUDE RPBAE & RPCS3
035610  013146                          4$:   MOV     @(R1)+,-(SP)    ;SAVE THE INITIAL STATE OF THE REGISTER
035612  017612  000000                        MOV     @(SP),(R2)      ;NOW GET THE INITIAL CONTENTS OF THE REGSISTER
035616  053736  002436                        BIS     TEMP,@(SP)+     ;NOW WRITE THE TEST PATTERN
035622  053722  002436                        BIS     TEMP,(R2)+      ;AND UPDATE THE IMAGE FILE
035626  005237  002436                        INC     TEMP            ;NEXT PATTERN
035632  005303                              DEC     R3              ;ONE LESS ITERATION TO GO
035634  003365                              BGT     4$              ;IF > 0, NOT DONE YET!!
035636  012701  004330                        MOV     #TST49,R1       ;GET THE REGISTER FILE AGAIN
035642  012702  002652                        MOV     #PSTACK,R2      ;AND THE OUTPUT FILE AGAIN
035646  012703  000010                        MOV     #8.,R3          ;GET THE OVERALL ITERATION COUNT
035652  005737  002504                        TST     RHTYPE          ;WHICH CONTROLLER??
035656  001402                              BEQ     5$              ;IF 0, IT'S AN RH11!!
035660  062703  000002                        ADD     #2,R3           ;INCLUDE THE TWO EXTRA REGISTERS: RPBAE & RPCS3
035664  013146                          5$:   MOV     @(R1)+,-(SP)    ;GET THE ADDRESS OF THE REGISTER UNDER TEST
035666  023622                              CMP     @(SP)+,(R2)+    ;DOES THE DATA MATCH?
035670  001425                              BEQ     6$              ;YES, GO-ON!
035672  017637  177776  002452              MOV     @-2(SP),RCVED   ;GET THE FAILING DATA
035700  016637  177776  002456              MOV     -2(SP),TESTRG   ;AND THE FAILING REGISTER ADDRESS
035706  016237  177776  002454              MOV     -2(R2),EXPTED   ;NOW GET THE EXPECTED DATA
035714  012737  016000  002404              MOV     #BIT10!BIT11!BIT12,ERRWD1
035722  012737  000406  002406              MOV     #BIT1!BIT2!BIT8,ERRWD2;CREATE THE MODULE CALLOUT
```

```
     58 035730  104456                          TRAP    C$ERHRD
        035732  000121                          .WORD   81
        035734  013641                          .WORD   EM36
        035736  014172                          .WORD   ERR0
     59 035740  005037  002402                  CLR     ITCOUN          ;RESET THE ITERATION COUNTER
     60 035744  005303                  6$:     DEC     R3              ;ONE LESS REGISTER TO TEST
     61 035746  003346                          BGT     5$              ;IF > 0, KEEP GOING!
     62 035750  005337  002402                  DEC     ITCOUN          ;ONE LESS ITERATION
     63 035754  003257                          BGT     1$              ;IF <= 0, DONE!!
     64 035756                          L10077:
        035756  104401                          TRAP    C$ETST
```

```
                                        .SBTTL  TEST 50 RPLA STATIC TEST
                                        ;%      TEST 50 RPLA STATIC TEST
                                        ;%      : SET UP FOR A SECTOR MATCH IN RPLA
                                        ;%      : SET UP A WATCHDOG TIMER
                                        ;%      : REPEAT
                                        ;%      : : IF DESIRED SECTOR DOESN'T MATCH CONTENTS OF RPLA
                                        ;%      : : : THEN
                                        ;%      : : : DECREMENT THE WATCHDOG TIMER
                                        ;%      : : : IF WATCHDOG TIMER = 0
                                        ;%      : : : : THEN
                                        ;%      : : : : OUTPUT ERROR MESSAGE (CAN'T FIND DESIRED SECTOR IN TIME)
                                        ;%      : : : : OUTPUT FAULT LIST:  J8, J11, J12, J13, RHXX, CONTROLLER, CABLES, TERMINA
                                        ;%      : : : : ELSE
                                        ;%      : : : : RE-READ RPLA LOOKING FOR A SECTOR MATCH
                                        ;%      : : : ENDIF
                                        ;%      : : : ELSE
                                        ;%      : : : GET NEXT LEGAL SECTOR ADDRESS
                                        ;%      : : : REFRESH THE WATCHDOG TIMER
                                        ;%      : : ENDIF
                                        ;%      : : UNTIL ALL LEGAL SECTOR ADDRESSES HAVE BEEN USED
                                        ;%      : ENDREPEAT
                                        ;%      END TEST 50

035760                                  T50::
035760  012737  000012  002402                MOV     #10.,ITCOUN     ;LOAD THE OVERALL ITERATION COUNTER
035766  005001                          1$:   CLR     R1              ;R1 IS USED FOR THE SECTOR ADDRESS
035770  012703  000003                        MOV     #3,R3           ;OVERALL ITERATION COUNTER
035774  013737  002532  002456                MOV     RPLA,TESTRG     ;THIS REGISTER MIGHT FAIL
036002  012737  016200  002404                MOV     #BIT7!BIT10!BIT11!BIT12,ERRWD1
036010  012737  000406  002406                MOV     #BIT1!BIT2!BIT8,ERRWD2
036016  004737  016662                        JSR     PC,SEIZE        ;GET THE DRIVE NOW!
036022  012737  177777  002436          2$:   MOV     #-1,TEMP        ;USED FOR A WATCHDOG T.   ?
036030  027701  144476                  3$:   CMP     @RPLA,R1        ;NOW LOOK FOR SECTOR 0
036034  001421                              BEQ     6$              ;MATCH, GO-ON
036036  005337  002436                        DEC     TEMP            ;1.2 LESS MICROSECONDS TO GO
036042  001372                              BNE     3$              ;KEEP GOING IF NOT ZERO
036044  005303                              DEC     R3              ;ONE LESS ITERATION TO GO
036046  003365                              BGT     2$              ;IF NOT ZERO, KEEP GOING
036050  017737  144456  002452          4$:   MOV     @RPLA,RCVED     ;GET THE RECEIVED DATA
036056  010137  002454                  5$:   MOV     R1,EXPTED       ;GET THE EXPECTED DATA
036062  104456                              TRAP    C$ERHRD
036064  000122                              .WORD   82
036066  012454                              .WORD   EM14
036070  014172                              .WORD   ERRO
036072  005037  002402                        CLR     ITCOUN          ;RESET THE ITERATION COUNTER
036076  000454                              BR      14$             ;TAKE EARLY RETURN
036100  012703  002652                  6$:   MOV     #F   ACK,R3     ;GET THE 2 OUT OF 3 BUFFER
036104  062701  000100                        ADD     #100,R1         ;SET UP FOR THE NEXT SECTOR ADDRESS
036110  020127  006200                        CMP     R1,#6200        ;DONE? (SECTOR 50)
036114  001442                              BEQ     13$             ;IF MATCH, YES
036116  012702  000002                        MOV     #2,R2           ;WE MUST HAVE TWO MATCHES
036122  012704  000003                        MOV     #3,R4           ;USE THIS FOR AN OVERALL ITERATION COUNT
036126  012737  177777  002436          7$:   MOV     #-1,TEMP        ;USE THIS AS A WATCHDOG TIMER
036134  005337  002436                  8$:   DEC     TEMP            ;1.2 MICRO SECONDS LESS WINDOW
036140  001404                              BEQ     9$              ;IF ZERO, FIND OUT WHICH ITERATION
036142  027701  144364                        CMP     @RPLA,R1        ;MATCH?
```

```
     55 036146  001372                    BNE     8$              ;IF NOT, KEEP TRYING
     56 036150  001403                    BEQ     10$             ;IF SO, TRY AGAIN
     57 036152  005304              9$:   DEC     R4              ;ONE LESS ITERATION TO GO
     58 036154  003364                    BGT     7$              ;IF NOT ZERO, KEEP TRYING
     59 036156  001734                    BEQ     4$              ;IF ZERO, WE HAVE AN ERROR
     60 036160  017723  144346      10$:   MOV     @RPLA,(R3)+     ;GET THE FIRST OF THREE READINGS
     61 036164  017723  144342            MOV     @RPLA,(R3)+     ;GET THE SECOND OF THREE READINGS
     62 036170  017723  144336            MOV     @RPLA,(R3)+     ;GET THE FINAL READING
     63 036174  024301              11$:   CMP     -(R3),R1        ;DO WE MATCH?
     64 036176  001003                    BNE     12$             ;IF NOT, CHECK IT FOR ERRORS
     65 036200  005302                    DEC     R2              ;OK ONCE, TRY AGAIN
     66 036202  003374                    BGT     11$             ;TAKE BRANCH IF NOT 0
     67 036204  000406                    BR      13$             ;TEST OK, SO-FAR
     68 036206  020327  002650      12$:   CMP     R3,#PSTACK-2    ;DID WE RUN OUT OF BUFFER?
     69 036212  101370                    BHI     11$             ;NOT YET
     70 036214  011337  002454            MOV     (R3),EXPTED     ;GET THE EXPECTED DATA FOR THE REPORT
     71 036220  000716                    BR      5$              ;NOW REPORT THE ERROR
     72 036222  005337  002402      13$:   DEC     ITCOUN          ;ONE LESS ITERATION.....
     73 036226  003257                    BGT     1$              ;IF <= 0, DONE!!
     74 036230                      14$:
        036230                      L10100:
        036230  104401                    TRAP    C$ETST
```

```
                                        .SBTTL  TEST 51 RPMR1 - RPER2 WRAP AROUND TEST
                                        ;
                                        ;%      TEST 51 RPMR1 - RPER2 WRAP AROUND TEST
                                        ;%      : USING PATTERNS 1-4, ONE AT A TIME,
                                        ;%      : W  TE RPMR1, LOW BYTE WITH TEST PATTERN
                                        ;%      : WR  E RPMR1, HIGH BYTE WITH 'FE'(HEX)
                                        ;%      : ISS  A DIAGNOSTIC COMMAND
                                        ;%      : WAI.  OR THE COMMAND COMPLETION
                                        ;%      : IF R  R2, LOW BYTE ONLY, DOESN'T MATCH THE TEST PATTERN
                                        ;%      : : TH
                                        ;%      : : OU.  T ERROR MESSAGE (REGISTER CONTENTS DON'T MATCH EXPECT DATA)
                                        ;%      : : OUT. JT FAULT LIST:  J7, J8
                                        ;%      : ENDIF
                                        ;%      END TEST 51
                                        ;
036232                                  T51::
036232  012737  000002  002402          MOV     #2.,ITCOUN      ;LOAD THE ITERATION COUNT
036240  012737  000035  002420          MOV     #DIAG,FUNCTN    ;LOAD THE DIAGNOSTIC COMMAND FUNCTION
036246  012737  000300  002404          MOV     #BIT6!BIT7,ERRWD1;LOAD THE CALLOUT LIST
036254  005037  002406                  CLR     ERRWD2          ;NO MODULE FOR THIS MASK
036260  004737  016662                  JSR     PC,SEIZE        ;LOAD THE DRIVE NUMBER
036264  013737  002552  002456          MOV     RPER2,TESTRG    ;THIS REGISTER MAY FAIL
036272  012701  177000          1$:     MOV     #177000,R1      ;SET UP FOR A 0'S WRITE WRAP TO RPER2
036276  104404                          TRAP    C$BSEG
036300  010177  144232                  MOV     R1,@RPMR1       ;LOAD THE MAINTENANCE REGISTER NOW
036304  004737  015146                  JSR     PC,DRIVER       ;ISSUE THE DIAGNOSTIC COMMAND
036310  017746  144236                  MOV     @RPER2,-(SP)    ;GET THE RESULTS
036314  042716  177400                  BIC     #177400,(SP)    ;AND REMOVE THE UNWANTED BITS
036320  120126                          CMPB    R1,(SP)+        ;MATCH?
036322  001415                          BEQ     2$              ;TAKE BRANCH IF SO...
036324  005037  002454                  CLR     EXPTED          ;RESET THE EXPECTED DATA
036330  110137  002454                  MOVB    R1,EXPTED       ;LOAD THE EXPECTED STATUS
036334  016637  177776  002452          MOV     -2(SP),RCVED    ;AND THE FAILING STATUS
036342  104456                          TRAP    C$ERHRD
036344  000123                          .WORD   83
036346  012454                          .WORD   EM14
036350  014172                          .WORD   ERR0
036352  005037  002402                  CLR     ITCOUN          ;NO ITERATIONS NECESSARY
036356  004737  015400          2$:     JSR     PC,DRVCLR       ;PURGE ERRORS
036362                          10000$:
036362  104405                          TRAP    C$ESEG
036364  104404                          TRAP    C$BSEG
036366  012701  177377                  MOV     #177377,R1      ;WRITE AN ALL ONES PATTERN TO RPER2
036372  010177  144140                  MOV     R1,@RPMR1       ;WRITE THE MAINTENANCE REGISTER NOW
036376  004737  015146                  JSR     PC,DRIVER       ;ISSUE THE DIAGNOSTIC COMMAND
036402  017746  144144                  MOV     @RPER2,-(SP)    ;GET THE RESULTS
036406  042716  177400                  BIC     #177400,(SP)    ;STRIP THE HIGH BITS OUT
036412  120126                          CMPB    R1,(SP)+        ;MATCH?
036414  001415                          BEQ     3$              ;IF SO, TAKE BRANCH
036416  005037  002454                  CLR     EXPTED          ;SET UP FOR AN ERROR MESSAGE
036422  110137  002454                  MOVB    R1,EXPTED       ;SET THE EXPECTED DATA
036426  016637  177776  002452          MOV     -2(SP),RCVED    ;SET THE RECEIVED DATA
036434  104456                          TRAP    C$ERHRD
036436  000124                          .WORD   84
036440  012454                          .WORD   EM14
036442  014172                          .WORD   ERR0
036444  005037  002402                  CLR     ITCOUN          ;NO FURTHER ITERATIONS NECESSARY
```

```
    51 036450  004737  015400          3$:     JSR     PC,DRVCLR       ;NO LEFT-OVER ERRORS
    52 036454                          10001$:
       036454  104405                          TRAP    C$ESEG
    53 036456  012701  000001                  MOV     #BIT0,R1        ;LOAD THE NEXT PATTERN NOW
    54 036462  052701  177000          4$:     BIS     #177000,R1      ;AND SET THE DIAGNOSTIC START MASK
    55 036466  104404                          TRAP    C$BSEG
    56 036470  010177  144042                  MOV     R1,@RPMR1       ;LOAD THE WRAP TEST NOW
    57 036474  004737  015146                  JSR     PC,DRIVER       ;ISSUE THE COMMAND NOW!
    58 036500  017746  144046                  MOV     @RPER2,-(SP)    ;GET THE RESULTS
    59 036504  042716  177400                  BIC     #177400,(SP)    ;STRIP UNWANTED DATA
    60 036510  120126                          CMPB    R1,(SP)+        ;MATCH??
    61 036512  001415                          BEQ     5$              ;IF SO, SKIP ERROR MESSAGE
    62 036514  005037  002454                  CLR     EXPTED          ;RESET THE EXPECTED DATA
    63 036520  110137  002454                  MOVB    R1,EXPTED       ;GET THE EXPECTED DATA
    64 036524  016637  177776  002452          MOV     -2(SP),RCVED    ;AND THE FAILED RESULTS
    65 036532  104456                          TRAP    C$ERHRD
       036534  000125                          .WORD   85
       036536  012454                          .WORD   EM14
       036540  014172                          .WORD   ERR0
    66 036542  005037  002402                  CLR     ITCOUN          ;NO ITERATIONS NECESSARY
    67 036546  004737  015400          5$:     JSR     PC,DRVCLR       ;NO ERRORS!
    68 036552                          10002$:
       036552  104405                          TRAP    C$ESEG
    69 036554  042701  177200                  BIC     #177200,R1      ;DONE?
    70 036560  001402                          BEQ     6$              ;IF ZERO, YES!!!
    71 036562  006301                          ASL     R1              ;NEXT BIT POSTIION, NOW!
    72 036564  000736                          BR      4$              ;KEEP GOING!
    73 036566  012701  000376          6$:     MOV     #376,R1         ;LAST PATTERN
    74 036572  052701  177000          7$:     BIS     #177000,R1      ;LOAD THE DIAGNOSTIC START AGAIN
    75 036576  104404                          TRAP    C$BSEG
    76 036600  010177  143732                  MOV     R1,@RPMR1       ;LOAD THE WRAP DATA NOW
    77 036604  004737  015146                  JSR     PC,DRIVER       ;EXECUTE THE DIAGNOSTIC COMMAND NOW
    78 036610  017746  143736                  MOV     @RPER2,-(SP)    ;GET THE RESULTS
    79 036614  042716  177400                  BIC     #177400,(SP)    ;STRIP UNWANTED DATA
    80 036620  120126                          CMPB    R1,(SP)+        ;MATCH??
    81 036622  001415                          BEQ     8$              ;IF SO, SKIP ERROR REPORT
    82 036624  005037  002454                  CLR     EXPTED          ;RESET THE EXPECTED DATA
    83 036630  110137  002454                  MOVB    R1,EXPTED       ;LOG THE GOOD DATA
    84 036634  016637  177776  002452          MOV     -2(SP),RCVED    ;LOG THE BAD DATA
    85 036642  104456                          TRAP    C$ERHRD
       036644  000126                          .WORD   86
       036646  012454                          .WORD   EM14
       036650  014172                          .WORD   ERR0
    86 036652  005037  002402                  CLR     ITCOUN          ;RESET THE ITERATIONS COUNTER
    87 036656  004737  015400          8$:     JSR     PC,DRVCLR       ;RESET ANY ERRORS
    88 036662                          10003$:
       036662  104405                          TRAP    C$ESEG
    89 036664  042701  177400                  BIC     #177400,R1      ;REMOVE THE MASK
    90 036670  000261                          SEC                     ;CARRY = 1
    91 036672  006101                          ROL     R1              ;SHIFT LEFT (ONE TIME!!)
    92 036674  042701  177400                  BIC     #177400,R1      ;CLEAR THE UNUSED BITS FOR THE FINAL TEST
    93 036700  022701  000377                  CMP     #377,R1         ;DONE??
    94 036704  001332                          BNE     7$              ;IF NOT, KEEP GOING
    95 036706  005337  002402                  DEC     ITCOUN          ;ONE LESS ITERATION TO-GO
    96 036712  003402                          BLE     9$              ;IF <= 0, DONE
    97 036714  000137  036272                  JMP     1$              ;DO UNTIL = 0
    98 036720  004737  015400          9$:     JSR     PC,DRVCLR       ;ELIMINATE ANY ERRORS!!
```

```
     99 036724  004737  015312                  JSR     PC,DIAGEN       ;SHUT THE DIAGNOSTIC MONITOR OFF.
    100 036730                          L10101:
         036730  104401                          TRAP    C$ETST
```

```
                                .SBTTL  TEST 52 ERROR LOG DUMP
                                ;%      TEST 52 ERROR LOG DUMP
                                ;%      : THIS TEST DOES NO DATA CHECKING
                                ;%      : LOAD #17(HEX) INTO RPMR1, HIGH BYTE
                                ;%      : LOAD LOW BYTE OF RPMR1 WITH RAM LOCATION TO BE DUMPED:
                                ;%      : 71-72(HEX) FOR REVISION LEVEL
                                ;%      : 32-37(HEX) FOR THE ERROR LOG
                                ;%      : 88(HEX) FOR FAILED RECAL ATTEMPTS
                                ;%      : 38-4A(HEX) FOR LAST 20. UNIQUE ERROR LOG ENTRIES
                                ;%      : REPEAT
                                ;%      : : LOAD A DIAGNOSTIC COMMAND
                                ;%      : : WHEN COMMAND EXECUTION COMPLETES GET CONTENTS OF RPER2
                                ;%      : : CONVERT TO HEX OR DECIMAL (AS REQUIRED)
                                ;%      : : PRINT OUTPUT TO USER
                                ;%      : : UNTIL ALL CONTENTS HAVE BEEN DUMPED
                                ;%      : ENDREPEAT
                                ;%      END TEST 52

036732                          T52::
036732  005737  002334                  TST     ERRDMP          ;DUMP THE ERROR LOG?
036736  003002                          BGT     1$              ;IF >0, YES
036740  104432                          TRAP    C$EXIT
036742  000736                          .WORD   L10102-.
036744  004737  016662          1$:     JSR     PC,SEIZE        ;LOAD THE DRIVE NUMBER
036750  012702  002652                  MOV     #PSTACK,R2      ;GET THE OUTPUT BUFFER
036754  012737  000035  002420          MOV     #DIAG,FUNCTN    ;SET UP FOR A DIAGNOSTIC COMMAND
036762  012701  000161                  MOV     #161,R1         ;THIS IS THE FIRST LOW BYTE PARAMETER (71 HEX)
036766  012704  000027                  MOV     #27,R4          ;THIS IS THE DUMP ROUTINE NUMBER (17 HEX)
036772  000304                          SWAB    R4              ;PUT THIS AS THE COMMAND NUMBER
036774  004737  015260                  JSR     PC,DIAGST       ;START THE DIAGNOSTIC MONITOR
037000  050104                  2$:     BIS     R1,R4           ;LOAD THE RAM ADDRESS
037002  004737  015400                  JSR     PC,DRVCLR       ;NO ERRORS INITIALLY
037006  004737  015352                  JSR     PC,DIAGLD       ;ISSUE THE COMMAND
037012  017712  143534                  MOV     @RPER2,(R2)     ;GET THE RESULTS (8080/2901 REV'S)
037016  042722  177400                  BIC     #177400,(R2)+   ;STRIP OUT UNWANTED DATA
037022  040104                          BIC     R1,R4           ;REMOVE THE LOW BYTE ARGUMENT
037024  020127  000162                  CMP     R1,#162         ;DONE BOTH LOCATIONS? (72 HEX)
037030  001402                          BEQ     3$              ;IF MATCH, YES
037032  005201                          INC     R1              ;SET THE 2901 REV LEVEL REQUEST
037034  000761                          BR      2$              ;AND GO TO THE RAM AND GET IT
037036                          3$:                             ;PRINT 8080 AND 2901 REVISION LEVELS
037036  013746  002654                  MOV     PSTACK+2,-(SP)
037042  013746  002652                  MOV     PSTACK,-(SP)
037046  012746  010202                  MOV     #FRMT20,-(SP)
037052  012746  000003                  MOV     #3,-(SP)
037056  010600                          MOV     SP,R0
037060  104417                          TRAP    C$PNTF
037062  062706  000010                  ADD     #10,SP
037066  012701  000061                  MOV     #61,R1          ;SET UP FOR THE NEXT RAM DUMP (31 HEX)
037072  004737  015400                  JSR     PC,DRVCLR       ;NO ERRORS NOW!
037076  004737  017252                  JSR     PC,NEXLOC       ;NOW GET THE DATA
037102  017746  143444                  MOV     @RPER2,-(SP)    ;GET THE RAM OUTPUT
037106  042726  177400                  BIC     #177400,(SP)+   ;STRIP UNUSED DATA
                                                                ;PRINT NUMBER OF SEEKS TOO LONG
037112  016646  177776                  MOV     -2(SP),-(SP)
037116  012746  007574                  MOV     #FRMT07,-(SP)
```

```
        037122  012746  000002          MOV     #2,-(SP)
        037126  010600                  MOV     SP,R0
        037130  104417                  TRAP    C$PNTF
        037132  062706  000006          ADD     #6,SP
    53  037136  004737  015400          JSR     PC,DRVCLR       ;NO RESIDUAL ERRORS
    54  037142  004737  017252          JSR     PC,NEXLOC       ;GET THE NEXT RAM CONTENTS
    55  037146  017746  143400          MOV     @RPER2,-(SP)    ;GET THE RESULTS
    56  037152  042726  177400          BIC     #177400,(SP)+   ;STRIP UNWANTED DATA
    57                                                          ;PRINT NUMBER OF SEEK OVER SHOOTS
    58  037156  016646  177776          MOV     -2(SP),-(SP)
        037162  012746  007624          MOV     #FRMT10,-(SP)
        037166  012746  000002          MOV     #2,-(SP)
        037172  010600                  MOV     SP,R0
        037174  104417                  TRAP    C$PNTF
        037176  062706  000006          ADD     #6,SP
    59  037202  004737  015400          JSR     PC,DRVCLR       ;NO ERRORS
    60  037206  004737  017252          JSR     PC,NEXLOC       ;NEXT CONTENTS, PLEASE..
    61  037212  017746  143334          MOV     @RPER2,-(SP)    ;GET THE RESULTS
    62  037216  042726  177400          BIC     #177400,(SP)+   ;STRIP UNUSED DATA
    63                                                          ;PRINT NUMBER OF SOFT SEEK OVERSHOOTS
    64  037222  016646  177776          MOV     -2(SP),-(SP)
        037226  012746  007655          MOV     #FRMT11,-(SP)
        037232  012746  000002          MOV     #2,-(SP)
        037236  010600                  MOV     SP,R0
        037240  104417                  TRAP    C$PNTF
        037242  062706  000006          ADD     #6,SP
    65  037246  004737  015400          JSR     PC,DRVCLR       ;NO FURTHER ERRORS
    66  037252  004737  017252          JSR     PC,NEXLOC       ;GET THE NEXT CONTENTS PLEASE..
    67  037256  017746  143270          MOV     @RPER2,-(SP)    ;GET THE RESULTS
    68  037262  042726  177400          BIC     #177400,(SP)+   ;STRIP THE UNUSED DATA
    69                                                          ;PRINT GUARD-BAND DETECTED SKI'S
    70  037266  016646  177776          MOV     -2(SP),-(SP)
        037272  012746  007713          MOV     #FRMT12,-(SP)
        037276  012746  000002          MOV     #2,-(SP)
        037302  010600                  MOV     SP,R0
        037304  104417                  TRAP    C$PNTF
        037306  062706  000006          ADD     #6,SP
    71  037312  004737  015400          JSR     PC,DRVCLR       ;NO FURTHER ERRORS
    72  037316  004737  017252          JSR     PC,NEXLOC       ;NEXT RAM LOCATION...
    73  037322  017746  143224          MOV     @RPER2,-(SP)    ;GET THE RESULTS
    74  037326  042726  177400          BIC     #177400,(SP)+   ;STRIP THE UNUSED DATA
    75                                                          ;PRINT NUMBER OF INDEX ERRORS
    76  037332  016646  177776          MOV     -2(SP),-(SP)
        037336  012746  007756          MOV     #FRMT13,-(SP)
        037342  012746  000002          MOV     #2,-(SP)
        037346  010600                  MOV     SP,R0
        037350  104417                  TRAP    C$PNTF
        037352  062706  000006          ADD     #6,SP
    77  037356  004737  015400          JSR     PC,DRVCLR       ;NO FURTHER ERRORS
    78  037362  004737  017252          JSR     PC,NEXLOC       ;NEXT RAM LOCATION
    79  037366  017746  143160          MOV     @RPER2,-(SP)    ;GET THE RESULTS
    80  037372  042726  177400          BIC     #177400,(SP)+   ;STRIP THE "WHO CARES" BITS
    81                                                          ;PRINT NUMBER OF PLO UNSAFES
    82  037376  016646  177776          MOV     -2(SP),-(SP)
        037402  012746  010004          MOV     #FRMT14,-(SP)
        037406  012746  000002          MOV     #2,-(SP)
        037412  010600                  MOV     SP,R0
```

```
            037414  104417                          TRAP    C$PNTF
            037416  062706  000006                  ADD     #6,SP
     83     037422  012701  000210                  MOV     #210,R1         ;GET THE SET-UP FOR THE #OF RECAL ATTEMPTS(88 HEX)
     84     037426  004737  015400                  JSR     PC,DRVCLR       ;NO FURTHER ERRORS
     85     037432  004737  017252                  JSR     PC,NEXLOC       ;GET THE DATA NOW
     86     037436  017746  143110                  MOV     @RPER2,-(SP)    ;GET THE RESULTS
     87     037442  042726  177400                  BIC     #177400,(SP)+   ;STRIP THE UNWANTED DATA
     88                                                                     ;PRINT THE NUMBER OF RECAL ATTEMPTS
     89     037446  016646  177776                  MOV     -2(SP),-(SP)
            037452  012746  010031                  MOV     #FRMT15,-(SP)
            037456  012746  000002                  MOV     #2,-(SP)
            037462  010600                          MOV     SP,R0
            037464  104417                          TRAP    C$PNTF
            037466  062706  000006                  ADD     #6,SP
     90                                                                     ;PRINT ERROR LOG ENTRIES, IF ANY
     91     037472  012746  010070                  MOV     #FRMT16,-(SP)
            037476  012746  000001                  MOV     #1,-(SP)
            037502  010600                          MOV     SP,R0
            037504  104417                          TRAP    C$PNTF
            037506  062706  000004                  ADD     #4,SP
     92     037512  012702  000004                  MOV     #4,R2           ;GET A 4 ITERATION COUNT
     93     037516  012701  000067                  MOV     #67,R1          ;GET THE FIRST RAM LOCATION-1 FOR THE LAST 20 ERRORS
     94     037522  012703  000005          4$:     MOV     #5,R3           ;5 ENTRIES / ROW
     95                                                                     ;CR-LF
     96     037526  012746  006420                  MOV     #CRLF,-(SP)
            037532  012746  000001                  MOV     #1,-(SP)
            037536  010600                          MOV     SP,R0
            037540  104417                          TRAP    C$PNTF
            037542  062706  000004                  ADD     #4,SP
     97     037546  004737  015400          5$:     JSR     PC,DRVCLR       ;NO FURTHER ERRORS
     98     037552  004737  017252                  JSR     PC,NEXLOC       ;GET THE RAM DATA
     99     037556  017746  142770                  MOV     @RPER2,-(SP)    ;GET THE RESULTS
    100     037562  042716  177400                  BIC     #177400,(SP)    ;STRIP THE UNUSED RESULTS
    101     037566  005726                          TST     (SP)+           ;LOOK FOR NULL DATA
    102     037570  001427                          BEQ     6$              ;TAKE BRANCH IF 0
    103     037572  005746                          TST     -(SP)           ;RESTORE THE STACK FOR OCTHEX
    104     037574  004737  015416                  JSR     PC,OCTHEX       ;CONVERT TO HEX
    105                                                                     ;DUMP THE RAM CONTENTS
    106     037600  012746  002660                  MOV     #PSTACK+6,-(SP)
            037604  012746  002656                  MOV     #PSTACK+4,-(SP)
            037610  012746  002654                  MOV     #PSTACK+2,-(SP)
            037614  012746  002652                  MOV     #PSTACK,-(SP)
            037620  012746  010161                  MOV     #FRMT17,-(SP)
            037624  012746  000005                  MOV     #5,-(SP)
            037630  010600                          MOV     SP,R0
            037632  104417                          TRAP    C$PNTF
            037634  062706  000014                  ADD     #14,SP
    107     037640  005303                          DEC     R3              ;ONE LESS ROW TO GO
    108     037642  003341                          BGT     5$              ;KEEP GOING
    109     037644  005302                          DEC     R2              ;ONE LESS COLUMN TO GO
    110     037646  003325                          BGT     4$              ;KEEP GOING
    111     037650                          6$:                             ;CR-LF
    112     037650  012746  006420                  MOV     #CRLF,-(SP)
            037654  012746  000001                  MOV     #1,-(SP)
            037660  010600                          MOV     SP,R0
            037662  104417                          TRAP    C$PNTF
            037664  062706  000004                  ADD     #4,SP
```

```
    113 037670  004737  015400                  JSR     PC,DRVCLR       ;RESET RPER2 TO 0
    114 037674  004737  015312                  JSR     PC,DIAGEN       ;SHUT OFF THE DIAGNOSTIC MONITOR
    115 037700                          L10102:
        037700  104401                          TRAP    C$ETST
```

```
                                .SBTTL  TEST 53 COMPOSITE MICROCODE TEST
                                ;%      TEST 53 COMPOSITE MICROCODE TEST
                                ;%      : THIS TEST RUNS TWO SEQUENCES OF MICRODIAGNOSTICS THROUGH THE
                                ;%      : RP07.  THE FIRST SEQUENCE IS COMPRISED OF ROUTINES 24 - 38
                                ;%      : THE SECOND SEQUENCE IS COMPRISED OF ROUTINES 18 - 23.  IF THE
                                ;%      : LOOP ON ERROR OPTION IS SELECTED, THE ROUTINE WHICH WAS RUNNING
                                ;%      : AT THE TIME OF THE ERROR WILL BE 'FROZEN' SO THAT THE ERROR MAY
                                ;%      : BE ANALYZED FURTHER TO IDENTIFY THE FAILURE MECHANISM.
                                ;%      : TEST ALGORITHM IS AS FOLLOWS:
                                ;%      : TURN ON THE DIAGNOSTIC MONITOR
                                ;%      : LOAD RPMR1 WITH A DIAGNOSTIC NUMBER (AND HEAD NUMBER IF NECESSARY)
                                ;%      : REPEAT
                                ;%      : : ISSUE A DIAGNOSTIC COMMAND
                                ;%      : : IF RPER2 (LOW BYTE) <> 0
                                ;%      : : : THEN
                                ;%      : : : REPORT THE ERROR (IN HEX), AND THE MODULE CALLOUT
                                ;%      : : ENDIF
                                ;%      : : UNTIL ALL ROUTINES HAVE BEEN RUN
                                ;%      : ENDREPEAT
                                ;%      : TURN OFF THE DIAGNOSTIC MONITOR
                                ;%      END TEST 53

 037702                         T53::
 037702  012704  000044                 MOV     #44,R4          ;SET UP THE FIRST ROUTINE NUMBER
 037706  004737  016662                 JSR     PC,SEIZE        ;LOAD THE DRIVE NUMBER
 037712  004737  015260                 JSR     PC,DIAGST       ;AND THEN THE "HANDSHAKE"
 037716  005002                         CLR     R2              ;R2 USED FOR THE TRACK ADDRESS
 037720  000304                 1$:     SWAB    R4              ;R4 HIGH BYTE USED FOR THE ROUTINE #
 037722                         2$:
 037722  104404                         TRAP    C$BSEG
 037724  004737  015352                 JSR     PC,DIAGLD       ;NOW EXECUTE THE ROUTINE NUMBER
 037730  017746  142616                 MOV     @RPER2,-(SP)    ;GET THE RESULTS OF THE TEST
 037734  042726  177400                 BIC     #177400,(SP)+   ;STRIP JUNK
 037740  001414                         BEQ     3$              ;IF 0, YES!!
 037742  104456                         TRAP    C$ERHRD
 037744  000620                         .WORD   400
 037746  013564                         .WORD   EM35
 037750  014310                         .WORD   ERR1
 037752  012737  040011  002420         MOV     #TRE!DRCLR,FUNCTN       ;LOAD THE DRIVE CLEAR AND CONTROLLER CLEAR COMMAND
 037760  004737  015146                 JSR     PC,DRIVER       ;NOW EXECUTE THE DRIVE CLEAR COMMAND
 037764  052777  100000  142544         BIS     #DMD,@RPMR1     ;SET THE DIAGNOSTIC MODE BIT AGAIN
 037772                         3$:
 037772                         10000$:
 037772  104405                         TRAP    C$ESEG
 037774  000304                         SWAB    R4              ;RESTORE R4
 037776  005204                         INC     R4              ;GET NEXT ROUTINE #
 040000  120427  000037                 CMPB    R4,#37          ;IS THIS A READ/WRITE ROUTINE?
 040004  103745                         BLO     1$              ;VALID ROUTINE, KEEP GOING
 040006  120427  000043                 CMPB    R4,#43          ;READ-WRITE ROUTINE?
 040012  101035                         BHI     5$              ;IF HIGHER, NO
 040014  000304                         SWAB    R4              ;ROUTINE # IN HIGH BYTE
 040016  005737  002336                 TST     SELTRK          ;USER SPECIFIED TRACK ADDRESS??
 040022  001411                         BEQ     4$              ;IF ZERO, NO-DO THEM ALL!!
 040024  010446                         MOV     R4,-(SP)        ;GET R4 ON THE STACK FOR SOME CHECKING
 040026  042716  000377                 BIC     #377,(SP)       ;STRIP THE TRACK ADDRESS
 040032  022627  021400                 CMP     (SP)+,#21400    ;WAS THIS THE LAST ROUTINE?
```

```
     52 040036  001431                          BEQ     6$              ;IF =, YES IT WAS!!
     53 040040  053704  002340                   BIS     TRAKAD,R4       ;SET THE USER SPECIFIED TRACK ADDRESS
     54 040044  000726                          BR      2$              ;AND GO-ON
     55 040046  162704  000400          4$:     SUB     #400,R4         ;GET THE LAST ROUTINE # (WE MAY NOT BE DONE)
     56 040052  040204                          BIC     R2,R4           ;RESET THE TRACK ADDRESS
     57 040054  005202                          INC     R2              ;NEXT TRACK ADDRESS, PLEASE
     58 040056  050204                          BIS     R2,R4           ;LOAD THE NEW TRACK ADDRESS
     59 040060  020227  000037                  CMP     R2,#31.         ;WAS IT LEGAL?
     60 040064  101716                          BLOS    2$              ;YES IT WAS, GO-ON
     61 040066  105004                          CLRB    R4              ;RESET TO TRACK 0
     62 040070  005002                          CLR     R2              ;AND RESET THE TRACK TO 0
     63 040072  062704  000400                  ADD     #400,R4         ;GET NEXT ROUTINE #
     64 040076  020427  021400                  CMP     R4,#21400       ;IS THIS ROUTINE #43 (HIGH BYTE INFO)?
     65 040102  103707                          BLO     2$              ;IF LESS, NO
     66 040104  000406                          BR      6$              ;DONE, TURN OFF THE MONITOR
     67 040106  120427  000073          5$:     CMPB    R4,#73          ;END ROUTINE?
     68 040112  101702                          BLOS    1$              ;NOT YET, IF LOWER
     69 040114  012704  000030                  MOV     #30,R4          ;LOAD THE NEXT SEQUENCE OF ROUTINES
     70 040120  000677                          BR      1$              ;AND KEEP GOING
     71 040122  004737  015312          6$:     JSR     PC,DIAGEN       ;ALL DONE, SHUT-OFF THE DIAGNOSTIC MONITOR
     72 040126                          L10103:
        040126  104401                          TRAP    C$ETST
```

```
                                        .SBTTL  TEST 54 READ-IN-PRESET FUNCTIONAL TEST
                                        ;
                                        ;%      TEST 54 READ-IN-PRESET FUNCTIONAL TEST
                                        ;%      :  WRITE RPDA WITH DATA PATTERN #3
                                        ;%      :  WRITE RPDC WITH DATA PATTERN #3
                                        ;%      :  SET RPOF:  FMT = 1
                                        ;%      :  ISSUE A READ-IN-PRESET COMMAND
                                        ;%      :  :  IF ((RPDA) OR (RPDC) OR (RPOF:  FMT) <> 0
                                        ;%      :  :  THEN
                                        ;%      :  :  OUTPUT ERROR MESSAGE (RIP COMMAND FAILED TO EXECUTE PROPERLY)
                                        ;%      :  :  OUTPUT FAULT LIST:  J12
                                        ;%      :  ENDIF
                                        ;%      END TEST 54
                                        ;
040130                                  T54::
040130  012737  000012  002402                  MOV     #10.,ITCOUN     ;LOAD THE ITERATION COUNT
040136  032777  010000  142360                  BIT     #MOL,@RPDS      ;DRIVE ON-LINE?
040144  001016                                  BNE     1$              ;IF = 1, YES
040146  004737  017326                          JSR     PC,SAVRPR       ;GET THE REGISTER IMAGE
040152  013746  002114                          MOV     L$TEST,-(SP)
040156  012746  006452                          MOV     #MSGMOL,-(SP)
040162  012746  000002                          MOV     #2,-(SP)
040166  010600                                  MOV     SP,R0
040170  104417                                  TRAP    C$PNTF
040172  062706  000006                          ADD     #6,SP
040176  104432                                  TRAP    C$EXIT
040200  000162                                  .WORD   L10104-.
040202                                  1$:
040202  104404                                  TRAP    C$BSEG
040204  004737  016662                          JSR     PC,SEIZE        ;GET THE DRIVE UNDER TEST
040210  013777  002350  142302                  MOV     PATT3,@RPDA     ;WRITE PRDA = -1
040216  013777  002350  142322                  MOV     PATT3,@RPDC     ;WRITE RPDC = -1
040224  052777  010000  142312                  BIS     #FMT,@RPOF      ;FMT 16 = 1
040232  012777  000021  142252                  MOV     #RIP,@RPCS1     ;ISSUE THE READ-IN-PRESET COMMAND
040240  005777  142254                          TST     @RPDA           ;DID RPDA CLEAR?
040244  001405                                  BEQ     2$              ;IF 0, YES!
040246  004737  017422                          JSR     PC,BICEXP       ;FORM THE FAILING DATA
040252  002520                                  RPDA                    ;THIS REGISTER
040254  177777                                  177777                  ;THESE BITS FAILED TO CLEAR
040256  000420                                  BR      4$              ;GO-ON
040260  005777  142262          2$:             TST     @RPDC           ;DID RPDC CLEAR?
040264  001405                                  BEQ     3$              ;IF = 0, YES!
040266  004737  017422                          JSR     PC,BICEXP       ;FORM THE FAILING DATA
040272  002546                                  RPDC                    ;THIS REGISTER
040274  177777                                  177777                  ;THESE BITS FAILED TO CLEAR
040276  000410                                  BR      4$              ;NOW REPORT THE ERROR
040300  032777  010000  142236  3$:             BIT     #FMT,@RPOF      ;DID FMT16 CLEAR
040306  001417                                  BEQ     5$              ;IF 0, YES
040310  004737  017422                          JSR     PC,BICEXP       ;FORM THE FAILING DATA FOR THIS FAILURE
040314  002544                                  RPOF                    ;THIS REGISTER
040316  010000                                  FMT                     ;THIS BIT FAILEDS TO CLEAR
040320  012737  004000  002404  4$:             MOV     #BIT11,ERRWD1   ;FORM MODULE CALL-OUT
040326  005037  002406                          CLR     ERRWD2          ;BOTH WORDS
040332  104456                                  TRAP    C$ERHRD
040334  000127                                  .WORD   87
040336  013326                                  .WORD   EM30
040340  014172                                  .WORD   ERR0
```

```
     51 040342  005037  002402                CLR     ITCOUN          ;NO ITERATIONS NOW!!
     52 040346                          5$:
        040346                          10000$:
        040346  104405                 TRAP    C$ESEG
     53 040350  005337  002402                DEC     ITCOUN          ;ONE LESS ITERATION
     54 040354  003312                       BGT     1$              ;IF <= 0, DONE!!
     55 040356  004737  017722                JSR     PC,PRELOD       ;PUT DRIVE BACK IN 16 BIT MODE
     56 040362                          L10104:
        040362  104401                 TRAP    C$ETST
```

```
                                        .SBTTL  TEST 55 COMMAND REJECT TEST
                                        ;
                                        ;%      TEST 55 COMMAND REJECT TEST
                                        ;%      :  SET RPCS2:  PAT = 1
                                        ;%      :  WRITE RPDA WITH DATA PATTERN #3, ONCE
                                        ;%      :  WRITE RPAS WITH DATA PATTERN #3, ONCE
                                        ;%      :  ISSUE A READ-IN-PRESET COMMAND
                                        ;%      :  IF ((RPDS:  ATA <> 1) OR (RPDA <> DATA PATTERN #3))
                                        ;%      :  :  THEN
                                        ;%      :  :  OUTPUT ERROR MESSAGE (COMMAND EXECUTED WITH ERRORS PRESENT)
                                        ;%      :  :  OUTPUT FAULT LIST:  J12
                                        ;%      :  ENDIF
                                        ;%      END TEST 55
                                        ;
040364                                  T55::
040364  012737  000012  002402                  MOV     #10.,ITCOUN     ;LOAD THE ITERATION COUNT
040372  032777  010000  142124                  BIT     #MOL,@RPDS      ;DRIVE ON-LINE?
040400  001016                                  BNE     1$              ;IF = 1, YES
040402  004737  017326                          JSR     PC,SAVRPR       ;GET THE REGISTER SNAPSHOT
040406  013746  002114                          MOV     L$TEST,-(SP)
040412  012746  006452                          MOV     #MSGMOL,-(SP)
040416  012746  000002                          MOV     #2,-(SP)
040422  010600                                  MOV     SP,R0
040424  104417                                  TRAP    C$PNTF
040426  062706  000006                          ADD     #6,SP
040432  104432                                  TRAP    C$EXIT
040434  000166                                  .WORD   L10105-.
040436                                  1$:
040436  104404                                  TRAP    C$BSEG
040440  004737  016662                          JSR     PC,SEIZE        ;GET THE DRIVE UNDER TEST
040444  052777  000020  142050                  BIS     #PAT,@RPCS2     ;INVERT PARITY (FORCE ERRORS)
040452  013777  002350  142040                  MOV     PATT3,@RPDA     ;WRITE RPDA = - 1
040460  013777  002350  142042                  MOV     PATT3,@RPAS     ;WRITE RPAS = - 1
040466  004737  017000                          JSR     PC,WAIT         ;NOW WAIT FOR THE 8080 TO DETECT THE PARITY ERROR
040472  012777  000021  142012                  MOV     #RIP,@RPCS1     ;ISSUE A READ-IN-PRESET
040500  023777  002350  142012                  CMP     PATT3,@RPDA     ;MATCH??
040506  001412                                  BEQ     2$              ;IF OK, (MATCH) GO-ON
040510  013737  002350  002454                  MOV     PATT3,EXPTED    ;FORM THE EXPECTED DATA
040516  013737  002520  002456                  MOV     RPDA,TESTRG     ;GET THE FAILING REGISTER
040524  017737  141770  002452                  MOV     @RPDA,RCVED     ;NOW THE FAILING RESULTS
040532  000412                                  BR      3$              ;NOW REPORT IT!
040534  004737  017000                  2$:     JSR     PC,WAIT         ;STALL FOR RP07 MICROPROCESSOR DELAY
040540  032777  100000  141756                  BIT     #ATA,@RPDS      ;DID ATA CLEAR
040546  001017                                  BNE     4$              ;IF SET, NO - IT'S OK
040550  004737  017372                          JSR     PC,BISEXP       ;FORM ERROR DATA
040554  002524                                  RPDS                    ;THIS REGISTER
040556  100000                                  ATA                     ;THIS BIT FAILED TO SET
040560  012737  004000  002404          3$:     MOV     #BIT11,ERRWD1   ;FORM MODULE CALL-OUT
040566  005037  002406                          CLR     ERRWD2          ;BOTH WORDS
040572  104456                                  TRAP    C$ERHRD
040574  000130                                  .WORD   88
040576  013326                                  .WORD   EM30
040600  014172                                  .WORD   ERR0
040602  005037  002402                          CLR     ITCOUN          ;NO ITERATIONS NEEDED
040606                                  4$:
040606                                  10000$:
040606  104405                                  TRAP    C$ESEG
```

```
     49 040610  005337  002402                DEC     ITCO'N          ;ONE LESS ITERATION TO-GO
     50 040614  003310                        BGT     '$              ;IF <= 0, DONE
     51 040616  004737  017722                JSR     PC,PRELOD       ;16/BIT MODE
     52 040622                          L10105:
        040622  104401                        TRAP    C$ETST
```

```
                                .SBTTL  TEST 56: DATA TEST #1
                                
                                ;%      TEST  DATA TEST #1 FIRST DATA TEST OF THE MASSBUS DATA LINES
                                ;%      :  SET UP A (TOGGLE) BIT MAP FOR ALL EXPECTED BITS (BITS 0 TO 15)
                                ;%      :  SET UP FOR A RETRY OF 20128 ITERATIONS (629 * 32)
                                ;%      :  SET RPDC = 0
                                ;%      :  SET RPDA = 255(.)
                                ;%      :  REPEAT
                                ;%      :  :  SET RPOF:  CMOD = 1
                                ;%      :  :  ISSUE A READ TRACK DESCRIPTOR COMMAND
                                ;%      :  :  IF (RPCS1:  TRE) OR (RPDS:  ERR) = 1
                                ;%      :  :  :  THEN
                                ;%      :  :  :  SET RPCS2:  CLR = 1
                                ;%      :  :  :  INCREMENT THE RETRY COUNTER
                                ;%      :  :  :  RELOAD THE DRIVE NUMBER
                                ;%      :  :  :  IF RPDA < LAST TRACK ADDRESS (32-RP07)
                                ;%      :  :  :  :  THEN INCREMENT RPDA (HIGH BYTE ONLY)
                                ;%      :  :  :  :  ELSE CLEAR RPDA (HIGH BYTE)
                                ;%      :  :  :  :  INCREMENT RPDC
                                ;%      :  :  :  ENDIF
                                ;%      :  :  :  ELSE
                                ;%      :  :  :  STORE TD WORD #1 AND WORD #2
                                ;%      :  :  :  MARK OFF BITS WHICH JUST TOGGLED FROM OFF TO ON, IN BIT MAP
                                ;%      :  :  :  INCREMENT RPDA (HIGH BYTE ONLY)
                                ;%      :  :  :  IF RPDA (HIGH BYTE) > LAST TRACK ADDRESS (32-RP07)
                                ;%      :  :  :  :  THEN
                                ;%      :  :  :  :  SET RPDA (HIGH BYTE) = 0
                                ;%      :  :  :  :  INCREMENT RPDC
                                ;%      :  :  :  :  ELSE
                                ;%      :  :  :  INCREMENT RPDA (HIGH BYTE ONLY)
                                ;%      :  :  :  ENDIF
                                ;%      :  :  ENDIF
                                ;%      :  :  UNTIL (BIT MAP-ALL BITS UNDER TEST HAVE TOGGLED) OR (RETRY MAX EXCEEDED)
                                ;%      :  ENDREPEAT
                                ;%      :  IF BIT MAP DIDN'T COMPLETELY TOGGLE, AND RETRY COUNT > MAXIMUM (20128)
                                ;%      :  :  THEN
                                ;%      :  :  OUTPUT ERROR MESSAGE (DATA LINES STUCK OR OPEN)
                                ;%      :  :  OUTPUT FAULT LIST:  J11 / J13, CABLES, RHXX, J10, TERMINATOR
                                ;%      :  ENDIF
                                ;%      END TEST
                                
 040624                         T56::
 040624  004737  016662         
                                        JSR     PC,SEIZE        ;GET THE DRIVE UNDER TEST
 040630  032777  010000  141666         BIT     #MOL,@RPDS      ;IS THE DRIVE REALLY ON-LINE?
 040636  001016                        BNE     1$              ;IF SET, IT IS ON-LINE
 040640  004737  017326                JSR     PC,SAVRPR       ;GET THE REGISTER SNAPSHOT
 040644  013746  002114                MOV     L$TEST,-(SP)
 040650  012746  006452                MOV     #MSGMOL,-(SP)
 040654  012746  000002                MOV     #2,-(SP)
 040660  010600                        MOV     SP,R0
 040662  104417                        TRAP    C$PNTF
 040664  062706  000006                ADD     #6,SP
 040670  104432                        TRAP    C$EXIT
 040672  000262                        .WORD   L10106-.
 040674  012737  000012  002402 1$:    MOV     #10.,ITCOUN     ;LOAD THE ITERATION COUNT
 040702  012737  177777  002454        MOV     #-1,EXPTED      ;SET UP FOR THE EXPECTED RESULTS
 040710                         2$:
```

```
                040710  104404                          TRAP    C$BSEG
    55 040712   040712  005037  002432                  CLR     CSTORE          ;CLEAR THE BITS RECEIVED COUNTER
    56 040716   040716  005037  002452                  CLR     RCVED           ;CLEAR THE RECEIVER OF THE DATA
    57 040722   040722  005037  002416                  CLR     DESCYL          ;START AT CYLINDER 0
    58 040726   040726  012737  000377  002414          MOV     #377,DESTRK     ;AND TRACK 0
    59 040734   040734  012701  000006                  MOV     #6,R1           ;GET AN ITERATION COUNT
    60 040740   040740  012702  002652                  MOV     #PSTACK,R2      ;GET THE BUFFER ADDRESS
    61 040744   040744  005022                  3$:     CLR     (R2)+           ;INITIALIZE THE BUFFER
    62 040746   040746  005301                          DEC     R1              ;ONE LESS ITERATION TO-GO
    63 040750   040750  003375                          BGT     3$              ;IF NOT ZERO, KEEP GOING
    64 040752   040752  052777  100000  141564  4$:     BIS     #CMOD,@RPOF     ;SET COMMAND MODIFIER
    65 040760   040760  012737  000075  002420          MOV     #RTD,FUNCTN     ;SET COMMAND = READ TRACK DESCRIPTOR
    66 040766   040766  012737  002652  002366          MOV     #PSTACK,TABADD  ;LOAD BUFFER LINK
    67 040774   040774  012737  000006  002412          MOV     #6,NEGWRD       ;SET WORD COUNT
    68 041002   041002  004737  015146                  JSR     PC,DRIVER       ;DO THE OPERATION NOW!
    69 041006   041006  005237  002432                  INC     CSTORE          ;SHOW THIS ITERATION IN THE COUNTER
    70 041012   041012  032777  040000  141504          BIT     #ERR,@RPDS      ;DID WE GET AN ERROR?
    71 041020   041020  001004                          BNE     5$              ;IF SET, YES
    72 041022   041022  032777  040000  141462          BIT     #TRE,@RPCS1     ;DID WE GET A TRANSFER ERROR?
    73 041030   041030  001403                          BEQ     6$              ;NO, THE TRANSFER WAS OK!
    74 041032   041032  004737  016662          5$:     JSR     PC,SEIZE        ;GET RID OF ERRORS NOW
    75 041036   041036  000414                          BR      8$
    76 041040   041040  012701  000006          6$:     MOV     #6,R1           ;GET THE ITERATION COUNT
    77 041044   041044  012702  002652                  MOV     #PSTACK,R2      ;AND THE BUFFER ADDRESS
    78 041050   041050  052237  002452          7$:     BIS     (R2)+,RCVED     ;LOG THE BIT(S) TRANSITION(S)
    79 041054   041054  005301                          DEC     R1              ;REDUCE THE ITERATION COUNT
    80 041056   041056  003374                          BGT     7$              ;IF > 0, KEEP GOING!
    81 041060   041060  023737  002452  002454          CMP     RCVED,EXPTED    ;ALL BITS TOGGLE?
    82 041066   041066  001426                          BEQ     10$             ;IF SAME, YES
    83 041070   041070  023727  002432  047200  8$:     CMP     CSTORE,#<628.*32.> ;DONE ALL CYLINDERS?
    84 041076   041076  103003                          BHIS    9$              ;YES, THERE IS AN ERROR
    85 041100   041100  004737  017266                  JSR     PC,SPIRAL       ;UPDATE THE DRIVER
    86 041104   041104  000722                          BR      4$              ;AND GO-ON!
    87 041106   041106  013737  002534  002456  9$:     MOV     RPDB,TESTRG     ;LOAD FAILING 'REGISTER''
    88 041114   041114  012737  013000  002404          MOV     #BIT9!BIT10!BIT12,ERRWD1 ;CREATE MODULE CALL-OUT
    89 041122   041122  012737  000406  002406          MOV     #BIT1!BIT2!BIT8,ERRWD2 ;BOTH WORDS
    90 041130   041130  104456                          TRAP    C$ERHRD
       041132   041132  001440                          .WORD   800
       041134   041134  013362                          .WORD   EM31
       041136   041136  014172                          .WORD   ERRO
    91 041140   041140  005037  002402                  CLR     ITCOUN          ;NO FURTHER ITERATIONS NECESSARY
    92 041144                               10$:
       041144                               10000$:
       041144   041144  104405                          TRAP    C$ESEG
    93 041146   041146  005337  002402                  DEC     ITCOUN          ;ONE LESS ITERATION TO GO
    94 041152   041152  003256                          BGT     2$              ;DO UNTIL = 0
    95 041154                               L10106:
       041154   041154  104401                          TRAP    C$ETST
```

```
                                .SBTTL  TEST 57: DATA TEST #2
                                ;
                                ;%      TEST DATA TEST #2 TEST INVALID ADDRESS ERROR, RECALIBRATE & SEEK COMMANDS
                                ;%      :  SET RPDC = FE CYLINDER ADDRESS
                                ;%      :  SET RPDA = 0
                                ;%      :  SET RPOF:  CMD
                                ;%      :  CLEAR RMPM1:  DMD
                                ;%      :  ISSUE SEEK COMMAND
                                ;%      :  IF RPER1:  IAE <> 1
                                ;%      :  :  THEN
                                ;%      :  :  OUTPUT ERROR MESSAGE (FAILED TO DETECT AN INVALID ADDRESS ERROR)
                                ;%      :  :  OUTPUT FAULT LIST:  J09, J10, J08, J07, J12, RHXX, CABLES, TERMINATOR
                                ;%      :  :  ELSE
                                ;%      :  :  SET RPCS2:  CLR = 1
                                ;%      :  :  ISSUE RECALIBRATE COMMAND
                                ;%      :  :  IF ((RPCS1:  TRE) OR (RPDS:  ERR)) = 1
                                ;%      :  :  :  THEN
                                ;%      :  :  :  OUTPUT ERROR MESSAGE (DETECTED ERRORS AFTER ISSUING A RECALIBRATE COMMAND)
                                ;%      :  :  :  OUTPUT FAULT LIST:  J09, J10, J12, CABLES, RHXX, TERMINATOR
                                ;%      :  :  ENDIF
                                ;%      :  :  SET RPOF:  CMD = 1
                                ;%      :  :  SET RPMR1:  DMD = 1
                                ;%      :  :  SET RPDC = FE CYLINDER
                                ;%      :  :  ISSUE A SEEK COMMAND
                                ;%      :  :  IF RPDC <> RPCC AND ((RPDS:  ERR <> 1) OR (RPCS1:  TRE <> 1))
                                ;%      :  :  :  THEN
                                ;%      :  :  :  OUTPUT ERROR MESSAGE (DIDN'T ACCESS FE CYLINDER PROPERLY, DIDN'T DETECT AN
                                ;%      :  :  :  OUTPUT FAULT LIST:  J09, J10, RHXX, CABLES, J12, TERMINATOR
                                ;%      :  :  :  ELSE
                                ;%      :  :  :  IF RPDC <> RPCC AND ((RPDS:  ERR = 1) OR (RPCS1:  TRE = 1))
                                ;%      :  :  :  :  THEN
                                ;%      :  :  :  :  OUTPUT ERROR MESSAGE (DIDN'T ACCESS FE CYLINDER PROPERLY, DID DETECT FRR
                                ;%      :  :  :  :  OUTPUT FAULT LIST:  J09, J10, J08, J07, RHXX, CABLES, J12
                                ;%      :  :  :  ENDIF
                                ;%      :  :  ENDIF
                                ;%      :  ENDIF
                                ;%      END TEST
                                ;
041156                          T57::
041156  013737  002376  002416          MOV     LASCYL,DESCYL   ;FORM THE CE CYLINDER ADDRESS
041164  005237  002416          INC     DESCYL          ;IT IS ONE MORE THAN THE END CYLINDER
041170  005037  002414          CLR     DESTRK          ;START AT TRACK #0
041174  004737  016662          JSR     PC,SEIZE        ;GET THE DRIVE UNDER TEST
041200  032777  010000  141316  BIT     #MOL,@RPDS      ;IS THE DRIVE ON LINE??
041206  001016                  BNE     1$              ;IF 1, IT IS
041210  004737  017326          JSR     PC,SAVRPR       ;GET THE REGISTER SNAPSHOT
041214  013746  002114          MOV     L$TEST,-(SP)
041220  012746  006452          MOV     #MSGMOL,-(SP)
041224  012746  000002          MOV     #2,-(SP)
041230  010600                  MOV     SP,R0
041232  104417                  TRAP    C$PNTF
041234  062706  000006          ADD     #6,SP
041240  104432                  TRAP    C$EXIT
041242  000432                  .WORD   L10107-.
041244                          1$:
041244  104404                  TRAP    C$BSEG
041246  052777  100000  141270  BIS     #CMOD,@RPOF     ;SET COMMAND MODIFIER
```

```
    54 041254  042777  100000  141254          BIC     #DMD,@RPMR1     ;AND FAIL TO SET DIAGNOSTIC MODE (FORCE ERRORS!!)
    55 041262  012737  002652  002366          MOV     #PSTACK,TABADD  ;DO THE LINK TRANSFER ADDRESS
    56 041270  012737  000006  002412          MOV     #6,NEGWRD       ;AND SET UP A WORD COUNT
    57 041276  012737  000005  002420          MOV     #SEEK,FUNCTN    ;LOAD A SEEK COMMAND
    58 041304  004737  015146                  JSR     PC,DRIVER       ;NOW ISSUE THE COMMAND
    59 041310  004737  017000                  JSR     PC,WAIT         ;WAIT FOR THINGS TO SETTLE DOWN
    60 041314  022777  002000  141204          CMP     #IAE,@RPER1     ;DID WE GET AN INVALID ADDRESS ERROR? (ONLY??)
    61 041322  001423                          BEQ     2$              ;IF = YES WE DID!
    62 041324  012737  002000  002454          MOV     #IAE,EXPTED     ;FORM THE EXPECTED DATA
    63 041332  017737  141170  002452          MOV     @RPER1,RCVED    ;FORM THE RECEIVED DATA
    64 041340  013737  002526  002456          MOV     RPER1,TESTRG    ;THIS REGISTER FAILED THE TEST
    65 041346  012737  005700  002404          MOV     #BIT6!BIT7!BIT8!BIT9!BIT11,ERRWD1;LIST THE MODULE CALLOUT
    66 041354  012737  000406  002406          MOV     #BIT1!BIT2!BIT8,ERRWD2;FOR BOTH MASKS
    67 041362  104456                          TRAP    C$ERHRD
       041364  001441                          .WORD   801
       041366  012454                          .WORD   EM14
       041370  014172                          .WORD   ERR0
    68 041372                          2$:
       041372                          10000$:
       041372  104405                          TRAP    C$ESEG
    69 041374  104404                          TRAP    C$BSEG
    70 041376  004737  016662                  JSR     PC,SEIZE        ;PURGE ERRORS, AND RELOAD THE DRIVE NUMBER
    71 041402  012737  000007  002420          MOV     #RECAL,FUNCTN   ;NOW SET A RECALIBRATE COMMAND IN THE QUEUE
    72 041410  004737  015146                  JSR     PC,DRIVER       ;EXECUTE THE COMMAND NOW!
    73 041414  004737  017000                  JSR     PC,WAIT         ;WAIT FOR SOME SETTLE TIME
    74 041420  032777  040000  141064          BIT     #TRE,@RPCS1     ;TRANSFER ERROR??
    75 041426  001405                          BEQ     3$              ;NOPE, NOT IF ZERO
    76 041430  004737  017422                  JSR     PC,BICEXP       ;LOAD THIS FAILURE STATUS
    77 041434  002512                          RPCS1                   ;THIS REGISTER
    78 041436  040000                          TRE                     ;THIS BIT SET AND SHOULDN'T HAVE
    79 041440  000410                          BR      4$              ;NOW REPORT THE FIND
    80 041442  032777  040000  141054  3$:     BIT     #ERR,@RPDS      ;DID WE GET AN ERROR SUMMATION BIT??
    81 041450  001420                          BEQ     5$              ;NOT IF ZERO
    82 041452  004737  017422                  JSR     PC,BICEXP       ;FORM THIS ERROR!!
    83 041456  002524                          RPDS                    ;THIS REGISTER FAILED
    84 041460  040000                          ERR                     ;THIS BIT SET AND SHOULDN'T HAVE
    85 041462  012737  005400  002404  4$:     MOV     #BIT8!BIT9!BIT11,ERRWD1;FORM THE MODULE CALLOUT
    86 041470  012737  000406  002406          MOV     #BIT1!BIT2!BIT8,ERRWD2;FOR BOTH MASKS
    87 041476  104456                          TRAP    C$ERHRD
       041500  001442                          .WORD   802
       041502  013051                          .WORD   EM23
       041504  014172                          .WORD   ERR0
    88 041506  004737  016662                  JSR     PC,SEIZE        ;RESET THE ERROR CONDITION
    89 041512                          5$:
       041512                          10001$:
       041512  104405                          TRAP    C$ESEG
    90 041514  104404                          TRAP    C$BSEG
    91 041516  052777  100000  141012          BIS     #DMD,@RPMR1     ;AND NOW SET DIAGNOSTIC MODE
    92 041524  012737  000005  002420          MOV     #SEEK,FUNCTN    ;LOAD A SEEK COMMAND
    93 041532  004737  015146                  JSR     PC,DRIVER       ;DO THE SEEK NOW!
    94 041536  004737  017000                  JSR     PC,WAIT         ;SETTLE TIME.....
    95 041542  027777  141000  141000          CMP     @RPDC,@RPCC     ;DID WE GET ON-CYLINDER??
    96 041550  001446                          BEQ     7$              ;YES, TEST PASSES
    97 041552  017737  140770  002454          MOV     @RPDC,EXPTED    ;LOAD THE ERROR STATUS
    98 041560  017737  140764  002452          MOV     @RPCC,RCVED     ;EXPECTED VS RECEIVED
    99 041566  013737  002550  002456          MOV     RPCC,TESTRG     ;AND THE "FAILED" REGISTER
   100 041574  032777  040000  140722          BIT     #ERR,@RPDS      ;LOOK FOR ERROR BITS
```

```
101 041602  00 017                          BNE     6$              ;WE DIDN'T GET ON-CYLINDER, BUT WE DETECTED AN ERROR
102 041604  03 777  040000  140700          BIT     #TRE,@RPCS1     ;DID WE DETECT A TRANSFER ERROR?
103 041612  001013                          BNE     6$              ;IF = 1, YES
104 041614  012737  005400  002404          MOV     #BIT8!BIT9!BIT11,ERRWD1;LOAD THE MODULE CALLOUT
105 041622  012737  000406  002406          MOV     #BIT1!BIT2!BIT8,ERRWD2;FOR BOTH MASKS
106 041630  104456                          TRAP    C$ERHRD
    041632  001443                          .WORD   803
    041634  012725                          .WORD   EM21
    041636  014172                          .WORD   ERR0
107 041640  000412                          BR      7$              ;NOW CHECK FOR LOOP...
108 041642  012737  005700  002404  6$:     MOV     #BIT6!BIT7!BIT8!BIT9!BIT11,ERRWD1;LOAD ALL THESE BITS FOR MODULE CALLOUT
109 041650  012737  000006  002406          MOV     #BIT1!BIT2,ERRWD2;THESE BITS ALSO!!
110 041656  104456                          TRAP    C$ERHRD
    041660  001444                          .WORD   804
    041662  012454                          .WORD   EM14
    041664  014172                          .WORD   ERR0
111 041666  004737  016662          7$:     JSR     PC,SEIZE        ;END WITHOUT ERRORS
112 041672                          10002$:
    041672  104405                          TRAP    C$ESEG
113 041674                          L10107:
    041674  104401                          TRAP    C$ETST
```

```
                        .SBTTL  TEST 58: DATA TEST #3

                        ;%      TEST DATA TEST #3 READ TD'S, FORMAT, FORMAT VERIFY A SELECTED TRACK ON FE CYLINDER
                        ;%      THEN PERFORM DATA TESTING ON THAT TRACK
                        ;%      : VAR    DO-REPEAT:  BOOLEAN
                        ;%      : VAR    RETRY-COUNTER:  INTEGER
                        ;%      : SET RPDC = FE CYLINDER ADDRESS
                        ;%      : SET DO-REPEAT = TRUE
                        ;%      : SET RPDA = 255(.)
                        ;%      : ISSUE A SEEK COMMAND
                        ;%      : IF ((RPER2:  ERR) OR (RPCS1:  TRE)) = 1
                        ;%      : : THEN
                        ;%      : : OUTPUT ERROR MESSAGE (DIDN'T EXECUTE SEEK PROPERLY)
                        ;%      : : OUTPUT FAULT LIST:  J09, J10, J08, J07, CABLES, RHXX, TERMINATOR
                        ;%      : ENDIF
                        ;%      : REPEAT
                        ;%      : : SET RPOF:  : CMD = 1
                        ;%      : : ISSUE A READ TRACK DESCRIPTOR COMMAND
                        ;%      : : IF TD WORD #3 <> 1 100 000 000 000 000 OR (RPCS2:  ERR OR RPCS1:  TRE = 1)
                        ;%      : : : THEN
                        ;%      : : : IF RPDA (HIGH BYTE) < LAST TRACK ADDRESS
                        ;%      : : : : THEN
                        ;%      : : : : INCREMENT RPDA (HIGH BYTE ONLY)
                        ;%      : : : : SET RPCS2:  CLR = 1
                        ;%      : : : : RELOAD THE DRIVE NUMBER FOR THE DRIVE-UNDER-TEST
                        ;%      : : : : ELSE
                        ;%      : : : : OUTPUT MESSAGE (INCORRECTLY FORMATTING TRACK #0, REFORMAT USING
                        ;%      : : : : FORMATTER UPON COMPLETION OF THIS DIAGNOSTIC)
                        ;%      : : : : SET DO-REPEAT = FALSE
                        ;%      : : : ENDIF
                        ;%      : : : ELSE
                        ;%      : : : SAVE TRACK NUMBER FOR FOUND NULLSET TD
                        ;%      : : : FORMAT TRACK FOUND WITH NULLSET TD INFORMATION
                        ;%      : : : IF ((RPDS:  : ERR) OR (RPCS1:  : TRE) = 1)
                        ;%      : : : : THEN
                        ;%      : : : : OUTPUT ERROR MESSAGE (FAILED DURING A FORMAT TRACK OPERATION)
                        ;%      : : : : OUTPUT FAULT LIST:  J09, J10, J11 / J13, J14, RHXX, CABLES, TERMINATOR
                        ;%      : : : ENDIF
                        ;%      : : : SET DO-REPEAT = FALSE
                        ;%      : : ENDIF
                        ;%      : : UNTIL NOT DO-REPEAT
                        ;%      : ENDREPEAT
                        ;%      : ISSUE A WRITE-CHECK HEADER COMMAND (WITH RPOF:  CMD = 1)
                        ;%      : IF ((RPDS:  ERR) OR (RPCS1:  TRE) = 1
                        ;%      : : THEN
                        ;%      : : OUTPUT ERROR MESSAGE (FAILED OPERATION:  WRITE-CHECK HEADERS, RPOF:  CMD = 1)
                        ;%      : : OUTPUT FAULT LIST:  J09, J10, J11 / J13, J14, RHXX, CABLES, TERMINATOR
                        ;%      : ENDIF
                        ;%      : A:
                        ;%      : WRITE A SECTOR USING DATA PATTERNS 1 TO 8, ONE AT A TIME
                        ;%      : IF ((RPDS:  ERR) OR (RPCS1:  TRE) = 1)
                        ;%      : : THEN
                        ;%      : : INCREMENT RETRY-COUNTER
                        ;%      : : IF RETRY COUNTER < 3
                        ;%      : : : THEN
                        ;%      : : : GOTO A
                        ;%      : : : ELSE
```

TEST 58: DATA TEST #3

```
                                        ;%      :  :  :  OUTPUT ERROR MESSAGE (FAILED TO WRITE A SIMPLE DATA TRANSFER)
                                        ;%      :  :  :  OUTPUT FAULT LIST:  J11 , J13, J09, J10, J14, CABLES, RHXX, TERMINATOR
                                        ;%      :  :  ENDIF
                                        ;%      :  ENDIF
                                        ;%      :  CLEAR RETRY-COUNTER
                                        ;%      :  B:
                                        ;%      :  READ A SECTOR USING DATA PATTERNS 1 TO 8, ONE AT A TIME
                                        ;%      :  IF ((RPDS:  ERR) OR (RPCS1:  TRE) = 1)
                                        ;%      :  :  THEN
                                        ;%      :  :  INCREMENT RETRY-COUNTER
                                        ;%      :  :  IF RETRY-COUNTER < 3
                                        ;%      :  :  :  THEN GOTO B
                                        ;%      :  :  :  ELSE
                                        ;%      :  :  :  OUTPUT ERROR MESSAGE (FAILED A SIMPLE READ TEST)
                                        ;%      :  :  :  OUTPUT FAULT LIST:  J11 / J13, J09, J10, J14, CABLES, RHXX, TERMINATOR
                                        ;%      :  :  ENDIF
                                        ;%      :  ENDIF
                                        ;%      :  ISSUE A RIP COMMAND
                                        ;%      :  SET UP A 6 WORD TRANSFER
                                        ;%      :  SET RPOF:  CMOD = 1
                                        ;%      :  ISSUE A READ HEADER AND DATA COMMAND
                                        ;%      :  IF RPER1:  FER = 0
                                        ;%      :  :  THEN
                                        ;%      :  :  OUTPUT ERROR MESSAGE (FAILED TO DETECT RPER1:  FER)
                                        ;%      :  ENDIF
                                        ;%      :  SET RPOF:  FMT16 = 1
                                        ;%      :  RESET ALL DRIVE ERRORS
                                        ;%      END TEST

041676                                  T58::
041676  004737  017722                          JSR     PC,PRELOD       ;GET THE DRIVE NOW
041702  032777  010000  140614                  BIT     #MOL,@RPDS      ;IS THE DRIVE ON LINE??
041710  001016                                  BNE     1$              ;IF 1, IT IS
041712  004737  017326                          JSR     PC,SAVRPR       ;GET THE REGISTER SNAPSHOT
041716  013746  002114                          MOV     L$TEST,-(SP)
041722  012746  006452                          MOV     #MSGMOL,-(SP)
041726  012746  000002                          MOV     #2,-(SP)
041732  010600                                  MOV     SP,R0
041734  104417                                  TRAP    C$PNTF
041736  062706  000006                          ADD     #6,SP
041742  104432                                  TRAP    C$EXIT
041744  002036                                  .WORD   L10110-.
041746  032777  004000  140550          1$:     BIT     #WRL,@RPDS      ;IS THE DRIVE WRITE LOCKED?
041754  001416                                  BEQ     2$              ;IF=0, NO
041756  004737  017326                          JSR     PC,SAVRPR       ;GET THE REGISTER SNAPSHOT
041762  013746  002114                          MOV     L$TEST,-(SP)
041766  012746  006522                          MOV     #MSGWLO,-(SP)
041772  012746  000002                          MOV     #2,-(SP)
041776  010600                                  MOV     SP,R0
042000  104417                                  TRAP    C$PNTF
042002  062706  000006                          ADD     #6,SP
042006  104432                                  TRAP    C$EXIT
042010  001772                                  .WORD   L10110-.
042012  005037  002414                  2$:     CLR     DESTRK          ;TRACK ADDRESS (DESIRED)=0
042016  013737  002376  002416                  MOV     LASCYL,DESCYL   ;GO TO LAST USER CYLINDER (DESIRED)
042024  005237  002416                          INC     DESCYL          ;GO TO FE CYLINDER (DESIRED)
042030                                  T58.1:
```

```
     042030  104402                          TRAP    C$BSUB
 106 042032  104404                          TRAP    C$BSEG
 107 042034  012737  000005  002420          MOV     #SEEK,FUNCTN    ;LOAD UP A SEEK COMMAND
 108 042042  012777  100000  140466          MOV     #DMD,@RPMR1     ;SET FOR DIAGNOSTIC MODE
 109 042050  004737  015146                  JSR     PC,DRIVER       ;ISSUE THE COMMAND
 110 042054  004737  017000                  JSR     PC,WAIT         ;STALL FOR SOME SETTLE TIME
 111 042060  012777  000377  140442          MOV     #377,@RPAS      ;CLEAR OUT THE RESULTING ATTENTION BIT
 112 042066  004737  017032                  JSR     PC,ERRCK        ;LOOK FOR ERRORS
 113 042072  005737  002466                  TST     ERSTAT          ;IF ERRORS, THIS = -1
 114 042076  001414                          BEQ     3$              ;IF 0, NO
 115 042100  012737  001700  002404          MOV     #BIT6!BIT7!BIT8!BIT9,ERRWD1  ;FORM THE MODULE CALLOUT
 116 042106  012737  000406  002406          MOV     #BIT1!BIT2!BIT8,ERRWD2  ;FOR BOTH WORDS
 117 042114  104456                          TRAP    C$ERHRD
     042116  001445                          .WORD   805
     042120  013411                          .WORD   EM32
     042122  014172                          .WORD   ERR0
 118 042124  004737  015400                  JSR     PC,DRVCLR       ;RESET ERRORS
 119 042130                          3$:
     042130                          10000$:
     042130  104405                          TRAP    C$ESEG
 120 042132  104404                          TRAP    C$BSEG
 121 042134  012702  002652          4$:     MOV     #PSTACK,R2      ;INITIALIZE A BUFFER
 122 042140  012701  000006                  MOV     #6,R1           ;GET THE BUFFER SIZE
 123 042144  005022                  5$:     CLR     (R2)+           ;BUFFER=0
 124 042146  005301                          DEC     R1              ;ONE LESS WORD TO GO
 125 042150  003375                          BGT     5$              ;DO UNTIL = 0
 126 042152  012737  000075  002420          MOV     #RTD,FUNCTN     ;SET UP FOR A READ TRACK DESCRIPTOR OP
 127 042160  052737  000377  002414          BIS     #377,DESTRK     ;SECTOR ADDRESS=-1
 128 042166  052777  100000  140350          BIS     #CMOD,@RPOF     ;SET THE COMMAND MODIFIER FOR A READ TD OPERATION
 129 042174  012737  000006  002412          MOV     #6,NEGWRD       ;SET UP FOR A 6 WORD TRANSFER
 130 042202  012737  002652  002366          MOV     #PSTACK,TABADD  ;LOAD THE LINK ADDRESS
 131 042210  004737  015146                  JSR     PC,DRIVER       ;ISSUE THE COMMAND
 132 042214  023727  002656  140000          CMP     PSTACK+4,#140000 ;IS TRACK DESCRIPTOR NULL?
 133 042222  001431                          BEQ     6$              ;IF EQUAL, YES!
 134 042224  004737  015400                  JSR     PC,DRVCLR       ;RESET ANY ERROR!
 135 042230  004737  017266                  JSR     PC,SPIRAL       ;GO TO NEXT TRACK
 136 042234  105737  002415                  TSTB    DESTRK+1        ;DID WE TRY ALL TRACKS?
 137 042240  001335                          BNE     4$              ;IF NOT 0, NO TRY AGAIN
 138 042242  012746  007062                  MOV     #MESG15,-(SP)
     042246  012746  000001                  MOV     #1,-(SP)
     042252  010600                          MOV     SP,R0
     042254  104417                          TRAP    C$PNTF
     042256  062706  000004                  ADD     #4,SP
 139 042262  012746  006763                  MOV     #MESG12,-(SP)
     042266  012746  000001                  MOV     #1,-(SP)
     042272  010600                          MOV     SP,R0
     042274  104417                          TRAP    C$PNTF
     042276  062706  000004                  ADD     #4,SP
 140 042302  004737  015400                  JSR     PC,DRVCLR       ;CLEAR OUT ANY ERRORS NOW!!
 141 042306  013746  002416          6$:     MOV     DESCYL,-(SP)    ;GET THE DESIRED CYLINDER ADDRESS
 142 042312  052716  030000                  BIS     #BIT13!BIT12,(SP)       ;AND MASK IT TO REPRESENT A TD
 143 042316  032737  040000  002652          BIT     #BIT14,PSTACK   ;WAS THE TD MOVED?
 144 042324  001402                          BEQ     7$              ;IF ZERO, NO
 145 042326  052716  040000                  BIS     #BIT14,(SP)     ;SET THE CORRECT BIT
 146 042332  005737  002652          7$:     TST     PSTACK          ;BIT 15 SET?  (HEADER 0 MOVED)
 147 042336  100002                          BPL     8$              ;IF ZERO, NO
 148 042340  052716  100000                  BIS     #BIT15,(SP)     ;SET THE SAME BIT IN THE MASK
```

```
                                                8$:     CMP     (SP)+,PSTACK    ;MATCH?
                                                        BEQ     9$              ;IF EQUAL, YES
                                                        MOV     #BIT8!BIT9!BIT10!BIT12!BIT13,ERRWD1;SET UP THE MODULE CALLOUT
                                                        MOV     #BIT1!BIT2!BIT8,ERRWD2;FOR BOTH MASKS
                                                        MOV     PSTACK,RCVED    ;FORM THE DATA FOR THE ERROR REPORT
                                                        MOV     -2(SP),EXPTED   ;AND THE EXPECTED DATA
                                                        MOV     #READTD,FATOF   ;LOAD THE FAILING FUNCTON
                                                        TRAP    C$ERHRD
                                                        .WORD   806
                                                        .WORD   EM37
                                                        .WORD   ERR2
                                                9$:     MOV     #IOBUFF,R1      ;GET THE OUTPUT BUFFER ADDRESS
                                                        BIC     #377,DESTRK     ;SECTOR ADDRESS = 0!
                                                        MOV     DESTRK,R2       ;LOAD THE BUFFER TRACK ADDRESS
                                                        CLRB    R2              ;FOR AN INTERLEAVED FORMAT
                                                        MOV     R2,R3           ;THIS IS THE HIGH OR "ODD" SECTOR
                                                        BISB    #25.,R3         ;IT STARTS AT SECTOR ADDRESS 25
                                                        CLR     R4              ;INITIALIZE THIS, IT'S A TOGGLE REGISTER
                                                        MOV     #50.,R5         ;# OF SECTORS/TRACK
                                                10$:    MOV     DESCYL,(R1)     ;CYLINDER ADDRESS
                                                        BIS     #150000,(R1)+   ;MARK SECTOR GOOD, IN 16 BIT MODE
                                                        TST     R4              ;DO THIS TO GET NEXT SECTOR
                                                        BMI     11$             ;IT'S -1, LOAD HIGH OR "ODD" SECTOR
                                                        MOV     R2,(R1)+        ;LOAD LOW SECTOR
                                                        INC     R2              ;UPDATE THE SECTOR COUNT
                                                        BIT     #ILEV,@RPDS     ;DRIVE INTERLEAVED ENABLED?
                                                        BEQ     12$             ;IF ZERO, NO!
                                                        COM     R4              ;AND TOGGLE
                                                        BR      12$             ;MOVE ON...
                                                11$:    MOV     R3,(R1)+        ;LOAD HIGH SECTOR
                                                        INC     R3              ;UPDATE SECTOR COUNT
                                                        CLR     R4              ;TOGGLE
                                                12$:    MOV     #140000,(R1)+   ;LOAD THE NULL-CASE
                                                        MOV     #140000,(R1)+   ;FOR ALL FOUR WORDS
                                                        MOV     #140000,(R1)+   ;THIRD WORD
                                                        MOV     #140000,(R1)+   ;FOURTH WORD
                                                        DEC     R5              ;ONE LESS SECTOR TO DO
                                                        BGT     10$             ;BUT GO ON UNTIL 0
                                                        MOV     #IOBUFF,TABADD  ;RELOAD THE LINK ADDRESS
                                                        MOV     #FORTRK,FUNCTN  ;LOAD UP FOR A FORMAT TRACK OPERATION
                                                        MOV     #<50.*6>,NEGWRD ;AND THE WORD COUNT (314<8> EFF1)
                                                        BIS     #CMOD,@RPOF     ;COMMAND MODIFIER=1
                                                        JSR     PC,DRIVER       ;NOW DO THE TRANSFER
                                                        JSR     PC,ERRCK        ;LOOK FOR ERRORS
                                                        TST     ERSTAT          ;IF ERRORS, THIS = -1
                                                        BEQ     13$             ;LOOKS OK IF 0!!
                                                        MOV     #BIT8!BIT9!BIT10!BIT12!BIT13,ERRWD1 ;LOAD THE MODULE CALLOUT LIST
                                                        MOV     #BIT1!BIT2!BIT8,ERRWD2 ;FOR BOTH MASK WORDS
                                                        TRAP    C$ERHRD
                                                        .WORD   807
                                                        .WORD   EM41
                                                        .WORD   ERR0
                                                        JSR     PC,DRVCLR       ;RELOAD AND RESET ERRORS!
                                                13$:
                                                10001$:
                                                        TRAP    C$ESEG
                                                        TRAP    C$BSEG
```

```
198 042644  012737  000053  002420          MOV     #WCKHD,FUNCTN   ;LOAD UP A WRITE-CHECK HEADERS COMMAND
199 042652  012702  002732                  MOV     #IOBUFF+2,R2    ;SET-UP TO REARRANGE THE BUFFER
200 042656  012703  000062                  MOV     #50.,R3         ;THIS IS THE ITERATION COUNT
201 042662  005004                          CLR     R4              ;THIS IS THE SECTOR ADDRESS
202 042664  110412                  14$:    MOVB    R4,(R2)         ;RELOAD THE SECTOR ADDRESS
203 042666  005204                          INC     R4              ;NEXT SECTOR ADDRESS
204 042670  062702  000014                  ADD     #14,R2          ;SKIP DATA IN CURRENT SECTOR MAP
205 042674  005303                          DEC     R3              ;ONE LESS ITERATION TO GO
206 042676  003372                          BGT     14$             ;IF > 0, GO-ON
207 042700  052777  100000  137636          BIS     #CMOD,@RPOF     ;COMMAND MODIFIER=1
208 042706  012737  002730  002366          MOV     #IOBUFF,TABADD  ;LOAD THE LINK ADDRESS
209 042714  012737  000454  002412          MOV     #<50.*6>,NEGWRD ;AND THE WORD COUNT (314<8> EFF1)
210 042722  004737  015146                  JSR     PC,DRIVER       ;NOW DO THE TRANSFER
211 042726  012737  011543  002470          MOV     #WTCKHD,FATOF   ;LOAD THE FAILING FUNCTION
212 042734  012737  033400  002404          MOV     #BIT8!BIT9!BIT10!BIT12!BIT13,ERRWD1 ;CREATE MODULE CALLOUT
213 042742  012737  000406  002406          MOV     #BIT1!BIT2!BIT8,ERRWD2 ;LIST FOR BOTH MASKS
214 042750  032777  040000  137534          BIT     #TRE,@RPCS1     ;DID WE GET A TRANSFER ERROR?
215 042756  001407                          BEQ     1$              ;IF ZERO, NO!
216 042760  004737  017150                  JSR     PC,LOCATE       ;FIND THE DATA FOR THE REPORT
217 042764  104456                          TRAP    C$ERHRD
    042766  001450                          .WORD   808
    042770  013441                          .WORD   EM33
    042772  014500                          .WORD   ERR2
218 042774  000411                          BR      16$             ;SKIP THE NEXT DISPATCH
219 042776  004737  017032          15$:    JSR     PC,ERRCK        ;ANY ERRORS?
220 043002  005737  002466                  TST     ERSTAT          ;IF ZERO, NO
221 043006  001406                          BEQ     17$             ;TAKE BRANCH IF NO ERRORS
222 043010  104456                          TRAP    C$ERHRD
    043012  001451                          .WORD   809
    043014  012454                          .WORD   EM14
    043016  014172                          .WORD   ERR0
223 043020  004737  015400          16$:    JSR     PC,DRVCLR       ;RESET ALL ERRORS
224 043024                          17$:
225 043024                          10002$:
    043024  104405                          TRAP    C$ESEG
226 043026                          L10111:
    043026  104403                          TRAP    C$ESUB
227 043030                          T58.2:
    043030  104402                          TRAP    C$BSUB
228 043032  105037  002414                  CLRB    DESTRK          ;SECTOR ADDRESS=0
229 043036  012737  033400  002404          MOV     #BIT8!BIT9!BIT10!BIT12!BIT13,ERRWD1;SET UP THE MODULE CALLOUT
230 043044  012737  000406  002406          MOV     #BIT1!BIT2!BIT8,ERRWD2;FOR BOTH MASKS
231 043052  012737  000004  002436          MOV     #4,TEMP         ;ALLOW FOR FOUR DATA ERRORS BEFORE REPORTING THE ERROR!
232 043060  012703  002344                  MOV     #PATT1,R3       ;GET THE TEST PATTERN
233 043064  012701  002730          1$:     MOV     #IOBUFF,R1      ;CREATE THE OUTPUT BUFFER
234 043070  012702  000400                  MOV     #256.,R2        ;GET THE BUFFER SIZE
235 043074  011321                  2$:     MOV     (R3),(R1)+      ;START LOADING THE BUFFER
236 043076  005302                          DEC     R2              ;ONE LESS WORD TO LOAD
237 043100  003375                          BGT     2$              ;IF > 0, GO-ON
238 043102  104404                          TRAP    C$BSEG
239 043104  012737  002730  002366  3$:     MOV     #IOBUFF,TABADD  ;LOAD THE LINK AGAIN
240 043112  012737  000061  002420          MOV     #WRDTA,FUNCTN   ;SETUP FOR A WRITE DATA COMMAND
241 043120  012737  000400  002412          MOV     #256.,NEGWRD    ;WRITE ONE SECTOR
242 043126  004737  015146                  JSR     PC,DRIVER       ;NOW DO IT!
243 043132  004737  017032                  JSR     PC,ERRCK        ;LOOK FOR ERRORS
244 043136  005737  002466                  TST     ERSTAT          ;IF ERRORS, THIS = -1
245 043142  001424                          BEQ     4$              ;SKIP ERROR DISPATCH IF 0
```

```
246 043144  005737  002436                      TST     TEMP            ;DID WE DO FOUR ITERATIONS?
247 043150  003021                              BGT     4$              ;IF NOT 0, NO!!
248 043152  104456                              TRAP    C$ERHRD
    043154  001452                              .WORD   810
    043156  013753                              .WORD   EM40
    043160  014172                              .WORD   ERR0
249 043162  012746  007315                      MOV     #FRMT02,-(SP)
    043166  012746  000001                      MOV     #1,-(SP)
    043172  010600                              MOV     SP,R0
    043174  104414                              TRAP    C$PNTB
    043176  062706  000004                      ADD     #4,SP
250 043202  012737  177777  002430              MOV     #-1,FASTAT      ;MARK THIS SECTOR AS FAILED
251 043210  004737  015400                      JSR     PC,DRVCLR       ;GET RID OF ANY ERRORS
252 043214  012702  003030          4$:         MOV     #IOBUFF+64.,R2  ;GET ONE BUFFER LOCATION
253 043220  005112                              COM     (R2)            ;AND LOUSE IT UP!
254 043222  012737  000051  002420              MOV     #WCKD,FUNCTN    ;LOAD THE WRITE CHECK FUNCTION
255 043230  012737  002730  002366              MOV     #IOBUFF,TABADD  ;LOAD THE LINK ADDRESS
256 043236  012737  000400  002412              MOV     #256.,NEGWRD    ;AND THE WORD COUNT
257 043244  004737  015146                      JSR     PC,DRIVER       ;NOW DO THE COMMAND EXECUTION
258 043250  004737  017000                      JSR     PC,WAIT         ;WAIT FOR A SETTLE TIME
259 043254  032777  040000  137240              BIT     #WCE,@RPCS2     ;DID WE GET A WRITE CHECK ERROR?
260 043262  001014                              BNE     5$              ;IF = 1, YES!
261 043264  004737  017372                      JSR     PC,BISEXP       ;FORM THE FAILING DATA
262 043270  002522                              RPCS2                   ;THIS REGISTER FAILED
263 043272  040000                              WCE                     ;THIS BIT FAILED TO SET
264 043274  104456                              TRAP    C$ERHRD
    043276  001453                              .WORD   811
    043300  012776                              .WORD   EM22
    043302  014172                              .WORD   ERR0
265 043304  012737  177777  002430              MOV     #-1,FASTAT      ;MARK THIS FAILURE
266 043312  000424                              BR      7$              ;NOW GO-ON
267 043314  017746  137214          5$:         MOV     @RPDB,-(SP)     ;GET THE ACTUAL DATA
268 043320  005112                              COM     (R2)            ;INVERT THE EXPECTED DATA
269 043322  022612                              CMP     (SP)+,(R2)      ;MATCH?
270 043324  001417                              BEQ     7$              ;LOOKS OK, GO-ON
271 043326  016637  177776  002452              MOV     -2(SP),RCVED    ;AND LOG THE RESULTS FOR ERROR REPORTING
272 043334  011237  002454                      MOV     (R2),EXPTED     ;NOW GET THE EXPECTED DATA
273 043340  005737  002436          6$:         TST     TEMP            ;WHICH ITERATION?
274 043344  003007                              BGT     7$              ;IF > 0, NOT THE LAST
275 043346  012737  011566  002470              MOV     #WTCKD,FATOF    ;LOAD THE FUNCTION AT TIME OF FAILURE
276 043354  104456                              TRAP    C$ERHRD
    043356  001454                              .WORD   812
    043360  013505                              .WORD   EM34
    043362  014500                              .WORD   ERR2
277 043364  017746  137122          7$:         MOV     @RPCS1,-(SP)    ;SAVE RPCS1 ON S  CK
278 043370  042716  037777                      BIC     #^C<SC!TRE>,(SP)        ;GET RID OF THE UNNECESSARY BITS
279 043374  022726  140000                      CMP     #SC!TRE,(SP)+   ;DID SC AND TRE SET?
280
281 043400  001410                              BEQ     8$              ;IF SET, SKIP ERROR REPORT
282 043402  004737  017372                      JSR     PC,BISEXP       ;LOAD THE FAILING DATA
283 043406  002512                              RPCS1                   ;THIS REGISTER
284 043410  140000                              SC!TRE                  ;THESE BITS DIDN'T SET
285 043412  104456                              TRAP    C$ERHRD
    043414  001455                              .WORD   813
    043416  012776                              .WORD   EM22
    043420  014172                              .WORD   ERR0
286 043422  004737  015400          8$:         JSR     PC,DRVCLR       ;RELOAD AND RESET
```

```
    287 043426  012737  002730  002366          MOV     #IOBUFF,TABADD  ;NOW VERIFY DATA FOR CORRECTNESS
    288 043434  012737  000400  002412          MOV     #256.,NEGWRD    ;DO 256 WORD (1 SECTOR) TRANSFER
    289 043442  012737  000051  002420          MOV     #WCKD,FUNCTN    ;SET UP FOR A WRITE CHECK
    290 043450  004737  015146                  JSR     PC,DRIVER       ;DO THE COMMAND NOW!
    291 043454  004737  017032                  JSR     PC,ERRCK        ;ERRORS?
    292 043460  005737  002466                  TST     ERSTAT          ;IF ERRORS, THIS = - 1
    293 043464  001452                          BEQ     13$             ;SKIP ERROR DISPATCH IF 0
    294 043466  005337  002436          9$:     DEC     TEMP            ;ALLOW ONE LESS ERROR!
    295 043472  002404                          BLT     10$             ;IF < 0, REPORT THE ERROR NOW!!
    296 043474  105237  002414                  INCB    DESTRK          ;GO TO THE NEXT SECTOR
    297 043500  000137  043104                  JMP     @#3$            ;AND FOR NOW, SKIP THE ERROR DISPATCH!
    298 043504  012737  011566  002470  10$:     MOV     #WTCKD,FATOF    ;LOAD THE FAILING FUNCTION
    299 043512  005037  002436                  CLR     TEMP            ;TEMP = 0, FOR A POSSIBLE LOOP
    300 043516  032777  040000  136766          BIT     #TRE,@RPCS1     ;DID WE GET A TRANSFER ERROR?
    301 043524  001417                          BEQ     11$             ;IF 0, NO
    302 043526  004737  017150                  JSR     PC,LOCATE       ;FIND THE ERROR
    303 043532  104456                          TRAP    C$ERHRD
        043534  001456                          .WORD   814
        043536  013441                          .WORD   EM33
        043540  014500                          .WORD   ERR2
    304 043542  012746  007315                  MOV     #FRMT02,-(SP)
        043546  012746  000001                  MOV     #1,-(SP)
        043552  010600                          MOV     SP,R0
        043554  104414                          TRAP    C$PNTB
        043556  062706  000004                  ADD     #4,SP
    305 043562  000411                          BR      12$             ;SKIP NEXT REPORT
    306 043564  004737  017032          11$:    JSR     PC,ERRCK        ;LOOK FOR ANY ERROR
    307 043570  005737  002466                  TST     ERSTAT          ;IF ONE FOUND, THIS = - 1
    308 043574  001406                          BEQ     13$             ;NO ERRORS, GO-ON
    309 043576  104456                          TRAP    C$ERHRD
        043600  001457                          .WORD   815
        043602  012454                          .WORD   EM14
        043604  014172                          .WORD   ERR0
    310 043606  004737  015400          12$:    JSR     PC,DRVCLR       ;RESET AND RELOAD
    311 043612  005737  002430          13$:    TST     FASTAT          ;ANY ERROR?
    312 043616  001403                          BEQ     14$             ;IF ZERO, NO
    313 043620  005037  002430                  CLR     FASTAT          ;RESET THE FAILED MARKER
    314 043624  000720                          BR      9$              ;AND GO TO NEXT SECTOR
    315 043626                          14$:
        043626                          10000$:
        043626  104405                          TRAP    C$ESEG
    316 043630  005723                          TST     (R3)+           ;POP R3 TO THE NEXT DATA TABLE ENTRY
    317 043632  020327  002362                  CMP     R3,#PATT8       ;DONE YET
    318 043636  101002                          BHI     15$             ;IF R3 > # PATT8, YES
    319 043640  000137  043064                  JMP     @#1$            ;DO MORE!!
    320 043644                          15$:
        043644                          L10112:
        043644  104403                          TRAP    C$ESUB
    321 043646  104404                          TRAP    C$BSEG
    322 043650  012737  000021  002420          MOV     #RIP,FUNCTN     ;SET UP FOR ANOTHER READ IN PRESET
    323 043656  004737  015146                  JSR     PC,DRIVER       ;ISSUE THE COMMAND
    324 043662  012737  000073  002420          MOV     #RDHDTA,FUNCTN  ;NOW PREPARE TO READ A HEADER
    325 043670  052777  100000  136646          BIS     #CMOD,@RPOF     ;ONLY SIX WORDS / TRANSFER
    326 043676  012737  000006  002412          MOV     #6,NEGWRD       ;LIKE I SAID, SIX WORDS ONLY!
    327 043704  012737  002652  002366          MOV     #PSTACK,TABADD  ;TRANSFER TO START AT THIS BUFFER ADDRESS
    328 043712  004737  015146                  JSR     PC,DRIVER       ;THIS SHOULD CAUSE A FORMAT ERROR
    329 043716  022777  000020  136602          CMP     #FER,@RPER1     ;DID IT??
```

TEST 58: DATA TEST #3

```
    330 043724  001423                          BEQ     1$              ;IF MAICH, IT DID!
    331 043726  012737  000020  002454          MOV     #FER,EXPTED     ;FORM THE EXPECTED DATA
    332 043734  017737  13 566  002452          MOV     @RPER1,RC ED    ;FORM THE RECEIVED DATA
    333 043742  013737  002526  002456          MOV     RPER1,TESTRG    ;THIS REGISTER FAILED THE TEST
    334 043750  012737  004400  002404          MOV     #BIT8!BIT11,ERRWD1;LOAD THE MODULE CALLOUT
    335 043756  012737  000406  002406          MOV     #BIT1!BIT2!BIT8,ERRWD2;FOR BOTH MASKS
    336 043764  104456                          TRAP    C$ERHRD
        043766  001460                          .WORD   816
        043770  01245                           .WORD   EM14
        043772  01417                           .WORD   ERR0
    337 043774  004737  017722          1$:     JSR     PC,PRELCD       ;RESET FOR 16 BIT MODE
    338 044000                          10000$:
        044000  104405                          TRAP    C$ESEG
    339 044002                          L10110:
        044002  104401                          TRA     C$ETST
```

```
                                .SBTTL  TEST 59 RPER1 NEGATIVE BIT TESTS
                                ;
                                ;%      TEST 59 RPER1 NEGATIVE BIT TESTS
                                ;%      :  SET UP AN ILLEGAL COMMAND (#43 - OCTAL)
                                ;%      :  ISSUE THE COMMAND
                                ;%      :  IF RPER1:  ILF = 0
                                ;%      :  :  THEN
                                ;%      :  :  OUTPUT ERROR MESSAGE (FAILED TO DETECT RPER1:  ILF)
                                ;%      :  :  OUTPUT FAULT LIST:  J12
                                ;%      :  ENDIF
                                ;%      :  ISSUE A DRIVE CLEAR COMMAND
                                ;%      :  SET UP FOR SECTOR ADDRESS 50(DECIMAL)
                                ;%      :  SET UP FOR TRACK ADDRESS 31(DECIMAL)
                                ;%      :  ISSUE SEEK COMMAND
                                ;%      :  IF RPER1:  IAE = 0
                                ;%      :  :  THEN
                                ;%      :  :  OUTPUT ERROR MESSAGE (FAILED TO DETECT RPER1:  IAE)
                                ;%      :  ENDIF
                                ;%      :  ISSUE A DRIVE CLEAR
                                ;%      :  DECREMENT THE SECTOR ADDRESS (49 DECIMAL)
                                ;%      :  INCREMENT THE TRACK ADDRESS (32 DECIMAL)
                                ;%      :  ISSUE SEEK COMMAND
                                ;%      :  IF RPER1:  IAE = 0
                                ;%      :  :  THEN
                                ;%      :  :  OUTPUT ERROR MESSAGE (FAILED TO DETECT RPER1:  IAE)
                                ;%      :  :  OUTPUT FAULT LIST:  J7, J8, RHXX, CABLES, TERMINATOR
                                ;%      :  ENDIF
                                ;%      :  ISSUE DRIVE CLEAR COMMAND
                                ;%      END TEST 59
                                ;
044400'                         T59::
044004  104404                          TRAP    C$BSEG
044006  004737  015400                  JSR     PC,DRVCLR       ;START UP WITHOUT ERRORS
044012  032777  010000  136504          BIT     #MOL,@RPDS      ;DRIVE ONLINE?
044020  001016                          BNE     1$              ;IF = 1, YES
044022  004737  017326                  JSR     PC,SAVRPR       ;GET THE REGISTER SNAPSHOT
044026  013746  002114                  MOV     L$TEST,-(SP)
044032  012746  006452                  MOV     #MSGMOL,-(SP)
044036  012746  000002                  MOV     #2,-(SP)
044042  010600                          MOV     SP,R0
044044  104417                          TRAP    C$PNTF
044046  062706  000006                  ADD     #6,SP
044052  104432                          TRAP    C$EXIT
044054  000244                          .WORD   L10113-.
044056  012737  000043  002420  1$:     MOV     #43,FUNCTN      ;LOAD UP AN ILLEGAL FUNCION
044064  013737  002526  002456          MOV     RPER1,TESTRG    ;FORM UP PART OF THE ERROR MESSAGE
044072  004737  015146                  JSR     PC,DRIVER       ;ISSUE THAT ILLEGAL COMMAND
044076  022777  000001  136422          CMP     #ILF,@RPER1     ;DID ILLEGAL FUNCTION ONLY SET?
044104  001417                          BEQ     2$              ;IF MATCH, YES
044106  012737  004000  002404          MOV     #BIT11,ERRWD1   ;LOAD THE MASK
044114  005037  002406                  CLR     ERRWD2          ;FOR BOTH MASKS
044120  012737  000001  002454          MOV     #ILF,EXPTED     ;SET UP THE EXPECTED DATA
044126  017737  136374  002452          MOV     @RPER1,RCVED    ;REPORT THE RECEIVED DATA
044134  104456                          TRAP    C$ERHRD
044136  001461                          .WORD   817
044140  012454                          .WORD   EM14
044142  014172                          .WORD   ERR0
```

```
     52 044144                                  2$:
        044144                                  10000$:
        044144  104405                          TRAP    C$ESEG
     53 044146  104404                          TRAP    C$BSEG
     54 044150  004737  015400                  JSR     PC,DRVCLR       ;PURGE ANY ERRORS
     55 044154  012737  005700  002404          MOV     #BIT6!BIT7!BIT8!BIT9!BIT11,ERRWD1;LOAD THE MODULE CALLOUT
     56 044162  012737  000406  002406          MOV     #BIT1!BIT2!BIT8,ERRWD2;FOR BOTH MASKS
     57 044170  012737  001165  002416          MOV     #629.,DESCYL    ;LAST USER CYLINDER, PLEASE
     58 044176  112737  000037  002415          MOVB    #31.,DESTRK+1   ;LAST USER TRACK, PLEASE
     59 044204  112737  000062  002414          MOVB    #50.,DESTRK     ;ILLEGAL SECTOR ADDRESS, PLEASE
     60 044212  012737  000005  002420          MOV     #SEEK,FUNCTN    ;LOAD UP A SEEK COMMAND
     61 044220  004737  015146                  JSR     PC,DRIVER       ;ISSUE THE COMMAND, BUT EXPECT IT TO FAIL
     62 044224  022777  002000  136274          CMP     #IAE,@RPER1     ;DID WE GET THE EXPECTED RESULTS?
     63 044232  001413                          BEQ     4$              ;IF MATCH, YES
     64 044234  012737  002000  002454  3$:     MOV     #IAE,EXPTED     ;FORM THE EXPECTED DATA
     65 044242  017737  136260  002452          MOV     @RPER1,RCVED    ;GET THE ACTUAL DATA
     66 044250  104456                          TRAP    C$ERHRD
        044252  001462                          .WORD   818
        044254  012454                          .WORD   EM14
        044256  014172                          .WORD   ERR0
     67 044260  000414                          BR      5$              ;AND GET-OUT!
     68 044262  105337  002414          4$:     DECB    DESTRK          ;LAST LEGAL SECTOR ADDRESS, PLEASE
     69 044266  105237  002415                  INCB    DESTRK+1        ;ILLEGAL TRACK ADDRESS, PLEASE
     70 044272  004737  015400                  JSR     PC,DRVCLR       ;NO ERRORS, YET!!
     71 044276  004737  015146                  JSR     PC,DRIVER       ;NOW ISSUE THE BOGUS SEEK COMMAND
     72 044302  022777  002000  136216          CMP     #IAE,@RPER1     ;DID WE GET IAE ONLY??
     73 044310  001351                          BNE     3$              ;TAKE BRANCH IF NOT
     74 044312  004737  017722          5$:     JSR     PC,PRELOD       ;RESET FURTHER ERRORS
     75 044316                                  10001$:
        044316  104405                          TRAP    C$ESEG
     76 044320                                  L10113:
        044320  104401                          TRAP    C$ETST
```

```
                                .SBTTL  TEST 60 USER SELECTED MICRODIAGNOSTIC ROUTINE
                                ;
                                ;%      TEST 60 USER SELECTED MICRODIAGNOSTIC ROUTINE
                                ;%      :  IF MANUAL TESTING IS NOT ALLOWED
                                ;%      :  THEN
                                ;%      :  :  EXIT TEST
                                ;%      :  ELSE
                                ;%      :  IF USER SELECTED INPUT ALLOWS A HEX DATA SELECTION
                                ;%      :  :  THEN
                                ;%      :  :  A:
                                ;%      :  :  GET A 2 CHARACTER USER INPUT
                                ;%      :  :  IF THE USER INPUT IS NOT A VALID HEX CHARACTER
                                ;%      :  :  :  THEN
                                ;%      :  :  :  REJECT THE INPUT AND GOTO A
                                ;%      :  :  ENDIF
                                ;%      :  :  LEFT JUSTIFY THE INPUT DATA AND MAKE IT BYTE ORIENTED
                                ;%      :  :  BY PUTTING TWO HEX CHARACTERS IN ONE BYTE
                                ;%      :  :  MOVE THE USER DATA INTO R4
                                ;%      :  :  TURN ON THE DIAGNOSTIC MONITOR IN THE DRIVE
                                ;%      :  :  LOAD THE ROUTINE NUMBER INTO THE DRIVE
                                ;%      :  :  WAIT FOR THE COMMAND TO FINISH EXECUTION
                                ;%      :  :  IF RPER2 <> 0
                                ;%      :  :  :  THEN
                                ;%      :  :  :  REPORT THE ERROR (DRIVE FAILED A MICRODIAGNOSTIC ROUTINE)
                                ;%      :  :  :  RESET ALL DRIVE AND CONTROLLER ERRORS
                                ;%      :  :  ENDIF
                                ;%      :  ENDIF
                                ;%      END TEST 60
                                ;
044322                          T60::
005737  002342                          TST     SELRUN          ;ALLOW A USER INPUT?
003002                          BGT     1$              ;IF >0, YES
104432                          TRAP    C$EXIT
000260                          .WORD   L10114-.
005737  002422          1$:     TST     ROUTDO          ;USER PREVIOUSLY SELECTED INPUT??
100470                          BMI     6$              ;SKIP NEXT DIALOGUE
104450                          TRAP    C$MANI
103402                          BCS     2$
104432                          TRAP    C$EXIT
000242                          .WORD   L10114-.
044352                  2$:                             ;PRINT 'ROUTINE NO. (2 CHAR 'HEX' INPUT)'
012746  010271                  MOV     #FRMT23,-(SP)
012746  000001                  MOV     #1,-(SP)
010600                          MOV     SP,R0
104417                          TRAP    C$PNTF
062706  000004                  ADD     #4,SP
104443                          TRAP    C$GMAN
000406                          BR      10000$
002652                          .WORD   PSTACK
000142                          .WORD   T$CODE
000000                          .WORD
000001                          .WORD   1
000002                          .WORD   T$LOLIM
000002                          .WORD   T$HILIM
044412                  10000$:
012704  002652                  MOV     #PSTACK,R4      ;GET THE START OF THE STRING
012702  000002                  MOV     #2,R2           ;SET AN ITERATION COUNT
```

```
     044422  112401                  3$:     MOVB    (R4)+,R1        ;GET THE DATA CHAHRACTER
     044424  020127  000071                   CMP     R1,#71          ;AND BEGIN TO SCALE IT
     044430  101004                          BHI     4$              ;TAKE BRANCH IF ALPHA, NOT NUMERIC
     044432  162701  000060                  SUB     #60,R1          ;STRIP THE ASCII
     044436  100745                          BMI     2$              ;IF MINUS, THE USER GOOFED!! DO AGAIN!
     044440  000406                          BR      5$              ;OK SO-FAR, KEEP GOING
     044442  162701  000067          4$:     SUB     #67,R1          ;STRIP THE ASCII
     044446  100741                          BMI     2$              ;IF MINUS, THE USER GOOFED!  DO AGAIN!
     044450  020127  000017                  CMP     R1,#17          ;LEGAL CHARACTER (IN HEX)??
     044454  003336                          BGT     2$              ;IF >, IT'S TOO LARGE
     044456  110164  177777          5$:     MOVB    R1,-1(R4)       ;MOVE THE HEX BACK INTO THE BUFFER (SANS ASCII)
     044462  005302                          DEC     R2              ;ONE LESS CHARACTER TO GO
     044464  003356                          BGT     3$              ;DO UNTIL R2 = 0
     044466  124444                          CMPB    -(R4),-(R4)     ;BACK THE POINTER UP BY TWO BYTES
     044470  106314                          ASLB    (R4)            ;TO LEFT JUSTIFY THE LOW BYTE
     044472  106314                          ASLB    (R4)            ;SECOND SHIFT
     044474  106314                          ASLB    (R4)            ;THIRD SHIFT
     044476  106324                          ASLB    (R4)+           ;FOURTH SHIFT (POP POINTER)
     044500  151437  002652                  BISB    (R4),PSTACK     ;FORM THE ENTIRE 2 CHAR HEX FIELD
     044504  105037  002653                  CLRB    PSTACK+1        ;THROW THE HIGH BYTE OUT NOW!
     044510  005137  002422                  COM     ROUTDO          ;MARK THE USER SELECTED INPUT
     044514  013737  002652  002424          MOV     PSTACK,SELNUM   ;SAVE THE USER ROUTINE NUMBER
     044522  013704  002424          6$:     MOV     SELNUM,R4       ;LOAD THE ROUTINE NUMBER
     044526  004737  015260                  JSR     PC,DIAGST       ;TURN ON THE MONITOR
     044532  000304                          SWAB    R4              ;HIGH BYTE = ROUTINE NUMBER
     044534  104404                          TRAP    C$BSEG
     044536  004737  015352                  JSR     PC,DIAGLD       ;LOAD THE ROUTINE NUMBER
     044542  017746  136004                  MOV     @RPER2,-(SP)    ;GET THE RESULTS OF THE TEST
     044546  042726  177400                  BIC     #177400,(SP)+   ;STRIP JUNK
     044552  001414                          BEQ     7$              ;IF ZERO, NO!!
     044554  104456                          TRAP    C$ERHRD
     044556  000621                          .WORD   401
     044560  013564                          .WORD   EM35
     044562  014310                          .WORD   ERR1
     044564  012737  040011  002420          MOV     #TRE!DRCLR,FUNCTN;PREPARE TO RESET THE ERRORS
     044572  004737  015146                  JSR     PC,DRIVER       ;PURGE ERRORS NOW!
     044576  052777  100000  135732          BIS     #DMD,@RPMR1     ;TURN ON THE DMD BIT AGAIN
     044604                          7$:
     044604                          10001$:
     044604  104405                          TRAP    C$ESEG
     044606  004737  015312                  JSR     PC,DIAGEN       ;TURN OFF THE MONITOR
     044612                          L10114:
     044612  104401                          TRAP    C$ETST
```

TEST 61 NOP FUNCTIONAL TEST

```
                                .SBTTL  TEST 61 NOP FUNCTIONAL TEST
                                ;%      TEST 61 NOP FUNCTIONAL TEST
                                ;%      :  LOAD UNIT UNDER TEST INTO RPCS2
                                ;%      :  IF RPDS:  DRY <> 1
                                ;%      :  :  THEN
                                ;%      :  :  OUTPUT ERROR MESSAGE (RPDS:  DRY NOT SET WHEN EXPECTED)
                                ;%      :  ENDIF
                                ;%      :  WRITE NOP COMMAND TO RPCS1
                                ;%      :  TIME RPDS:  DRY
                                ;%      :  IF TIME EXPIRES AND RPDS:  DRY <> 1
                                ;%      :  :  THEN
                                ;%      :  :  OUTPUT ERROR MESSAGE (RPDS:  DRY NOT SET IN TIME)
                                ;%      :  ENDIF
                                ;%      :  IF RPDS:  ERR = 1
                                ;%      :  :  THEN
                                ;%      :  :  OUTPUT ERROR MESSAGE (COMPOSITE ERROR SET WHEN NOT EXPECTED)
                                ;%      :  ENDIF
                                ;%      :  IF RPCS1:  TRE = 1
                                ;%      :  :  THEN
                                ;%      :  :  OUTPUT ERROR MESSAGE (RPCS1:  TRE SET WHEN NOT EXPECTED)
                                ;%      :  ENDIF
                                ;%      END TEST 61

044614                          T61::
044614  012737  004000  002404          MOV     #BIT11,ERRWD1   ;LOAD THE ERROR MASK
044622  005037  002406                  CLR     ERRWD2          ;FOR BOTH MASKS
044626  004737  016662                  JSR     PC,SEIZE        ;GET THE DRIVE NOW!
044632  012701  000036                  MOV     #30.,R1         ;GET AN OVERALL WATCHDOG TIMER
044636  012777  000015  135646          MOV     #NOP,@RPCS1     ;WRITE A NOP COMMAND
044644  105777  135654          1$:     TSTB    @RPDS           ;DO WE HAVE DRIVE READY?
044650  100413                  BMI     2$              ;IF MINUS, YES!!
044652  004737  017000                  JSR     PC,WAIT         ;STALL, AND WASTE SOME TIME
044656  005301                  DEC     R1              ;ONE LESS ITERATION TO-GO
044660  003371                  BGT     1$              ;IF R1 <> 0, DO AGAIN
044662  004737  017326                  JSR     PC,SAVRPR       ;GET THE REGISTER SNAPSHOT
044666  104456                  TRAP    C$ERHRD
044670  000622                  .WORD   402
044672  012015                  .WORD   EM2
044674  014652                  .WORD   ERR3
044676  000425                  BR      4$              ;AND SKIP NEXT PART OF TEST
044700  032777  040000  135616  2$:     BIT     #ERR,@RPDS      ;COMPOSITE ERROR SET?
044706  001407                  BEQ     3$              ;TAKE BRANCH IF NOT
044710  004737  017326                  JSR     PC,SAVRPR       ;GET THE REGISTER SNAPSHOT
044714  104456                  TRAP    C$ERHRD
044716  000623                  .WORD   403
044720  011747                  .WORD   EM1
044722  014652                  .WORD   ERR3
044724  000412                  BR      4$              ;AND TAKE EARLY EXIT
044726  032777  040000  135556  3$:     BIT     #TRE,@RPCS1     ;TRANSFER ERROR SET?
044734  001410                  BEQ     5$              ;IF ZERO, WE'RE OK
044736  004737  017326                  JSR     PC,SAVRPR       ;GET THE REGISTER SNAPSHOT
044742  104456                  TRAP    C$ERHRD
044744  000624                  .WORD   404
044746  012562                  .WORD   EM16
044750  014652                  .WORD   ERR3
044752  004737  016662          4$:     JSR     PC,SEIZE        ;PURGE REMAINING ERRORS
```

```
     49 044756                          5$:
        044756                          L10115:
        044756  104401                          TRAP    C$ETST
     50
```

```
                                .SBTTL  HARDWARE PARAMETER CODING SECTION

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

044760  000022                          .WORD L10116-L$HARD/2
044762                          L$HARD::
                                                                ;PRINT 'RPCS1 ADRS?'
044762  000031                          .WORD   T$CODE
044764  045026                          .WORD   MESG1
044766  160000                          .WORD   T$LOLIM
044770  177777                          .WORD   T$HILIM
                                                                ;PRINT 'VECTOR ADRS?'
044772  001031                          .WORD   T$CODE
044774  045041                          .WORD   MESG4
044776  000000                          .WORD   T$LOLIM
045000  000377                          .WORD   T$HILIM
                                                                ;PRINT 'BR LEVEL?'
045002  002032                          .WORD   T$CODE
045004  045055                          .WORD   MESG5
045006  000340                          .WORD   340
045010  000000                          .WORD   T$LOLIM
045012  000007                          .WORD   T$HILIM
                                                                ;PRINT 'DRIVE #?'
045014  003032                          .WORD   T$CODE
045016  045066                          .WORD   MESG6
045020  000007                          .WORD   7
045022  000000                          .WORD   T$LOLIM
045024  000007                          .WORD   T$HILIM
                                        .EVEN
045026                          L10116:

045026      122     120     103 MESG1:  .ASCIZ  /RPCS1 ADRS/
045041      126     105     103 MESG4:  .ASCIZ  /VECTOR ADRS/
045055      102     122     04. MESG5:  .ASCIZ  /BR LEVEL/
045066      104     122     111 MESG6:  .ASCIZ  /DRIVE #/

                                        .EVEN
```

```
                                .SBTTL  SOFTWARE PARAMETER CODING SECTION

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

045076  000022                          .WORD L10117-L$SOFT/2
045100                          L$SOFT::
                                                        ;PRINT 'EXECUTE TEST 25.,  MASSBUS INTERFACE SWITCH TEST  (L
045100  000130                          .WORD   T$CODE
045102  045144                          .WORD   MESG17
045104  000001                          .WORD   1
                                                        ;PRINT 'EXECUTE TEST 52., PRINT CONTENTS OF INTERNAL ERROR L
045106  001130                          .WORD   T$CODE
045110  045224                          .WORD   MESG18
045112  000001                          .WORD   1
                                                        ;PRINT 'SELECT A TRACK FOR THE RP07 INTERNAL RD-WRT TESTS (L
045114  002130                          .WORD   T$CODE
045116  045313                          .WORD   MESG20
045120  000001                          .WORD   1
                                                        ;GO TO 1$ IF NO
045122  006044                          .WORD   T$CODE
                                                        ;PRINT 'TRACK ADDRESS (D)  0 ?'
045124  003052                          .WORD   T$CODE
045126  045375                          .WORD   MESG21
045130  000037                          .WORD   37
045132  000000                          .WORD   T$LOLIM
045134  000037                          .WORD   T$HILIM
045136                          1$:                     ;PRINT 'EXECUTE TEST 60., SELECT A MICRO-DIAGNOSTIC FOR EXEC
045136  004130                          .WORD   T$CODE
045140  045413                          .WORD   MESG22
045142  000001                          .WORD   1


                                        .EVEN
045144                          L10117:

045144      105     130     105 MESG17::.ASCIZ  /EXECUTE TEST 25., MASSBUS INTERFACE SWITCH TEST/
045224      105     130     105 MESG18::.ASCIZ  /EXECUTE TEST 52., PRINT CONTENTS OF INTERNAL ERROR LOG/
045313      123     105     114 MESG20::.ASCIZ  /SELECT A TRACK FOR THE RP07 INTERNAL RD-WRT TESTS/
045375      124     122     101 MESG21::.ASCIZ  /TRACK ADDRESS/
045413      105     130     105 MESG22::.ASCIZ  /EXECUTE TEST 60., SELECT A MICRO-DIAGNOSTIC FOR EXECUTION/


                                        .EVEN

045506                          $PATCH::.BLKW   50.             ;PROGRAM PATCH AREA (50. WORDS)

                                        .EVEN
045652  045672                          .WORD T$FREE
045654  000006                          .WORD T$SIZE
045656                          L$LAST::
```

SOFTWARE PARAMETER CODING SECTION

```
      1
     14
     16 045656  000000                          .WORD   0
        045660  000004                          .WORD   L10122-./2-1
        045662                          L10120:
     17 045662  176700                          .WORD   176700
     18 045664  000254                          .WORD   254
     19 045666  000240                          .WORD   240
     20 045670  000000                          .WORD   0
     21 045672                          L10122:
     23         000001                          .END
```

SYMBOL TABLE

```
AD       011074 G    CONSET  020330      C$SPRI= 000041      EM17    012622 G    FRMT03  007404 G
ADR    = 000020 G    CPE    = 040000      C$SVEC= 000037      EM2     012015 G    FRMT04  007426 G
AOE    = 001000      CPU    = 020000      C$TPRI= 000013      EM20    012661 G    FRMT05  007474 G
ASSEMB= 000010       CR     = 000015 G    DCK    = 100000     EM21    012725 G    FRMT06  007545 G
ATA    = 100000      CREADY  015134       DCU    = 000040     EM22    012776 G    FRMT07  007574 G
ATABIT  002566 G     CRLF    006420 G      DECODE  020532      EM23    013051 G    FRMT10  007624 G
AT0    = 000001      CSTORE  002432 G      DESCYL  002416 G    EM24    013126 G    FRMT11  007655 G
AT1    = 000002      C$AU   = 000052       DESTRK  002414 G    EM25    013167 G    FRMT12  007713 G
AT2    = 000004      C$AUTO= 000061       DFPTBL  002320 G    EM26    013224 G    FRMT13  007756 G
AT3    = 000010      C$BRK  = 000022       DIAG   = 000035     EM27    013266 G    FRMT14  010004 G
AT4    = 000020      C$PSEG= 000004       DIAGEN  015312      EM3     012055 G    FRMT15  010031 G
AT5    = 000040      C$BSUB= 000002       DIAGLD  015352      EM30    013326 G    FRMT16  010070 G
AT6    = 000100      C$CEFG= 000045       DIAGMC= 000000      EM31    013362 G    FRMT17  010161 G
AT7    = 000200      C$CLCK= 000062       DIAGST  015260 G    EM32    013411 G    FRMT20  010202 G
A16    = 000400      C$CLEA= 000012       DLT    = 100000     EM33    013441 G    FRMT23  010271 G
A17    = 001000      C$CLOS= 000035       DMD    = 100000     EM34    013505 G    FRMT40  010337 G
BAI    = 000010      C$CLP1= 000006       DMPREG  016212      EM35    013564 G    FRMT41  010430 G
BELL   = 000007 G    C$CVEC= 000036       DPE    = 000010     EM36    013641 G    FRMT50  010510 G
BICEXP  017422 G     C$DCLN= 000044       DPR    = 000400     EM37    013701 G    FRMT51  010601 G
BISEXP  017372 G     C$DODU= 000051       DRCLR  = 000011     EM4     012100 G    FRMT60  010661 G
BITPOS  002400 G     C$DRPT= 000024       DRIVER  015146      EM40    013753 G    FRMT61  010753 G
BIT0   = 000001 G    C$DU   = 000053       DRQ    = 004000     EM41    014026 G    FRMT70  011035 G
BIT00  = 000001 G    C$EDIT= 000003       DRT0   = 000001     EM42    014075 G    FRMT71  011055 G
BIT01  = 000002 G    C$ERDF= 000055       DRT1   = 000002     EM43    014130 G    FUNCTN  002420 G
BIT02  = 000004 G    C$ERHR= 000056       DRT2   = 000004     EM5     012116 G    F$AU   = 000015
BIT03  = 000010 G    C$ERRO= 000060       DRT3   = 000010     EM6     012155 G    F$AUTO= 000020
BIT04  = 000020 G    C$ERSF= 000054       DRT4   = 000020     EM7     012217 G    F$BGN  = 000040
BIT05  = 000040 G    C$ERSO= 000057       DRT5   = 000040     ENDCYL  002374 G    F$CLEA= 000007
BIT06  = 000100 G    C$ESCA= 000010       DRT6   = 000100     ENDTRK  002370 G    F$DU   = 000016
BIT07  = 000200 G    C$ESEG= 000005       DRT7   = 000200     ERR    = 040000     F$END  = 000041
BIT08  = 000400 G    C$ESUB= 000003       DRT8   = 000400     ERRCK   017032      F$HARD= 000004
BIT09  = 001000 G    C$ETST= 000001       DRVBLT  011477 G    ERRDMP  002334      F$HW   = 000013
BIT1   = 000002 G    C$EXIT= 000032       DRVCLR  015400      ERRVEC= 000004      F$INIT= 000006
BIT10  = 002000 G    C$GETB= 000026       DRVNO   002506 G    ERRWD1  002404 G    F$JMP  = 000050
BIT11  = 004000 G    C$GETW= 000027       DRVSN   002510 G    ERRWD2  002406 G    F$MOD  = 000000
BIT12  = 010000 G    C$GMAN= 000043       DRY    = 000200     ERR0    014172 G    F$MSG  = 000011
BIT13  = 020000 G    C$GPHR= 000042       DS      011121 G    ERR1    014310 G    F$PROT= 000021
BIT14  = 040000 G    C$GPLO= 000030       DSE    = 020000     ERR2    014500 G    F$PWR  = 000017
BIT15  = 100000 G    C$GPRI= 000040       DSNMSG  006423 G    ERR3    014652 G    F$RPT  = 000012
BIT2   = 000004 G    C$INIT= 000011       DTE    = 010000     ERSTAT  002466 G    F$SEG  = 000003
BIT3   = 000010 G    C$INLP= 000020       DVA    = 004000     EVL    = 000004 G   F$SOFT= 000005
BIT4   = 000020 G    C$MANI= 000050       DVC    = 000200     EWN    = 000002     F$SRV  = 000010
BIT5   = 000040 G    C$MEM  = 000031       ECH    = 000100     EXPTED  002454 G    F$SUB  = 000002
BIT6   = 000100 G    C$MSG  = 000023       ECI    = 004000     E$END  = 002100     F$SW   = 000014
BIT7   = 000200 G    C$OPEN= 000034       EC.00   004354      E$LOAD= 000035      F$TEST= 000001
BIT8   = 000400 G    C$PNTB= 000014       EF.CON= 000036 G    FASTAT  002430 G    F1     = 000002
BIT9   = 001000 G    C$PNTF= 000017       EF.NEW= 000035 G    FATOF   002470 G    F2     = 000004
BLOWER  011361 G     C$PNTS= 000016       EF.PWR= 000034 G    FAULTS  016556      F3     = 000010
BOE    = 000400 G    C$PNTX= 000015       EF.RES= 000037 G    FER    = 000020     F4     = 000020
BSE    = 100000      C$QIO  = 000377       EF.STA= 000040 G    FLOAT   020034      F5     = 000040
BYTCNT  002410 G     C$RDBU= 000007       EM1     011747 G    FLST00  007273 G    GO     = 000001
CA       011151 G    C$REFG= 000047       EM11    012272 G    FLST01  007312 G    G$CNTO= 000200
CALMOD   016132      C$RESE= 000033       EM12    012342 G    FMT    = 010000     G$DELM= 000372
CLKSTA   002426 G    C$REVI= 000003       EM13    012410 G    FORTRK= 000063      G$DISP= 000003
CLR    = 000040      C$RFLA= 000021       EM14    012454 G    FRMT00  007161 G    G$EXCP= 000400
CMOD   = 100000      C$RPT  = 000025       EM15    012523 G    FRMT01  007214 G    G$HILI= 000002
COMPAR   020202      C$SEFG= 000046       EM16    012562 G    FRMT02  007315 G    G$LOLI= 000001
```

SYMBOL TABLE

```
G$NO  = 000000          J1      011161 G        L$EXP4  002064 G        L10034  025032          MCUTXT  002676 G
G$OFFS= 000400          J10     011236 G        L$EXP5  002066 G        L10035  025356          MDPE  = 000400
G$OFSI= 000376          J11     011243 G        L$HARD  044762 G        L10036  025536          MESG1   045026
G$PRMA= 000001          J12     011250 G        L$HIME  002120 G        L10037  025730          MESG10  006577 G
G$PRMD= 000002          J13     011255 G        L$HPCF  002016 G        L10040  026226          MESG11  006671 G
G$PRML= 000000          J14     011262 G        L$HPTP  002022 G        L10041  026524          MESG12  006763 G
G$RADA= 000140          J15     011267 G        L$HW    002320 G        L10042  027042          MESG13  011607 G
G$RADB= 000000          J16     011274 G        L$ICP   002104 G        L10043  027360          MESG14  011667 G
G$RADD= 000040          J17     011301 G        L$INIT  020652 G        L10044  027632          MESG15  007062 G
G$RADL= 000120          J2      011166 G        L$LADP  002026 G        L10045  030100          MESG17  045144 G
G$RADO= 000020          J20     011306 G        L$LAST  045656 G        L10046  030320          MESG18  045224 G
G$XFER= 000004          J21     011313 G        L$LOAD  002100 G        L10047  030512          MESG20  045313 G
G$YES = 000010          J3      011173 G        L$LUN   002074 G        L10050  030622          MESG21  045375 G
HCE   = 000200          J4      011200 G        L$MREV  002050 G        L10051  031014          MESG22  045413 G
HCI   = 002000          J5      011205 G        L$NAME  002000 G        L10052  031152          MESG4   045041
HCRC  = 000400          J6      011212 G        L$PRIO  002042 G        L10053  031320          MESG5   045055
HDA     011320 G        J7      011217 G        L$PROT  020644 G        L10054  031444          MESG6   045066
HELP  = 000000          J8      011224 G        L$PRT   002112 G        L10055  031576          MOH   = 020000
HERTZ   015750          J9      011231 G        L$REPP  002062 G        L10056  031734          MOL   = 010000
HOE   = 100000 G        KWSRV   016104          L$REV   002010 G        L10057  032134          MSGMOL  006452 G
IAE   = 002000          K1RELA  011443 G        L$RPT   020636 G        L10060  032300          MSGWLO  006522 G
IBE   = 010000 G        LASCYL  002376 G        L$SOFT  045100 G        L10061  032560          MSK     002450 G
IDU   = 000040 G        LASTRK  002372 G        L$SPC   002056 G        L10062  032716          MTD   = 040000
IE    = 000100          LBC   = 002000          L$SPCP  002020 G        L10063  033140          MTRBRK  011421 G
IER   = 020000 G        LBT   = 002000          L$SPTP  002024 G        L10064  033322          MXF   = 001000
ILEV  = 000004          LCE   = 001000          L$STA   002030 G        L10065  033452          NBA   = 100000
ILF   = 000001          LCLKTB  015740          L$SW    002332 G        L10066  033730          NED   = 010000
ILOCK   002460 G        LDZERO  017572          L$TEST  002114 G        L10067  034030          NEGWRD  002412 G
ILR   = 000002          LF    = 000012 G        L$TIML  002014 G        L10070  034316          NEM   = 004000
INTFLG  002462 G        LKS     015742          L$UNIT  002012 G        L10071  034422          NEXLOC  017252
INTSRV  020630 G        LKV     015744          L10000  00233C          L10072  034634          NOP   = 000015
IOBUFF  002730 G        LOCATE  017150          L10001  002344          L10073  035106          OCTHEX  015416
IR    = 000100          LOE   = 040000 G        L10002  014306          L10074  035204          OFFDIR= 000200
IRLOCK  017672          LOT   = 000010 G        L10003  014476          L10075  035322          OM    = 000001
ISR   = 000100 G        L$ACP   002110 G        L10004  014650          L10076  035500          ONEFIL= 000001
ITCOUN  002402 G        L$APT   002036 G        L10005  014676          L10077  035756          OPI   = 020000
IXE   = 004000 G        L$AU    021506 G        L10006  016130          L10100  036230          OPRPNL  011455 G
IXU   = 000100          L$AUT   002070 G        L10007  020634          L10101  036730          OR    = 000200
I$AU  = 000041          L$AUTO  021346 G        L10010  020642          L10102  037700          ORLOCK  017706
I$AUTO= 000041          L$CCP   002106 G        L10012  021344          L10103  040126          O$APTS= 000000
I$CLN = 000041          L$CLEA  021350 G        L10013  021346          L10104  040362          O$AU  = 000000
I$DU  = 000041          L$CO    002032 G        L10014  021476          L10105  040622          O$BGNR= 000000
I$HRD = 000041          L$[illegible]O  002011 G        L10015  021504          L10106  041154          O$BGNS= 000001
I$INIT= 000041          L$[illegible]   006362 G        L10016  021512          L10107  041674          O$DU  = 000000
I$MOD = 000041          L$DESP  002076 G        L10017  021610          L10110  044002          O$ERRT= 000000
I$MSG = 000041          L$DEVP  002060 G        L10020  021776          L10111  043026          O$GNSW= 000001
I$PROT= 000040          L$DISP  002124 G        L10021  022140          L10112  043644          O$POIN= 000001
I$PTAB= 000041          L$DLY   002116 G        L10022  022300          L10113  044320          O$SETU= 000001
I$PWR = 000041          L$DTP   002040 G        L10023  022442          L10114  044612          PAR   = 000010
I$RPT = 000041          L$DTYP  002034 G        L10024  022772          L10115  044756          PAT   = 000020
I$SEG = 000041          L$DU    021500 G        L10025  023266          L10116  045026          PATCNT  002434 G
I$SETU= 000041          L$DUT   002072 G        L10026  023440          L10117  045144          PATT1   002344 G
I$SFT = 000041          L$DVTY  006354 G        L10027  023600          L10120  045662          PATT2   002346 G
I$SRV = 000041          L$EF    002052 G        L10030  023770          L10122  045672          PATT3   002350 G
I$SUB = 000041          L$ENVI  002044 G        L10031  024150          MASK    002446 G        PATT4   002352 G
I$TST = 000041          L$ETP   002102 G        L10032  024332          MCPE  = 020000          PATT5   002354 G
J$JMP = 000167          L$EXP1  002046 G        L10033  024506          MCUTAB  004060 G        PATT6   002356 G
```

SYMBOL TABLE

```
PATT7   002360 G    RPDS    002524 G    S$LSYM= 010000      T$$DU = 010015      T45     034636 G
PATT8   002362 G    RPDT    002540 G    TABADD  002366 G    T$$HAR= 010116      T46     035110 G
PATT9   002364 G    RPEC1   002556 G    TAP   = 040000      T$$HW = 010000      T47     035206 G
PCLKTB  015724      RPEC2   002560 G    TEMP    002436 G    T$$INI= 010012      T48     035324 G
PGE   = 100000      RPER1   002526 G    TERM    011325 G    T$$MSG= 010005      T49     035502 G
PGM   = 001000      RPER2   002552 G    TESTRG  002456 G    T$$PC = 000001      T5      022302 G
PHF   = 000400      RPER3   002554 G    TRAKAD  002340      T$$PRO= 010011      T50     035760 G
PIP   = 020000      RPLA    002532 G    TRE   = 040000      T$$PTA= 010121      T51     036232 G
PKB     015730      RPMR1   002536 G    TST03   004160 G    T$$RPT= 010010      T52     036732 G
PKC     015732      RPOF    002544 G    TST04   004172 G    T$$SEG= 010001      T53     037702 G
PKCS    015726      RPSN    002542 G    TST05   004204 G    T$$SOF= 010117      T54     040130 G
PKV     015734      RPVEC   002476 G    TST08   004216 G    T$$SRV= 010007      T55     040364 G
PNT   = 001000 G    RPWC    002514 G    TST11   004232 G    T$$SUB= 010112      T56     040624 G
PRELOD  017722      RTD   = 000075      TST12   004244 G    T$$SW = 010001      T57     041156 G
PRI   = 002000 G    RWU1  = 002000      TST28   004256 G    T$$TES= 010115      T58     041676 G
PRI00 = 000000 G    RWU2  = 004000      TST33   004272 G    T1      021514 G    T58.1   042030
PRI01 = 000040 G    RWU3  = 010000      TST34   004302 G    T10     023602 G    T58.2   043030
PRI02 = 000100 G    SAVRPR  017326      TST49   004330 G    T11     023772 G    T59     044004 G
PRI03 = 000140 G    SBE   = 000004      T$ARG = 000001      T12     024152 G    T6      022444 G
PRI04 = 000200 G    SC    = 100000      T$CODE= 004130      T13     024334 G    T60     044322 G
PRI05 = 000240 G    SCF   = 000002      T$ERRN= 000624      T14     024510 G    T61     044614 G
PRI06 = 000300 G    SC1   = 000100      T$EXCP= 000000      T15     025034 G    T7      022774 G
PRI07 = 000340 G    SC16  = 002000      T$FLAG= 000040      T16     025360 G    T8      023270 G
PSEL  = 002000      SC2   = 000200      T$FREE= 045672      T17     025540 G    T9      023442 G
PSTACK  002652 G    SC32  = 004000      T$GMAN= 000000      T18     025732 G    UAM   = 000200 G
PTRANS  011376 G    SC4   = 000400      T$HILI= 000037      T19     026230 G    UNABLE  002464 G
RCVED   002452 G    SC64  = 010000      T$LAST= 000001      T2      021612 G    UNIT    002472 G
RDDTA = 000071      SC8   = 001000      T$LOLI= 000000      T20     026526 G    UNS   = 040000
RDHDTA= 000073      SDF   = 000020      T$LSYM= 010000      T21     027044 G    UPE   = 020000
RDY   = 000200      SEARCH= 000031      T$LTNO= 000075      T22     027362 G    US1   = 000001
READTD  011531 G    SEEK  = 000005      T$NEST= 177777      T23     027634 G    US2   = 000002
READY   015122      SEIZE   016662      T$NS0 = 000000      T24     030102 G    US4   = 000004
RECAL = 000007      SELNUM  002424 G    T$NS1 = 000005      T25     030322 G    VV    = 000100
REG     002576 G    SFLRUN  002342      T$NS2 = 000003      T26     030514 G    WAIT    017000
REGSET  017452      SELTRK  002336      T$NS3 = 000003      T27     030624 G    WAITMS  016756
RELEAS= 000013      SENSOR  011341 G    T$PCNT= 000000      T28     031016 G    WATDRY  020372
RESET   017474      SETUP   017744      T$PTAB= 010121      T29     031154 G    WATIME  016776
RH      011132 G    SFPTBL  002332 G    T$PTHV= 000001      T3      022000 G    WCE   = 040000
RHEXT   002502 G    SIZE70  014700      T$PTNU= 000001      T30     031322 G    WCF   = 000040
RHTYPE  002504 G    SKI   = 040000      T$SAVL= 177777      T31     031446 G    WCKD  = 000051
RIP   = 000021      SNDIGT  006447 G    T$SEGL= 177777      T32     031600 G    WCKHD = 000053
RMR   = 000004      SNK     002440 G    T$SEK0= 010001      T33     031736 G    WLE   = 004000
ROUTDO  002422 G    SPIRAL  017266      T$SEK1= 010003      T34     032136 G    WOR   = 001000
RPADR   002474 G    SRC     002442 G    T$SIZE= 000006      T35     032302 G    WRDTA = 000061
RPARDY  015042      SRCTMP  002444 G    T$SUBN= 000000      T36     032562 G    WRL   = 004000
RPAS    002530 G    STOPCK  016054      T$TAGL= 177777      T37     032720 G    WRTD  = 000065
RPBA    002516 G    ST.CLK  015550      T$TAGN= 010123      T38     033142 G    WRU   = 000400
RPBAE   002562 G    ST.LCL  016016      T$TEMP= 000000      T39     033324 G    WTCKD   011566 G
RPCC    002550 G    ST.PCL  015752      T$TEST= 000075      T4      022142 G    WTCKHD  011543 G
RPCS1   002512 G    SVCGBL= 000000      T$TSTM= 177777      T40     033454 G    X$ALWA= 000000
RPCS2   002522 G    SVCINS= 000000      T$TSTS= 000001      T41     033732 G    X$FALS= 000040
RPCS3   002564 G    SVCSUB= 000000      T$$AU = 010016      T42     034032 G    X$OFFS= 000400
RPDA    002520 G    SVCTAG= 000000      T$$AUT= 010013      T43     034320 G    X$TRUE= 000020
RPDB    002534 G    SVCTST= 000000      T$$CLE= 010014      T44     034424 G    $PATCH  045506 G
RPDC    002546 G    SWTTST  002332      T$$DAT= 010122

. ABS.  045672      000
```

SYMBOL TABLE

000000 001
ERRORS DETECTED: 0

VIRTUAL MEMORY USED: 32256 WORDS (126 PAGES)
DYNAMIC MEMORY AVAILABLE FOR 70 PAGES
CZRJMA.BIC,CZRJMA/C=[20,0]SVC34R.MLB,[20,12]CZRJMA.DOC,CZRJMA.HIS,CZRJMA

CROSS REFERENCE TABLE (CREF V04.00)

CROSS REFERENCE TABLE (CREF V04.00)

	71-32	73-36	78-22	79-34	79-44	80-36	80-54	81-21	82-26	84-56	85-30	91-88	93-142	93-151
	93-192	93-212	93-229											
BIT13	11-57#	14-139	14-258	14-270	14-290	14-424	14-430	14-432	14-434	14-446	14-448	14-450	14-452	14-454
	14-456	14-458	14-460	14-462	14-466	93-142	93-151	93-192	93-212	93-229				
BIT14	11-57#	14-199	14-258	14-290	14-434	14-446	14-448	14-466	14-468	14-470	14-498	93-143	93-145	
BIT15	11-57#	14-139	14-258	14-290	14-466	14-470	14-486	14-488	14-490	14-492	14-494	14-496	14-498	14-500
	14-502	14-504	20-25	93-148										
BIT2	11-57#	14-68	14-219	55-28	55-28	55-28	58-20	60-45	61-25	62-36	63-29	64-23	65-32	67-18
	68-16	70-62	71-33	73-37	81-22	82-27	84-57	85-31	91-89	92-66	92-86	92-105	92-109	93-116
	93-152	93-193	93-213	93-230	93-335	94-56								
BIT3	11-57#	14-60	14-62	14-64	14-66	14-86	14-88	14-90	14-92	14-94	14-96	14-98	14-100	14-142
	14-144	14-146	14-148	14-150	14-152	14-154	14-156	14-162	14-164	14-166	14-168	14-170	14-172	14-174
	14-176	14-178	14-180	14-182	14-184	14-186	14-188	14-190	14-192	14-194	14-196	14-198	14-200	14-202
	14-206	14-208	14-210	14-214	14-230	14-232	14-234	14-236	14-394	56-31	56-31	56-31	61-25	
BIT4	11-57#	14-60	14-62	14-64	14-66	14-84	14-88	14-92	14-98	14-100	14-142	14-144	14-146	14-148
	14-150	14-152	14-154	14-156	14-158	14-160	14-166	14-168	14-170	14-176	14-180	14-182	14-184	14-186
	14-188	14-190	14-192	14-194	14-196	14-198	14-200	14-204	14-206	14-210	14-222	14-224	14-226	14-228
	14-230	14-238	14-240	14-242	14-244	14-246	14-248	14-250	14-252	14-254	14-256	14-284	14-286	14-288
	14-390	14-392	14-394	14-396	14-398	14-400	14-402	60-45	78-23	81-22				
BIT5	11-57#	14-60	14-62	14-64	14-66	14-69	14-86	14-90	14-94	14-96	14-138	14-140	14-142	14-144
	14-146	14-148	14-154	14-162	14-166	14-168	14-170	14-172	14-176	14-200	14-202	14-206	14-208	14-210
	14-212	14-214	14-222	14-224	14-226	14-228	14-282	14-400						
BIT6	11-57#	14-38	14-40	14-42	14-44	14-46	14-48	14-50	14-52	14-54	14-56	14-58	14-70	14-72
	14-74	14-76	14-78	14-80	14-82	14-84	14-126	14-128	14-130	14-132	14-136	14-138	14-198	14-206
	14-209	14-222	14-224	14-230	14-258	14-262	14-268	14-304	14-376	14-480	86-19	92-65	92-108	93-115
	94-55													
BIT7	11-57#	14-61	14-63	14-65	14-67	14-138	14-139	14-141	14-143	14-145	14-147	14-149	14-155	14-167
	14-169	14-171	14-177	14-198	14-201	14-207	14-216	14-218	14-258	14-259	14-260	14-264	14-268	14-270
	14-276	14-280	14-282	14-290	14-291	14-296	14-300	14-304	14-310	14-312	14-314	14-316	14-318	14-336
	14-338	14-376	14-378	14-474	14-488	14-489	14-491	14-493	14-495	14-499	14-501	61-24	63-28	64-22
	65-31	66-17	67-17	68-15	69-21	70-58	85-30	86-19	92-65	92-108	93-115	94-55		
BIT8	11-57#	14-84	14-102	14-108	14-206	14-208	14-258	14-264	14-266	14-268	14-270	14-272	14-274	14-276
	14-292	14-422	14-424	14-428	14-432	14-442	14-474	58-20	60-45	61-25	62-36	63-29	64-23	65-32
	67-18	68-15	72-43	73-37	75-41	77-38	77-42	81-22	82-27	84-57	85-31	91-89	92-65	92-66
	92-85	92-86	92-104	92-105	92-108	93-115	93-116	93-151	93-152	93-192	93-193	93-212	93-213	93-229
	93-230	93-334	93-335	94-55	94-56									
BIT9	11-57#	14-102	14-104	14-106	14-108	14-110	14-112	14-114	14-116	14-118	14-120	14-122	14-124	14-132
	14-139	14-258	14-263	14-264	14-266	14-268	14-270	14-272	14-274	14-290	14-292	14-422	14-424	14-426
	14-428	14-430	14-432	14-434	14-438	14-448	14-470	14-472	14-498	72-43	75-41	77-38	77-42	91-88
	92-65	92-85	92-104	92-108	93-115	93-151	93-192	93-212	93-229	94-55				
BITPOS	13-23#	18-14	18-21	30-74*	30-75*	79-29	80-30							
BLOWER	13-134	16-30#												
BOE	11-57#													
BSE	12-181#													
BYTCNT	13-27#													
C$AU	7-373#	34-35												
C$AUTO	7-373#	31-18												
C$BRK	7-373#	18-33	18-44	24-36	24-48									
C$BSEG	7-373#	37-21	37-33	38-21	38-21	38-21	38-21	39-22	39-22	39-22	39-22	40-21	40-21	40-21
	40-21	41-38	41-39	41-50	42-35	42-36	43-42	43-42	43-42	43-42	44-31	45-31	45-34	46-31
	47-27	47-27	47-27	47-27	48-25	48-25	48-25	48-25	49-28	49-46	49-59	49-70	50-30	50-48
	50-61	50-72	51-24	51-35	52-24	52-37	53-29	53-29	53-29	54-28	54-28	54-28	55-28	55-28
	55-28	56-31	56-31	56-31	57-21	57-34	58-22	58-35	59-16	60-37	61-17	62-15	63-17	64-25
	64-25	64-25	64-25	65-20	66-14	67-21	68-20	69-25	69-25	69-25	69-25	70-36	71-19	72-20
	73-15	74-19	75-23	76-14	77-30	78-15	79-24	80-26	81-14	82-16	83-23	86-24	86-38	86-55
	86-75	88-30	89-25	90-25	91-54	92-52	92-69	92-90	93-106	93-120	93-197	93-238	93-321	94-32

CROSS REFERENCE TABLE (CREF V04.00)

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        94-53    95-72
C$BSUB   7-373#  93-105   93-227
C$CEFG   7-373#
C$CLCK   7-373#  20-101   20-120
C$CLEA   7-373#  32-57
C$CLOS   7-373#
C$CLP1   7-373#
C$CVEC   7-373#  32-26    32-29    32-31    36-64    57-49    58-47    59-37
C$DCLN   7-373#
C$DODU   7-373#
C$DRPT   7-373#
C$DU     7-373#  33-34
C$EDIT   7-373#   7-427
C$ERDF   7-373#  22-21
C$ERHR   7-373#  18-20    23-101   24-26    25-69    25-106   36-67    37-30    37-41    41-47    41-57    41-65    41-72    41-81
        42-45    42-57    42-65    44-43    45-48    46-48    49-35    49-42    49-55    49-66    49-79    50-37    50-44    50-57
        50-68    50-81    51-31    51-42    52-33    52-44    53-29    53-29    53-29    53-29    54-28    54-28    54-28    54-28
        55-28    55-28    55-28    55-28    56-31    56-31    56-31    56-31    57-29    57-40    58-31    58-41    59-31    60-46
        61-26    62-37    63-30    65-33    66-29    70-66    71-34    72-44    73-38    74-34    74-36    75-43    75-61    76-24
        77-67    78-24    79-36    79-46    80-38    80-45    80-56    81-23    82-28    83-34    84-58    85-42    86-34    86-49
        86-65    86-85    88-35    89-50    90-46    91-90    92-67    92-87    92-106   92-110   93-117   93-156   93-194   93-217
        93-222   93-248   93-264   93-276   93-285   93-303   93-309   93-336   94-51    94-66    95-77    96-37    96-42    96-47
C$ERRO   7-373#
C$ERSF   7-373#
C$ERSO   7-373#
C$ESCA   7-373#
C$ESEG   7-373#  37-32    37-43    38-21    38-21    38-21    38-21    39-22    39-22    39-22    39-22    40-21    40-21    40-21
        40-21    41-49    41-59    41-83    42-47    42-67    43-42    43-42    43-42    43-42    44-47    45-52    45-58    46-50
        47-27    47-27    47-27    47-27    48-25    48-25    48-25    48-25    49-45    49-58    49-69    49-82    50-47    50-60
        50-71    50-84    51-34    51-45    52-36    52-47    53-29    53-29    53-29    54-28    54-28    54-28    55-28    55-28
        55-28    56-31    56-31    56-31    57-31    57-42    58-33    58-43    59-33    60-47    61-28    62-39    63-32    64-25
        64-25    64-25    64-25    65-38    66-33    67-38    68-48    69-25    69-25    69-25    69-25    70-68    71-36    72-46
        73-40    74-38    75-63    76-26    77-69    78-26    79-48    80-58    81-25    82-30    83-36    86-37    86-52    86-68
        86-88    88-39    89-52    90-48    91-92    92-68    92-89    92-112   93-119   93-196   93-225   93-315   93-338   94-52
        94-75    95-81
C$ESUB   7-373#  93-226   93-320
C$ETST   7-373#  36-71    37-46    38-24    39-25    40-24    41-86    42-70    43-46    44-50    45-61    46-53    47-30    48-28
        49-85    50-87    51-49    52-51    53-30    54-29    55-29    56-32    57-50    58-48    59-40    60-56    61-31    62-42
        63-35    64-28    65-41    66-36    67-41    68-51    69-28    70-72    71-39    72-50    73-43    74-41    75-66    76-29
        77-72    78-29    79-51    80-61    81-28    82-33    83-40    84-64    85-74    86-100   87-115   88-72    89-56    90-52
        91-95    92-113   93-339   94-76    95-83    96-49
C$EXIT   7-373#  30-20    30-126   32-42    41-34    46-27    47-21    48-21    49-49    49-73    50-51    50-75    52-20    53-29
        54-28    55-28    56-31    58-32    60-28    60-31    60-36    77-52    83-22    87-26    89-24    90-24    91-51    92-51
        93-93    93-101   94-41    95-36    95-41
C$GETB   7-373#
C$GETW   7-373#
C$GMAN   7-373#  60-33    60-49    95-44
C$GPHR   7-373#  30-37
C$GPLO   7-373#
C$GPRI   7-373#
C$INIT   7-373#  30-141
C$INLP   7-373#
C$MANI   7-373#  60-29    95-39
C$MEM    7-373#
C$MSG    7-373#  16-105   16-124   16-136   16-142
C$OPEN   7-373#
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CROSS REFERENCE TABLE (CREF V04.00)

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C$PNTB    7-373#  16-99   16-100  16-104  16-112  16-117  16-123  16-128  16-129  16-130  16-132  16-135  16-141  21-9
         21-12    21-18   93-249  93-304
C$PNTF    7-373#  26-17   26-26   30-27   30-82   30-95   30-100  77-47   83-18   87-45   87-52   87-58   87-64   87-70
         87-76    87-82   87-89   87-91   87-96   87-106  87-112  89-20   90-20   91-47   92-47   93-92   93-97   93-138
         93-139   94-37   95-43
C$PNTS    7-373#
C$PNTX    7-373#  20-218  20-219  20-221  20-222  20-224  20-225  20-229  20-230
C$QIO     7-373#
C$RDBU    7-373#
C$REFG    7-373#  30-12   30-16   30-22
C$RESE    7-373#   7-373#  30-10
C$REVI    7-373#   7-427
C$RFLA    7-373#
C$RPT     7-373#  28-75
C$SEFG    7-373#
C$SPRI    7-373#  32-18   47-26   51-23   51-48   52-26   52-50   57-35   58-36   59-26   59-39
C$SVEC    7-373#  20-154  20-161  36-62   57-32   58-34   59-15
C$TPRI    7-373#
CA       13-126   16-6#
CALMOD   16-119   20-193#
CLKSTA   13-35#   20-98*  20-116*  20-131*  20-169  32-22
CLR      12-30#   22-9    23-94   30-71   32-20   37-35   41-40   41-74   46-32   49-60   50-62   51-36   52-38   53-29
         54-28    55-28   56-31   57-46   58-24   58-44   59-18   59-34   63-18   70-39   75-45
CMOD     12-156#  91-64   92-53   93-128  93-187  93-207  93-325
COMPAR   25-87#   38-21   38-21   39-22   39-22   40-21   40-21   43-42   43-42   47-27   47-27   48-25   48-25   64-25
         64-25    67-24   68-44   69-25   69-25
CONSET   25-118#  38-21   39-22   40-21   43-42   47-27   48-25   64-25   69-25
CPE      12-192#
CPU      12-191#
CR       15-12
CREADY   18-44#   18-46   19-26
CRLF     15-39#   16-104  16-123  16-132  16-135  16-141  21-18   30-27   30-100  87-96   87-112
CSTORE   13-37#   25-30*  25-52   25-76*  25-78*  25-120*  91-55*  91-69*  91-83
DCK      12-93#
DCU      12-173#
DECODE   16-98    16-120  16-127  27-10#
DESCYL   13-30#   19-17   23-20   23-22*  91-57*  92-40*  92-41*  93-103*  93-104*  93-141  93-165  94-57*
DESTRK   13-29#   19-18   23-16   23-18*  23-23*  91-58*  92-42*  93-102*  93-127*  93-136  93-158*  93-159  93-228*  93-296*
         94-58*   94-59*  94-68*  94-69*
DFPTBL    9-9#
DIAG     12-212#  19-14   19-21   19-41   20-12   20-26   32-14   86-18   87-29
DIAGEN   20-9#    32-16   86-99   87-114  88-71   95-82
DIAGLD   20-24#   22-115  87-36   88-31   95-73
DIAGMC    7-373    7-373
DIAGST   19-39#   87-33   88-27   95-70
DLT      12-40#
DMD      12-98#   70-38   70-41   70-45   70-47   70-65   88-38   92-54   92-91   93-108  95-80
DMPREG   16-101   16-118  16-139  20-217#
DPE      12-171#
DPR      12-66#
DRCLR    12-207#  20-9    70-46   77-54   88-36   95-78
DRIVER   19-12#   19-42   20-10   20-13   20-27   86-26   86-41   86-57   86-77   88-37   91-68   92-58   92-72   92-93
         93-109   93-131  93-188  93-210  93-242  93-257  93-290  93-323  93-328  94-44   94-61   94-71   95-79
DRQ      12-128#  63-22   63-24
DRT0     12-119#
DRT1     12-120#
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CROSS REFERENCE TABLE (CREF V04.00)

CROSS REFERENCE TABLE (CREF V04.00)

EM34	16-73#	93-276												
EM35	16-74#	88-35	95-77											
EM36	16-75#	84-58												
EM37	16-76#	93-156												
EM4	16-47#													
EM40	16-78#	93-248												
EM41	16-79#	93-194												
EM42	16-80#	74-34												
EM43	16-81#	18-20												
EM5	16-48#	42-57												
EM6	16-49#	42-65												
EM7	16-50#													
ENDCYL	13-21#	30-60												
ENDTRK	13-19#	30-59												
ERR	12-72#	22-61	22-66	74-21	74-25	75-35	75-39	75-53	75-57	76-21	77-36	77-41	77-55	77-61
	77-65	83-27	83-31	91-70	92-80	92-84	92-100	96-39						
ERRC	16-96#	23-101	24-26	25-69	25-106	37-30	37-41	41-47	41-57	41-65	41-72	41-81	42-45	42-57
	42-65	44-43	45-48	46-48	49-35	49-42	49-55	49-66	49-79	50-37	50-44	50-57	50-68	50-81
	51-31	51-42	52-33	52-44	53-29	53-29	53-29	54-28	54-28	54-28	55-28	55-28	55-28	56-31
	56-31	56-31	57-29	58-31	58-41	60-46	61-26	62-37	63-30	65-33	66-29	70-66	71-34	72-44
	73-38	74-34	74-36	75-43	75-61	76-24	77-67	78-24	79-36	79-46	80-38	80-45	80-56	81-23
	82-28	83-34	84-58	85-42	86-34	86-49	86-65	86-85	89-50	90-46	91-90	92-67	92-87	92-106
	92-110	93-117	93-194	93-222	93-248	93-264	93-285	93-309	93-336	94-51	94-66			
ERR1	16-107#	18-20	88-35	95-77										
ERR2	16-126#	93-156	93-217	93-276	93-303									
ERR3	16-138#	96-37	96-42	96-47										
ERRCK	22-60#	93-112	93-189	93-219	93-243	93-291	93-306							
ERRDMP	10-11#	87-21												
ERRVEC	17-10	17-13	17-14*	17-41*										
ERRWD1	13-25#	20-199*	20-205*	27-10	30-64*	32-9*	37-28*	38-19*	39-19*	40-18*	41-35*	42-32*	43-39*	44-28*
	45-28*	46-28*	47-22*	48-22*	49-26*	50-27*	51-19*	52-21*	53-29*	54-28*	55-28*	56-31*	57-18*	58-19*
	60-44*	61-24*	62-35*	63-28*	64-22*	65-31*	66-27*	67-17*	68-15*	69-21*	70-52*	70-58*	70-60*	71-32*
	72-39*	72-43*	73-36*	74-27*	75-41*	75-59*	76-22*	77-38*	77-42*	77-66*	78-22*	79-34*	79-44*	80-36*
	80-54*	81-21*	82-26*	83-32*	84-56*	85-30*	86-19*	89-48*	90-44*	91-88*	92-65*	92-85*	92-104*	92-108*
	93-115*	93-151*	93-192*	93-212*	93-229*	93-334*	94-47*	94-55*	96-26*					
ERRWD2	13-26#	20-200*	20-206*	30-65*	32-10*	37-29*	38-18*	39-20*	40-19*	41-36*	42-33*	43-40*	44-29*	45-29*
	46-29*	47-23*	48-23*	49-25*	50-28*	51-20*	52-22*	53-29*	54-28*	55-28*	56-31*	57-19*	58-20*	60-45*
	61-25*	62-36*	63-29*	64-23*	65-32*	66-28*	67-18*	68-16*	69-22*	70-55*	70-62*	71-33*	72-40*	73-37*
	74-26*	75-42*	75-60*	76-23*	77-34*	78-23*	79-35*	79-45*	80-37*	80-55*	81-22*	82-27*	83-33*	84-57*
	85-31*	86-20*	89-49*	90-45*	91-89*	92-66*	92-86*	92-105*	92-109*	93-116*	93-152*	93-193*	93-213*	93-230*
	93-335*	94-48*	94-56*	96-27*										
ERSTAT	13-51#	22-60*	22-74*	30-69*	32-11*	70-34*	70-43*	70-49*	70-50	70-53	70-56	70-69*	72-26*	72-31*
	72-35*	72-36	72-41	72-47*	93-113	93-190	93-220	93-244	93-292	93-307				
EVL	11-57#													
EWN	12-62#													
EXPTED	13-46#	16-100	16-130	22-65*	22-66*	22-72*	22-73*	22-99*	23-61*	23-68*	23-75*	23-98*	23-100*	24-22*
	24-23*	24-24	25-54*	25-92*	37-27*	37-38*	44-27*	44-34	44-39	45-47*	60-43*	61-22*	62-27*	62-32
	63-21*	63-24*	63-25	70-64*	71-22*	72-25*	73-35*	75-51*	78-19*	79-29*	79-30	79-38	79-39*	80-30*
	80-32	80-47*	80-48	80-49*	80-50	84-55*	85-41*	85-70*	86-31*	86-32*	86-46*	86-47*	86-62*	86-63*
	86-82*	86-83*	90-34*	91-53*	91-81	92-62*	92-97*	93-154*	93-272*	93-331*	94-49*	94-64*		
F$AU	7-373#	34-9	34-35											
F$AUTO	7-373#	31-10	31-18											
F$BGN	7-373#	7-399	10-26	11-51	16-96	16-107	16-126	16-138	20-179	27-39	27-43	28-40	28-46	29-8
	30-8	30-20	30-126	31-10	32-8	32-42	33-8	34-9	34-36	36-38	36-60	36-71	37-19	37-21
	37-33	37-46	38-17	38-21	38-21	38-21	38-21	38-24	39-18	39-22	39-22	39-22	39-22	39-25
	40-17	40-21	40-21	40-21	40-21	40-24	41-31	41-34	41-38	41-39	41-50	41-86	42-31	42-35

	42-36	42-70	43-37	43-42	43-42	43-42	43-42	43-46	44-26	44-31	44-50	45-26	45-31	45-34
	45-61	46-24	46-27	46-31	46-53	47-18	47-21	47-27	47-27	47-27	47-27	47-30	48-18	48-21
	48-25	48-25	48-25	48-25	48-28	49-24	49-28	49-46	49-49	49-59	49-70	49-73	49-85	50-26
	50-30	50-48	50-51	50-61	50-72	50-75	50-87	51-18	51-24	51-35	51-49	52-17	52-20	52-24
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	93-321	93-339	94-31	94-32	94-41	94-53	94-76	95-30	95-36	95-41	95-72	95-83	96-25	96-49
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F$DU	7-373#	33-8	33-34											
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	28-60	28-75	30-20	30-126	30-141	31-18	32-42	32-57	33-19	33-34	34-20	34-35	34-36	36-38
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	41-86	42-31	42-31	42-31	42-67	42-70	42-70	43-37	43-37	43-37	43-42	43-42	43-42	43-46
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	49-49	49-58	49-69	49-73	49-82	49-85	49-85	50-26	50-26	50-26	50-47	50-51	50-60	50-71
	50-75	50-84	50-87	50-87	51-18	51-18	51-18	51-34	51-45	51-49	51-49	52-17	52-17	52-17
	52-20	52-36	52-47	52-51	52-51	53-28	53-28	53-28	53-29	53-29	53-29	53-29	53-30	53-30
	54-27	54-27	54-27	54-28	54-28	54-28	54-28	54-29	54-29	55-27	55-27	55-27	55-28	55-28
	55-28	55-28	55-29	55-29	56-30	56-30	56-30	56-31	56-31	56-31	56-31	56-32	56-32	57-17
	57-17	57-17	57-31	57-42	57-50	57-50	58-18	58-18	58-18	58-32	58-33	58-43	58-48	58-48
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	67-38	67-41	67-41	68-14	68-14	68-14	68-48	68-51	68-51	69-20	69-20	69-20	69-25	69-25
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	76-26	76-29	76-29	77-28	77-28	77-28	77-52	77-69	77-72	77-72	78-13	78-13	78-13	78-26
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	83-13	83-22	83-36	83-40	83-40	84-18	84-18	84-18	84-64	84-64	85-25	85-25	85-25	85-74
	85-74	86-16	86-16	86-16	86-37	86-52	86-68	86-88	86-100	86-100	87-20	87-20	87-20	87-26
	87-115	87-115	88-24	88-24	88-24	88-39	88-72	88-72	89-15	89-15	89-15	89-24	89-52	89-56
	89-56	90-15	90-15	90-15	90-24	90-48	90-52	90-52	91-42	91-42	91-42	91-51	91-92	91-95
	91-95	92-39	92-39	92-39	92-51	92-68	92-89	92-112	92-113	92-113	93-87	93-87	93-87	93-93
	93-101	93-105	93-105	93-119	93-196	93-225	93-226	93-226	93-227	93-227	93-315	93-320	93-320	93-338
	93-339	93-339	94-31	94-31	94-31	94-41	94-52	94-75	94-76	94-76	95-30	95-30	95-30	95-36
	95-41	95-81	95-83	95-83	96-25	96-25	96-25	96-49	96-49	96-51	97-42	97-61	98-33	98-64
	99-15	99-16	99-21	99-22										

CROSS REFERENCE TABLE (CREF V04.00)

CROSS REFERENCE TABLE (CREF V04.00)

CROSS REFERENCE TABLE (CREF V04.00)

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I$HRD    97-52#   97-61#
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I$PROT    7-373#  29-8#
I$PTAB    7-373#  99-16   99-16#  99-21   99-21#
I$PWR     7-373#
I$RPT     7-373#  28-46#  28-75#
I$SEG     7-373#  36-60   37-19   37-21#  37-32#  37-33#  37-43#  38-17   38-21#  38-21#  38-21#  38-21#  38-21#  38-21#  38-21#
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CROSS REFERENCE TABLE (CREF V04.00)

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	72-50	72-50#	72-50#	73-13	73-13#	73-43	73-43#	73-43#	74-17	74-17#	74-41	74-41#	74-41#	75-21
	75-21#	75-66	75-66#	75-66#	76-12	76-12#	76-29	76-29#	76-29#	77-28	77-28#	77-52	77-72	77-72#
	77-72#	78-13	78-13#	78-29	78-29#	78-29#	79-22	79-22#	79-51	79-51#	79-51#	80-24	80-24#	80-61
	80-61#	80-61#	81-12	81-12#	81-28	81-28#	81-28#	82-14	82-14#	82-33	82-33#	82-33#	83-13	83-13#
	83-22	83-40	83-40#	83-40#	84-18	84-18#	84-64	84-64#	84-64#	85-25	85-25#	85-74	85-74#	85-74#
	86-16	86-16#	86-100	86-100#	86-100#	87-20	87-20#	87-26	87-115	87-115#	87-115#	88-24	88-24#	88-72
	88-72#	88-72#	89-15	89-15#	89-24	89-56	89-56#	89-56#	90-15	90-15#	90-24	90-52	90-52#	90-52#
	91-42	91-42#	91-51	91-95	91-95#	91-95#	92-39	92-39#	92-51	92-113	92-113#	92-113#	93-87	93-87#
	93-93	93-101	93-105	93-227	93-339	93-339#	93-339#	94-31	94-31#	94-41	94-76	94-76#	94-76#	95-30
	95-30#	95-36	95-41	95-83	95-83#	95-83#	96-25	96-25#	96-49	96-49#	96-49#			
IAE	12-88#	92-60	92-62	94-62	94-64	94-72								
IBE	11-57#													
IDU	11-57#													
IE	12-5#	51-25	51-26	51-30	51-37	51-41	52-27	52-28	52-32	52-39	52-43	57-36	58-37	59-27
IER	11-57#													
ILEV	12-63#	93-171												
ILF	12-78#	71-27	71-29	72-28	72-30	94-45	94-49							
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ILR	12-79#													
INTFLG	13-49#	27-40*	30-67*	57-22*	57-38	58-23*	58-39	59-17*	59-29					
INTSRV	27-39#	57-32	58-34	59-15										
IOBUFF	13-104#	93-157	93-184	93-199	93-208	93-233	93-239	93-252	93-255	93-287				
IR	12-31#	24-37	42-37	42-40	42-44									
IRLOCK	24-15	24-36#	24-38	25-57	25-95	44-33	45-37	46-35	53-29	54-28	55-28	55-28	56-31	56-31
ISR	11-57#													
ITCOUN	13-24#	25-107*	36-61*	36-68*	36-69*	37-20*	37-31*	37-42*	37-44*	38-20*	38-22*	39-21*	39-23*	40-20*
	40-22*	41-37*	41-48*	41-58*	41-66*	41-73*	41-82*	41-84*	42-34*	42-46*	42-58*	42-66*	42-68*	43-41*
	43-43*	44-30*	44-44*	44-48*	45-30*	45-49*	45-59*	46-30*	46-49*	46-51*	47-24*	47-28*	48-24*	48-26*
	49-27*	49-36*	49-43*	49-56*	49-67*	49-80*	49-83*	50-29*	50-38*	50-45*	50-58*	50-69*	50-82*	50-85*
	51-21*	51-32*	51-43*	51-46*	52-23*	52-34*	52-45*	52-48*	53-29*	53-29*	53-29*	53-29*	53-29*	53-29*
	54-28*	54-28*	54-28*	54-28*	54-28*	54-28*	55-28*	55-28*	55-28*	55-28*	55-28*	55-28*	56-31*	56-31*
	56-31*	56-31*	56-31*	56-31*	57-20*	57-30*	57-41*	57-47*	58-21*	58-42*	58-45*	59-14*	59-32*	59-35*
	61-16*	61-27*	61-29*	62-14*	62-38*	62-40*	63-16*	63-31*	63-33*	64-21*	64-26*	65-19*	65-34*	65-39*
	66-13*	66-30*	66-34*	67-20*	67-39*	68-19*	68-49*	69-24*	69-26*	70-35*	70-67*	70-70*	71-18*	71-35*
	71-37*	72-19*	72-45*	72-48*	73-14*	73-39*	73-41*	74-18*	74-37*	74-39*	75-22*	75-44*	75-62*	75-64*
	76-13*	76-25*	76-27*	77-29*	77-68*	77-70*	78-14*	78-25*	78-27*	79-23*	79-47*	79-49*	80-25*	80-39*
	80-46*	80-57*	80-59*	81-13*	81-24*	81-26*	82-15*	82-29*	82-31*	83-14*	83-35*	83-37*	84-19*	84-59*
	84-62*	85-26*	85-43*	85-72*	86-17*	86-35*	86-50*	86-66*	86-86*	86-95*	89-16*	89-51*	89-53*	90-16*
	90-47*	90-49*	91-52*	91-91*	91-93*									
IXE	11-57#													
IXU	12-174#													
J$JMP	7-373#	28-60	33-19	34-20										
J1	13-108	16-7#												
J10	13-117	16-16#												
J11	13-118	16-17#												
J12	13-119	16-18#												
J13	13-120	16-19#												
J14	13-121	16-20#												
J15	13-122	16-21#												
J16	13-123	16-22#												
J17	13-124	16-23#												
J2	13-109	16-8#												
J20	13-129	16-24#												
J21	13-130	16-25#												

CROSS REFERENCE TABLE (CREF V04.00)

J3	13-110	16-9#					
J4	13-111	16-10#					
J5	13-112	16-11#					
J6	13-113	16-12#					
J7	13-114	16-13#					
J8	13-115	16-14#					
J9	13-116	16-15#					
K1RELA	13-137	16-33#					
KWSRV	20-154	20-161	20-180#				
L$ACP	7-427#						
L$APT	7-427#						
L$AU	34-9#						
L$AUT	7-427#						
L$AUTO	7-427	31-10#					
L$CCP	7-427#						
L$CLEA	7-427	32-8#					
L$CO	7-427#						
L$DEPO	7-427#						
L$DESC	7-427	15-27#					
L$DESP	7-427#						
L$DEVP	7-427#						
L$DISP	7-427	8-8#					
L$DLY	7-427#	22-50	42-39	42-51	57-37	58-38	59-28
L$DTP	7-427#						
L$DTYP	7-427#						
L$DU	33-8#						
L$DUT	7-427#						
L$DVTY	7-427	15-17#					
L$EF	7-427#						
L$ENVI	7-427#						
L$ETP	7-427#						
L$EXP1	7-427#						
L$EXP4	7-427#						
L$EXP5	7-427#						
L$HARD	7-427	97-52	97-52#				
L$HIME	7-427#						
L$HPCP	7-427#						
L$HPTP	7-427#						
L$HW	7-427	9-9	9-9#				
L$ICP	7-427#						
L$INIT	7-427	30-8#					
L$LADP	7-427#						
L$LAST	7-427	98-63#	99-22				
L$LOAD	7-427#						
L$LUN	7-427#						
L$MREV	7-427#						
L$NAME	7-427#						
L$PRIO	7-427#						
L$PROT	7-427	29-8#					
L$PRT	7-427#						
L$REPP	7-427#						
L$REV	7-427#						
L$RPT	28-46#						
L$SOFT	7-427	98-12	98-12#				
L$SPC	7-427#						
L$SPCP	7-427#						

CROSS REFERENCE TABLE (CREF V04.00)

L$SPTP	7-427#									
L$STA	7-427#									
L$SW	7-427	10-8	10-8#							
L$TEST	7-427#	77-47	83-18	89-20	90-20	91-47	92-47	93-92	93-97	94-37
L$TIML	7-427#									
L$UNIT	7-427#									
L10000	9-9	9-25#								
L10001	10-8	10-25#								
L10002	16-105#									
L10003	16-124#									
L10004	16-136#									
L10005	16-142#									
L10006	20-185#									
L10007	27-41#									
L10010	28-60	28-75#								
L10012	30-20	30-126	30-141#							
L10013	31-18#									
L10014	32-42	32-57#								
L10015	33-19	33-34#								
L10016	34-20	34-35#								
L10017	36-71#									
L10020	37-46#									
L10021	38-24#									
L10022	39-25#									
L10023	40-24#									
L10024	41-34	41-86#								
L10025	42-70#									
L10026	43-46#									
L10027	44-50#									
L10030	45-61#									
L10031	46-27	46-53#								
L10032	47-21	47-30#								
L10033	48-21	48-28#								
L10034	49-85#									
L10035	50-87#									
L10036	51-49#									
L10037	52-20	52-51#								
L10040	53-29	53-30#								
L10041	54-28	54-29#								
L10042	55-28	55-29#								
L10043	56-31	56-32#								
L10044	57-50#									
L10045	58-32	58-48#								
L10046	59-40#									
L10047	60-28	60-31	60-36	60-56#						
L10050	61-31#									
L10051	62-42#									
L10052	63-35#									
L10053	64-28#									
L10054	65-41#									
L10055	66-36#									
L10056	67-41#									
L10057	68-51#									
L10060	69-28#									
L10061	70-72#									
L10062	71-39#									

CROSS REFERENCE TABLE (CREF V04.00)

L10063	72-50#													
L10064	73-43#													
L10065	74-41#													
L10066	75-66#													
L10067	76-29#													
L10070	77-52	77-72#												
L10071	78-29#													
L10072	79-51#													
L10073	80-61#													
L10074	81-28#													
L10075	82-33#													
L10076	83-22	83-40#												
L10077	84-64#													
L10100	85-74#													
L10101	86-100#													
L10102	87-26	87-115#												
L10103	88-72#													
L10104	89-24	89-56#												
L10105	90-24	90-52#												
L10106	91-51	91-95#												
L10107	92-51	92-113#												
L10110	93-93	93-101	93-339#											
L10111	93-226#													
L10112	93-320#													
L10113	94-41	94-76#												
L10114	95-36	95-41	95-83#											
L10115	96-49#													
L10116	97-52	97-61#												
L10117	98-12	98-33#												
L10120	99-16#													
L10122	99-16	99-21#												
LASCYL	13-22#	23-20	30-60*	92-40	93-103									
LASTRK	13-20#	23-16	30-59*											
LBC	12-178#													
LBT	12-68#													
LCE	12-177#													
LCLKTB	20-126*	20-146#												
LDZERO	24-13#	39-22	43-42	64-25	69-25									
LF	15-13													
LKS	20-127*	20-148#	20-162*	20-174*										
LKV	20-129*	20-149#	20-161	32-29										
LOCATE	22-85#	93-216	93-302											
LOE	11-57#													
LOT	11-57#													
MASK	13-43#	25-35*	25-38	25-68*	25-72*	25-122*	25-123*	38-21	39-22	40-21	43-42	47-27	48-25	64-25
	69-25													
MCPE	12-10#	22-68	22-73	58-26	58-30	65-26	65-30	73-21	73-31					
MCUTAB	13-108#	27-11												
MCUTXT	13-103#	27-12	27-32											
MDPE	12-33#	46-37	46-41	53-29	53-29	54-28	54-28	55-28	55-28	56-31	56-31			
MESG1	97-54	97-66#												
MESG10	15-47#	26-17												
MESG11	15-48#	26-26												
MESG12	15-49#	93-139												
MESG13	16-41#	60-33												
MESG14	16-42#	60-49												

CROSS REFERENCE TABLE (CREF V04.00)

```
MESG15   15-50#   93-138
MESG17   98-14    98-38#
MESG18   98-16    98-39#
MESG20   98-18    98-40#
MESG21   98-22    98-41#
MESG22   98-24    98-42#
MESG4    97-56    97-67#
MESG5    97-58    97-68#
MESG6    97-60    97-69#
MOH      12-129#
MOL      12-70#   26-12    77-44    83-15    89-17    90-17    91-44    92-44    93-89    94-34
MSGMOL   15-45#   77-47    83-18    89-20    90-20    91-47    92-47    93-92    94-37
MSGWLO   15-46#   93-97
MSK      13-44#   23-90*   23-95    23-100   23-102*  24-21    24-22    25-38*   25-39*   25-53    25-63    25-91    25-101   25-122
         67-15*   67-16*   68-41*   68-42*
MTD      12-155#
MTRBRK   13-136   16-32#
MXF      12-34#   41-51    41-52    41-56
NBA      12-131#
NED      12-37#
NEGWRD   13-28#   19-12*   19-16    91-67*   92-56*   93-129*  93-186*  93-209*  93-241*  93-256*  93-288*  93-326*
NEM      12-36#
NEXLOC   22-112#  87-48    87-54    87-60    87-66    87-72    87-78    87-85    87-98
NOP      12-209#  96-30
O$APTS    7-373#   7-427
O$AU      7-373#   7-427
O$BGNR    7-373#   7-427
O$BGNS    7-373#   7-405#   7-427
O$DU      7-373#   7-427
O$ERRT    7-373#   7-427
O$GNSW    7-373#   7-405#   7-427
O$POIN    7-373#   7-405    7-405#   7-405#   7-405#   7-427
O$SETU    7-373#   7-405#   7-427    98-63
OCTHEX   16-110   16-115   20-49#   87-104
OFFDIR   12-151#
OM       12-61#
ONEFIL    2-4#     2-8      4-=43    5-1      7-358#   7-394    10-27    11-1     11-8#    11-13    28-7#    28-12    34-37    35-1
         35-9#    36-3     96-52    97-1     97-8#    97-14
OPI      12-91#
OPRPNL   13-138   16-34#
OR       12-32#   24-49    42-49    42-52    42-56    42-60    42-64
ORLOCK   24-19    24-48#   24-50    25-61    25-99    44-38    45-43    53-29    54-28    55-28    55-28    56-31    56-31
PAR      12-81#   66-19    66-22    66-26    71-24    71-26    72-24    72-32    72-34    73-24    75-29    75-33    75-47
PAT      12-29#   46-34    72-22    75-25    77-32    77-57    79-26    79-37    80-28    82-18    90-27
PATCNT   13-38#   25-32*   25-118*  38-21    39-22    40-21    43-42    47-27    48-25    64-25    69-25
PATT1    13-8#    13-144   13-150   13-162   13-169   13-175   13-181   13-193   45-33    66-16    73-17    75-26    77-33    77-58
         79-27    80-29    82-19    93-232
PATT2    13-9#    13-145   13-151   13-157   13-163   13-170   13-176   13-182   13-194   37-22    37-27    45-55
PATT3    13-10#   13-183   13-195   38-21    39-22    40-21    43-42    46-36    47-27    48-25    64-25    69-25    89-27    89-28
         90-28    90-29    90-32    90-34
PATT4    13-11#   38-21    39-22    40-21    43-42    47-27    48-25    62-22    64-25    65-21    69-25
PATT5    13-12#   13-164   13-196   44-27
PATT6    13-13#   13-197
PATT7    13-14#   13-198   67-15    67-25    68-17    68-45
PATT8    13-15#   13-199   93-317
PATT9    13-16#   13-156   13-200
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CROSS REFERENCE TABLE (CREF V04.00)

CROSS REFERENCE TABLE (CREF V04.00)

	41-60	41-63	41-67	41-70	41-76	41-79	46-43	46-46	49-29*	49-30	49-33	49-37	49-40	49-61
	49-64	50-31*	50-32	50-35	50-39	50-42	50-63	50-66	51-25*	51-26	51-29	51-37	51-40	52-27*
	53-29	53-29	54-28	54-28	55-28	55-28	56-31	56-31	57-23*	57-24	57-27	57-36*	58-26	58-29
	58-37*	59-27*	62-17*	62-22*	62-28	62-34	65-26	65-29	67-22	68-28	70-46*	72-23*	73-21	73-30
	77-54*	81-16	81-19	82-21	82-24	83-25*	89-30*	90-31*	91-72	92-74	92-77	92-102	93-214	93-277
	93-283	93-300	96-30*	96-44										
RPCS2	13-66#	13-142	13-206	22-9*	22-10*	23-94*	24-37	24-49	26-11*	30-71*	30-73*	32-20*	32-21*	37-35*
	38-21	41-40*	41-41*	41-51*	41-52	41-55	41-74*	41-75*	42-37	42-40	42-43	42-49	42-52	42-55
	42-60	42-63	46-32*	46-33*	46-34*	46-37	46-40	49-60*	50-62*	51-36*	52-38*	53-29	53-29	53-29*
	54-28	54-28	54-28*	55-28	55-28	55-28*	56-31	56-31	56-31*	57-46*	58-24*	58-25*	58-44*	59-18*
	59-19*	59-34*	60-38*	61-18*	62-16*	62-21*	62-26*	63-18*	63-19*	70-37*	70-39*	70-40*	70-44*	72-22*
	75-25*	75-45*	75-46*	77-32*	77-53*	77-57*	79-26*	79-37*	80-28*	82-18*	90-27*	93-259	93-262	
RPCS3	13-83#	13-167	13-211	22-90	22-93	22-96	47-27	52-28	52-31	52-39	52-42	53-29	53-29	53-29
	53-29	53-29*	54-28	54-28	54-28	54-28	54-28*	55-28	55-28	55-28	55-28	55-28*	56-31	56-31
	56-31	56-31	56-31*											
RPDA	13-65#	13-179	13-186	13-205	19-18*	65-24*	66-18*	66-21	67-26	73-19*	73-20	75-26*	75-27	77-33*
	77-58*	79-27*	80-29*	82-19*	89-27*	89-31	89-34	90-28*	90-32	90-35	90-36			
RPDB	13-71#	13-160	22-100	42-48*	42-59	44-34*	44-39	44-41	44-42	45-27	45-38*	45-44	45-46	46-36*
	53-29	53-29*	54-28	54-28*	55-28	55-28	55-28*	55-28*	56-31	56-31	56-31*	56-31*	91-87	93-267
RPDC	13-76#	13-188	13-209	19-17*	67-34	68-24	68-46	89-28*	89-37	89-40	92-95	92-97		
RPDS	13-67#	18-34	22-11	22-13*	22-16	22-61	22-63	22-64	26-12	26-21	68-32	74-21	74-24	75-35
	75-38	75-53	75-56	76-17	76-20	77-36	77-40	77-44	77-55	77-61	77-64	80-40	80-43	83-15
	83-27	83-30	89-17	90-17	90-39	90-42	91-44	91-70	92-44	92-80	92-83	92-100	93-89	93-94
	93-171	94-34	96-31	96-39										
RPDT	13-73#	60-39	60-41	60-42	61-19	61-23	63-20	63-27						
RPEC1	13-80#													
RPEC2	13-81#													
RPER1	13-68#	66-19	66-22	66-25	71-21	71-24	72-28	72-32	72-38	73-24	73-33	73-34	74-28	75-29
	75-32	75-47	75-49	75-50	92-60	92-63	92-64	93-329	93-332	93-333	94-43	94-45	94-50	94-62
	94-65	94-72												
RPER2	13-78#	16-113	20-195	71-27	74-30	86-22	86-27	86-42	86-58	86-78	87-37	87-49	87-55	87-61
	87-67	87-73	87-79	87-86	87-99	88-32	95-74							
RPER3	13-79#	74-32												
RPLA	13-70#	85-29	85-34	85-40	85-54	85-60	85-61	85-62						
RPMR1	13-72#	13-191	13-207	18-19	19-40*	20-11*	20-14*	20-24*	20-25*	20-38	20-40*	70-38*	70-41	70-45*
	70-47	70-63	86-25*	86-40*	86-56*	86-76*	88-38*	92-54*	92-91*	93-108*	95-80*			
RPOF	13-75#	13-187	13-208	25-10*	67-30	89-29*	89-43	89-46	91-64*	92-53*	93-128*	93-187*	93-207*	93-325*
RPSN	13-74#	30-83												
RPVEC	13-56#	30-56*	30-57*	32-31	57-32	57-44	57-49	58-34	58-47	59-15	59-20	59-24	59-37	
RPWC	13-63#	13-148	13-203	19-16*										
RTD	12-220#	91-65	93-126											
RWU1	12-188#													
RWU2	12-189#													
RWU3	12-190#													
S$LSYM	7-373#	9-25#	10-25#	16-105#	16-124#	16-136#	16-142#	20-185#	27-41#	28-75#	30-141#	31-18#	32-57#	33-34#
	34-35#	36-71#	37-21	37-21	37-21#	37-33	37-33	37-33#	37-46#	38-21	38-21	38-21	38-21	38-21
	38-21	38-21	38-21	38-21#	38-21#	38-21#	38-21#	38-24#	39-22	39-22	39-22	39-22	39-22	39-22
	39-22	39-22	39-22#	39-22#	39-22#	39-22#	39-25#	40-21	40-21	40-21	40-21	40-21	40-21	40-21
	40-21	40-21#	40-21#	40-21#	40-21#	40-24#	41-38	41-38	41-38#	41-39	41-39	41-39#	41-50	41-50
	41-50#	41-86#	42-35	42-35	42-35#	42-36	42-36	42-36#	42-70#	43-42	43-42	43-42	43-42	43-42
	43-42	43-42	43-42	43-42#	43-42#	43-42#	43-42#	43-46#	44-31	44-31	44-31#	44-50#	45-31	45-31
	45-31#	45-34	45-34	45-34#	45-61#	46-31	46-31	46-31#	46-53#	47-27	47-27	47-27	47-27	47-27
	47-27	47-27	47-27	47-27#	47-27#	47-27#	47-27#	47-30#	48-25	48-25	48-25	48-25	48-25	48-25
	48-25	48-25	48-25#	48-25#	48-25#	48-25#	48-28#	49-28	49-28	49-28#	49-46	49-46	49-46#	49-59
	49-59	49-59#	49-70	49-70	49-70#	49-85#	50-30	50-30	50-30#	50-48	50-48	50-48#	50-61	50-61
	50-61#	50-72	50-72	50-72#	50-87#	51-24	51-24	51-24#	51-35	51-35	51-35#	51-49#	52-24	52-24

STOPCK	20-169#	32-19												
SVCGBL	7-373#	7-382#	7-427	7-427	7-427	7-427	7-427	7-427	7-427	7-427	7-427	7-427	7-427	7-427
	7-427	7-427	7-427	7-427	7-427	7-427	7-427	7-427	7-427	7-427	7-427	7-427	7-427	7-427
	7-427	7-427	7-427	7-427	7-427	7-427	7-427	7-427	7-427	7-427	7-427	7-427	7-427	7-427
	7-427	7-427	7-427	7-427	7-427	7-427	7-427	7-427	7-427	7-427	7-427	7-427	7-427	7-427
	7-427	7-427	7-427	7-427	7-427	7-427	7-427	7-427	7-427	7-427	7-427	7-427	7-427	7-427
	7-427	7-427	7-427	7-427	7-427	7-427	7-427	7-427	7-427	7-427	7-427	7-427	7-427	7-427
	7-427	7-427	7-427	7-427	7-427	7-427	7-427	7-427	7-427	7-427	7-427	7-427	7-427	7-427
	7-427	7-427	7-427	7-427	7-427	7-427	7-427	7-427	7-427	7-427	7-427	7-427	7-427	7-427
	7-427	7-427	7-427	7-427	8-8	8-8	8-8	9-9	9-9	9-9	9-9	9-9	9-9	10-8
	10-8	10-8	10-8	10-8	10-8	15-17	15-17	15-17	15-27	15-27	15-27	16-96	16-96	16-96
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CROSS REFERENCE TABLE (CREF V04.00)

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67-41	67-41	68-20	68-20	68-48	68-48	68-51	68-51	69-25	69-25	69-25	69-25	69-25	69-25
69-25	69-25	69-25	69-25	69-25	69-25	69-25	69-25	69-25	69-25	69-28	69-28	70-36	70-36
70-66	70-66	70-66	70-66	70-66	70-66	70-66	70-66	70-68	70-68	70-72	70-72	71-19	71-19
71-34	71-34	71-34	71-34	71-34	71-34	71-34	71-34	71-36	71-36	71-39	71-39	72-20	72-20
72-44	72-44	72-44	72-44	72-44	72-44	72-44	72-44	72-46	72-46	72-50	72-50	73-15	73-15
73-38	73-38	73-38	73-38	73-38	73-38	73-38	73-38	73-40	73-40	73-43	73-43	74-19	74-19
74-34	74-34	74-34	74-34	74-34	74-34	74-34	74-34	74-36	74-36	74-36	74-36	74-36	74-36
74-36	74-36	74-38	74-38	74-41	74-41	75-23	75-23	75-43	75-43	75-43	75-43	75-43	75-43
75-43	75-43	75-61	75-61	75-61	75-61	75-61	75-61	75-61	75-61	75-63	75-63	75-66	75-66
76-14	76-14	76-24	76-24	76-24	76-24	76-24	76-24	76-24	76-24	76-26	76-26	76-29	76-29
77-30	77-30	77-47	77-47	77-47	77-47	77-47	77-47	77-47	77-47	77-47	77-47	77-47	77-47
77-52	77-52	77-52	77-52	77-67	77-67	77-67	77-67	77-67	77-67	77-67	77-67	77-69	77-69
77-72	77-72	78-15	78-15	78-24	78-24	78-24	78-24	78-24	78-24	78-24	78-24	78-26	78-26
78-29	78-29	79-24	79-24	79-36	79-36	79-36	79-36	79-36	79-36	79-36	79-36	79-46	79-46
79-46	79-46	79-46	79-46	79-46	79-46	79-48	79-48	79-51	79-51	80-26	80-26	80-38	80-38
80-38	80-38	80-38	80-38	80-38	80-38	80-45	80-45	80-45	80-45	80-45	80-45	80-45	80-45
80-56	80-56	80-56	80-56	80-56	80-56	80-56	80-56	80-58	80-58	80-61	80-61	81-14	81-14
81-23	81-23	81-23	81-23	81-23	81-23	81-23	81-23	81-25	81-25	81-28	81-28	82-16	82-16

CROSS REFERENCE TABLE (CREF V04.00)

82-28	82-28	82-28	82-28	82-28	82-28	82-28	82-28	82-30	82-30	82-33	82-33	83-18	83-18
83-18	83-18	83-18	83-18	83-18	83-18	83-18	83-18	83-18	83-18	83-22	83-22	83-22	83-22
83-23	83-23	83-34	83-34	83-34	83-34	83-34	83-34	83-34	83-34	83-36	83-36	83-40	83-40
84-58	84-58	84-58	84-58	84-58	84-58	84-58	84-58	84-64	84-64	85-42	85-42	85-42	85-42
85-42	85-42	85-42	85-42	85-74	85-74	86-24	86-24	86-34	86-34	86-34	86-34	86-34	86-34
86-34	86-34	86-37	86-37	86-38	86-38	86-49	86-49	86-49	86-49	86-49	86-49	86-49	86-49
86-52	86-52	86-55	86-55	86-65	86-65	86-65	86-65	86-65	86-65	86-65	86-65	86-68	86-68
86-75	86-75	86-85	86-85	86-85	86-85	86-85	86-85	86-85	86-85	86-88	86-88	86-100	86-100
87-26	87-26	87-26	87-26	87-45	87-45	87-45	87-45	87-45	87-45	87-45	87-45	87-45	87-45
87-45	87-45	87-45	87-45	87-52	87-52	87-52	87-52	87-52	87-52	87-52	87-52	87-52	87-52
87-52	87-52	87-58	87-58	87-58	87-58	87-58	87-58	87-58	87-58	87-58	87-58	87-58	87-58
87-64	87-64	87-64	87-64	87-64	87-64	87-64	87-64	87-64	87-64	87-64	87-64	87-70	87-70
87-70	87-70	87-70	87-70	87-70	87-70	87-70	87-70	87-70	87-70	87-76	87-76	87-76	87-76
87-76	87-76	87-76	87-76	87-76	87-76	87-76	87-76	87-82	87-82	87-82	87-82	87-82	87-82
87-82	87-82	87-82	87-82	87-82	87-82	87-89	87-89	87-89	87-89	87-89	87-89	87-89	87-89
87-89	87-89	87-89	87-89	87-91	87-91	87-91	87-91	87-91	87-91	87-91	87-91	87-91	87-91
87-96	87-96	87-96	87-96	87-96	87-96	87-96	87-96	87-96	87-96	87-106	87-106	87-106	87-106
87-106	87-106	87-106	87-106	87-106	87-106	87-106	87-106	87-106	87-106	87-106	87-106	87-106	87-106
87-112	87-112	87-112	87-112	87-112	87-112	87-112	87-112	87-112	87-112	87-115	87-115	88-30	88-30
88-35	88-35	88-35	88-35	88-35	88-35	88-35	88-35	88-39	88-39	88-72	88-72	89-20	89-20
89-20	89-20	89-20	89-20	89-20	89-20	89-20	89-20	89-20	89-20	89-24	89-24	89-24	89-24
89-25	89-25	89-50	89-50	89-50	89-50	89-50	89-50	89-50	89-50	89-52	89-52	89-56	89-56
90-20	90-20	90-20	90-20	90-20	90-20	90-20	90-20	90-20	90-20	90-20	90-20	90-24	90-24
90-24	90-24	90-25	90-25	90-46	90-46	90-46	90-46	90-46	90-46	90-46	90-46	90-48	90-48
90-52	90-52	91-47	91-47	91-47	91-47	91-47	91-47	91-47	91-47	91-47	91-47	91-47	91-47
91-51	91-51	91-51	91-51	91-54	91-54	91-90	91-90	91-90	91-90	91-90	91-90	91-90	91-90
91-92	91-92	91-95	91-95	92-47	92-47	92-47	92-47	92-47	92-47	92-47	92-47	92-47	92-47
92-47	92-47	92-51	92-51	92-51	92-51	92-52	92-52	92-67	92-67	92-67	92-67	92-67	92-67
92-67	92-67	92-68	92-68	92-69	92-69	92-87	92-87	92-87	92-87	92-87	92-87	92-87	92-87
92-89	92-89	92-90	92-90	92-106	92-106	92-106	92-106	92-106	92-106	92-106	92-106	92-110	92-110
92-110	92-110	92-110	92-110	92-110	92-110	92-112	92-112	92-113	92-113	93-92	93-92	93-92	93-92
93-92	93-92	93-92	93-92	93-92	93-92	93-92	93-92	93-93	93-93	93-93	93-93	93-97	93-97
93-97	93-97	93-97	93-97	93-97	93-97	93-97	93-97	93-97	93-97	93-101	93-101	93-101	93-101
93-105	93-105	93-106	93-106	93-117	93-117	93-117	93-117	93-117	93-117	93-117	93-117	93-119	93-119
93-120	93-120	93-138	93-138	93-138	93-138	93-138	93-138	93-138	93-138	93-138	93-138	93-139	93-139
93-139	93-139	93-139	93-139	93-139	93-139	93-139	93-139	93-156	93-156	93-156	93-156	93-156	93-156
93-156	93-156	93-194	93-194	93-194	93-194	93-194	93-194	93-194	93-194	93-196	93-196	93-197	93-197
93-217	93-217	93-217	93-217	93-217	93-217	93-217	93-217	93-222	93-222	93-222	93-222	93-222	93-222
93-222	93-222	93-225	93-225	93-226	93-226	93-227	93-227	93-238	93-238	93-248	93-248	93-248	93-248
93-248	93-248	93-248	93-248	93-249	93-249	93-249	93-249	93-249	93-249	93-249	93-249	93-249	93-249
93-264	93-264	93-264	93-264	93-264	93-264	93-264	93-264	93-276	93-276	93-276	93-276	93-276	93-276
93-276	93-276	93-285	93-285	93-285	93-285	93-285	93-285	93-285	93-285	93-303	93-303	93-303	93-303
93-303	93-303	93-303	93-303	93-304	93-304	93-304	93-304	93-304	93-304	93-304	93-304	93-304	93-304
93-309	93-309	93-309	93-309	93-309	93-309	93-309	93-309	93-315	93-315	93-320	93-320	93-321	93-321
93-336	93-336	93-336	93-336	93-336	93-336	93-336	93-336	93-338	93-338	93-339	93-339	94-32	94-32
94-37	94-37	94-37	94-37	94-37	94-37	94-37	94-37	94-37	94-37	94-37	94-37	94-41	94-41
94-41	94-41	94-51	94-51	94-51	94-51	94-51	94-51	94-51	94-51	94-52	94-52	94-53	94-53
94-66	94-66	94-66	94-66	94-66	94-66	94-66	94-66	94-75	94-75	94-76	94-76	95-36	95-36
95-36	95-36	95-39	95-39	95-40	95-40	95-41	95-41	95-41	95-41	95-43	95-43	95-43	95-43
95-43	95-43	95-43	95-43	95-43	95-43	95-44	95-44	95-44	95-44	95-44	95-44	95-44	95-44
95-44	95-44	95-44	95-44	95-44	95-44	95-44	95-44	95-72	95-72	95-77	95-77	95-77	95-77
95-77	95-77	95-77	95-77	95-81	95-81	95-83	95-83	96-37	96-37	96-37	96-37	96-37	96-37
96-37	96-37	96-42	96-42	96-42	96-42	96-42	96-42	96-42	96-42	96-47	96-47	96-47	96-47
96-47	96-47	96-47	96-47	96-49	96-49	97-52	97-52	97-54	97-54	97-54	97-54	97-54	97-54
97-54	97-54	97-56	97-56	97-56	97-56	97-56	97-56	97-56	97-56	97-58	97-58	97-58	97-58
97-58	97-58	97-58	97-58	97-58	97-58	97-60	97-60	97-60	97-60	97-60	97-60	97-60	97-60

CROSS REFERENCE TABLE (CREF V04.00)

	97-60	97-60	97-61	97-61	98-12	98-12	98-14	98-14	98-14	98-14	98-14	98-14	98-16	98-16
	98-16	98-16	98-16	98-16	98-18	98-18	98-18	98-18	98-18	98-18	98-20	98-20	98-22	98-22
	98-22	98-22	98-22	98-22	98-22	98-22	98-22	98-22	98-24	98-24	98-24	98-24	98-24	98-24
	98-33	98-33	98-63	98-63	98-63	98-63	98-63	98-63	99-16	99-16	99-16	99-16		
SVCSUB	7-373#	7-381#	93-105	93-105	93-105	93-227	93-227	93-227						
SVCTAG	7-373#	7-383#	9-25	9-25	9-25	10-25	10-25	10-25	16-105	16-105	16-105	16-124	16-124	16-124
	16-136	16-136	16-136	16-142	16-142	16-142	20-185	20-185	20-185	27-41	27-41	27-41	28-75	28-75
	28-75	30-141	30-141	30-141	31-18	31-18	31-18	32-57	32-57	32-57	33-34	33-34	33-34	34-35
	34-35	34-35	36-71	36-71	36-71	37-32	37-32	37-32	37-43	37-43	37-43	37-46	37-46	37-46
	38-21	38-21	38-21	38-21	38-21	38-21	38-21	38-21	38-21	38-21	38-21	38-21	38-24	38-24
	38-24	39-22	39-22	39-22	39-22	39-22	39-22	39-22	39-22	39-22	39-22	39-22	39-22	39-25
	39-25	39-25	40-21	40-21	40-21	40-21	40-21	40-21	40-21	40-21	40-21	40-21	40-21	40-21
	40-24	40-24	40-24	41-49	41-49	41-49	41-59	41-59	41-59	41-83	41-83	41-83	41-86	41-86
	41-86	42-47	42-47	42-47	42-67	42-67	42-67	42-70	42-70	42-70	43-42	43-42	43-42	43-42
	43-42	43-42	43-42	43-42	43-42	43-42	43-42	43-42	43-46	43-46	43-46	44-47	44-47	44-47
	44-50	44-50	44-50	45-52	45-52	45-52	45-58	45-58	45-58	45-61	45-61	45-61	46-50	46-50
	46-50	46-53	46-53	46-53	47-27	47-27	47-27	47-27	4 -27	47-27	47-27	47-27	47-27	47-27
	47-27	47-27	47-30	47-30	47-30	48-25	48-25	48-25	48-25	48-25	48-25	48-25	48-25	48-25
	48-25	48-25	48-25	48-28	48-28	48-28	49-45	49-45	49-45	49-58	49-58	49-58	49-69	49-69
	49-69	49-82	49-82	49-82	49-85	49-85	49-85	50-47	50-47	50-47	50-60	50-60	50-60	50-71
	50-71	50-71	50-84	50-84	50-84	50-87	50-87	50-87	51-34	51-34	51-34	51-45	51-45	51-45
	51-49	51-49	51-49	52-36	52-36	52-36	52-47	52-47	52-47	52-51	52-51	52-51	53-29	53-29
	53-29	53-29	53-29	53-29	53-29	53-29	53-29	53-30	53-30	53-30	54-28	54-28	54-28	54-28
	54-28	54-28	54-28	54-28	54-28	54-29	54-29	54-29	55-28	55-28	55-28	55-28	55-28	55-28
	55-28	55-28	55-28	55-29	55-29	55-29	56-31	56-31	56-31	56-31	56-31	56-31	56-31	56-31
	56-31	56-32	56-32	56-32	57-31	57-31	57-31	57-42	57-42	57-42	57-50	57-50	57-50	58-33
	58-33	58-33	58-43	58-43	58-43	58-48	58-48	58-48	59-33	59-33	59-33	59-40	59-40	59-40
	60-33	60-33	60-33	60-47	60-47	60-47	60-49	60-49	60-49	60-56	60-56	60-56	61-28	61-28
	61-28	61-31	61-31	61-31	62-39	62-39	62-39	62-42	62-42	62-42	63-32	63-32	63-32	63-35
	63-35	63-35	64-25	64-25	64-25	64-25	64-25	64-25	64-25	64-25	64-25	64-25	64-25	64-25
	64-28	64-28	64-28	65-38	65-38	65-38	65-41	65-41	65-41	66-33	66-33	66-33	66-36	66-36
	66-36	67-38	67-38	67-38	67-41	67-41	67-41	68-48	68-48	68-48	68-51	68-51	68-51	69-25
	69-25	69-25	69-25	69-25	69-25	69-25	69-25	69-25	69-25	69-25	69-25	69-28	69-28	69-28
	70-68	70-68	70-68	70-72	70-72	70-72	71-36	71-36	71-36	71-39	71-39	71-39	72-46	72-46
	72-46	72-50	72-50	72-50	73-40	73-40	73-40	73-43	73-43	73-43	74-38	74-38	74-38	74-41
	74-41	74-41	75-63	75-63	75-63	75-66	75-66	75-66	76-26	76-26	76-26	76-29	76-29	76-29
	77-69	77-69	77-69	77-72	77-72	77-72	78-26	78-26	78-26	78-29	78-29	78-29	79-48	79-48
	79-48	79-51	79-51	79-51	80-58	80-58	80-58	80-61	80-61	80-61	81-25	81-25	81-25	81-28
	81-28	81-28	82-30	82-30	82-30	82-33	82-33	82-33	83-36	83-36	83-36	83-40	83-40	83-40
	84-64	84-64	84-64	85-74	85-74	85-74	86-37	86-37	86-37	86-52	86-52	86-52	86-68	86-68
	86-68	86-88	86-88	86-88	86-100	86-100	86-100	87-115	87-115	87-115	88-39	88-39	88-39	88-72
	88-72	88-72	89-52	89-52	89-52	89-56	89-56	89-56	90-48	90-48	90-48	90-52	90-52	90-52
	91-92	91-92	91-92	91-95	91-95	91-95	92-68	92-68	92-68	92-89	92-89	92-89	92-112	92-112
	92-112	92-113	92-113	92-113	93-119	93-119	93-119	93-196	93-196	93-196	93-225	93-225	93-225	93-226
	93-226	93-226	93-315	93-315	93-315	93-320	93-320	93-320	93-338	93-338	93-338	93-339	93-339	93-339
	94-52	94-52	94-52	94-75	94-75	94-75	94-76	94-76	94-76	95-44	95-44	95-44	95-81	95-81
	95-81	95-83	95-83	95-83	96-49	96-49	96-49	97-61	97-61	97-61	98-33	98-33	98-33	99-16
	99-16	99-16	99-21	99-21	99-21									
SVCTST	7-373#	7-380#	36-60	36-60	36-60	37-19	37-19	37-19	38-17	38-17	38-17	39-18	39-18	39-18
	40-17	40-17	40-17	41-31	41-31	41-31	42-31	42-31	42-31	43-37	43-37	43-37	44-26	44-26
	44-26	45-26	45-26	45-26	46-24	46-24	46-24	47-18	47-18	47-18	48-18	48-18	48-18	49-24
	49-24	49-24	50-26	50-26	50-26	51-18	51-18	51-18	52-17	52-17	52-17	53-28	53-28	53-28
	54-27	54-27	54-27	55-27	55-27	55-27	56-30	56-30	56-30	57-17	57-17	57-17	58-18	58-18
	58-18	59-13	59-13	59-13	60-22	60-22	60-22	61-15	61-15	61-15	62-13	62-13	62-13	63-15
	63-15	63-15	64-20	64-20	64-20	65-18	65-18	65-18	66-12	66-12	66-12	67-14	67-14	67-14
	68-14	68-14	68-14	69-20	69-20	69-20	70-33	70-33	70-33	71-17	71-17	71-17	72-18	72-18

CROSS REFERENCE TABLE (CREF V04.00)

	72-18	73-13	73-13	73-13	74-17	74-17	74-17	75-21	75-21	75-21	76-12	76-12	76-12	77-28
	77-28	77-28	78-13	78-13	78-13	79-22	79-22	79-22	80-24	80-24	80-24	81-12	81-12	81-12
	82-14	82-14	82-14	83-13	83-13	83-13	84-18	84-18	84-18	85-25	85-25	85-25	86-16	86-16
	86-16	87-20	87-20	87-20	88-24	88-24	88-24	89-15	89-15	89-15	90-15	90-15	90-15	91-42
	91-42	91-42	92-39	92-39	92-39	93-87	93-87	93-87	94-31	94-31	94-31	95-30	95-30	95-30
	96-25	96-25	96-25											
SWTTST	10-9#	60-23												
T$$AU	34-9#	34-20	34-35											
T$$AUT	31-10#	31-18												
T$$CLE	32-8#	32-42	32-57											
T$$DAT	99-16	99-16#	99-21											
T$$DU	33-8#	33-19	33-34											
T$$HAR	97-52	97-52#	97-61											
T$$HW	9-9	9-9#	9-25											
T$$INI	30-8#	30-20	30-126	30-141										
T$$MSG	16-96#	16-105	16-107#	16-124	16-126#	16-136	16-138#	16-142						
T$$PC	99-15#	99-22												
T$$PRO	29-8#													
T$$PTA	99-15#	99-16	99-16#											
T$$RPT	28-46#	28-60	28-75											
T$$SEG	37-21	37-21#	37-32	37-32#	37-33	37-33#	37-43	37-43#	38-21	38-21	38-21	38-21	38-21	38-21
	38-21	38-21	38-21#	38-21#	38-21#	38-21#	38-21#	38-21#	38-21#	38-21#	39-22	39-22	39-22	39-22
	39-22	39-22	39-22	39-22	39-22#	39-22#	39-22#	39-22#	39-22#	39-22#	39-22#	39-22#	40-21	40-21
	40-21	40-21	40-21	40-21	40-21	40-21	40-21#	40-21#	40-21#	40-21#	40-21#	40-21#	40-21#	40-21#
	41-38	41-38#	41-39	41-39#	41-49	41-49#	41-50	41-50#	41-59	41-59#	41-83	41-83#	42-35	42-35#
	42-36	42-36#	42-47	42-47#	42-67	42-67#	43-42	43-42	43-42	43-42	43-42	43-42	43-42	43-42
	43-42#	43-42#	43-42#	43-42#	43-42#	43-42#	43-42#	43-42#	44-31	44-31#	44-47	44-47#	45-31	45-31#
	45-34	45-34#	45-52	45-52#	45-58	45-58#	46-31	46-31#	46-50	46-50#	47-27	47-27	47-27	47-27
	47-27	47-27	47-27	47-27	47-27#	47-27#	47-27#	47-27#	47-27#	47-27#	47-27#	47-27#	48-25	48-25
	48-25	48-25	48-25	48-25	48-25	48-25	48-25#	48-25#	48-25#	48-25#	48-25#	48-25#	48-25#	48-25#
	49-28	49-28#	49-45	49-45#	49-46	49-46#	49-49	49-58	49-58#	49-59	49-59#	49-69	49-69#	49-70
	49-70#	49-73	49-82	49-82#	50-30	50-30#	50-47	50-47#	50-48	50-48#	50-51	50-60	50-60#	50-61
	50-61#	50-71	50-71#	50-72	50-72#	50-75	50-84	50-84#	51-24	51-24#	51-34	51-34#	51-35	51-35#
	51-45	51-45#	52-24	52-24#	52-36	52-36#	52-37	52-37#	52-47	52-47#	53-29	53-29	53-29	53-29
	53-29	53-29	53-29#	53-29#	53-29#	53-29#	53-29#	53-29#	54-28	54-28	54-28	54-28	54-28	54-28
	54-28#	54-28#	54-28#	54-28#	54-28#	54-28#	55-28	55-28	55-28	55-28	55-28	55-28	55-28#	55-28#
	55-28#	55-28#	55-28#	55-28#	56-31	56-31	56-31	56-31	56-31	56-31	56-31#	56-31#	56-31#	56-31#
	56-31#	56-31#	57-21	57-21#	57-31	57-31#	57-34	57-34#	57-42	57-42#	58-22	58-22#	58-33	58-33#
	58-35	58-35#	58-43	58-43#	59-16	59-16#	59-33	59-33#	60-37	60-37#	60-47	60-47#	61-17	61-17#
	61-28	61-28#	62-15	62-15#	62-39	62-39#	63-17	63-17#	63-32	63-32#	64-25	64-25	64-25	64-25
	64-25	64-25	64-25	64-25	64-25#	64-25#	64-25#	64-25#	64-25#	64-25#	64-25#	64-25#	65-20	65-20#
	65-38	65-38#	66-14	66-14#	66-33	66-33#	67-21	67-21#	67-38	67-38#	68-20	68-20#	68-48	68-48#
	69-25	69-25	69-25	69-25	69-25	69-25	69-25	69-25	69-25#	69-25#	69-25#	69-25#	69-25#	69-25#
	69-25#	69-25#	70-36	70-36#	70-68	70-68#	71-19	71-19#	71-36	71-36#	72-20	72-20#	72-46	72-46#
	73-15	73-15#	73-40	73-40#	74-19	74-19#	74-38	74-38#	75-23	75-23#	75-63	75-63#	76-14	76-14#
	76-26	76-26#	77-30	77-30#	77-69	77-69#	78-15	78-15#	78-26	78-26#	79-24	79-24#	79-48	79-48#
	80-26	80-26#	80-58	80-58#	81-14	81-14#	81-25	81-25#	82-16	82-16#	82-30	82-30#	83-23	83-23#
	83-36	83-36#	86-24	86-24#	86-37	86-37#	86-38	86-38#	86-52	86-52#	86-55	86-55#	86-68	86-68#
	86-75	86-75#	86-88	86-88#	88-30	88-30#	88-39	88-39#	89-25	89-25#	89-52	89-52#	90-25	90-25#
	90-48	90-48#	91-54	91-54#	91-92	91-92#	92-52	92-52#	92-68	92-68#	92-69	92-69#	92-89	92-89#
	92-90	92-90#	92-112	92-112#	93-10	93-106#	93-119	93-119#	93-120	93-120#	93-196	93-196#	93-197	93-197#
	93-225	93-225#	93-238	93-238#	93-31	93-315#	93-321	93-321#	93-338	93-338#	94-32	94-32#	94-52	94-52#
	94-53	94-53#	94-75	94-75#	95-72	95-72#	95-81	95-81#						
T$$SOF	98-12	98-12#	98-33											
T$$SRV	20-179#	20-185	27-39#	27-41										
T$$SUB	93-105#	93-226	93-227#	93-320										

CROSS REFERENCE TABLE (CREF V04.00)

T$$SW	10-8	10-8#	10-25											
T$$TES	36-60#	36-71	37-19#	37-46	38-17#	38-24	39-18#	39-25	40-17#	40-24	41-31#	41-34	41-86	42-31#
	42-70	43-37#	43-46	44-26#	44-50	45-26#	45-61	46-[illegible]#	46-27	46-53	47-18#	47-21	47-30	48-18#
	48-21	48-28	49-24#	49-85	50-26#	50-87	51-18#	51-49	52-17#	52-20	52-51	53-28#	53-29	53-30
	54-27#	54-28	54-29	55-27#	55-28	55-29	56-30#	56-31	56-32	57-17#	57-50	58-18#	58-32	58-48
	59-13#	59-40	60-22#	60-28	60-31	60-36	60-56	61-15#	61-31	62-13#	62-42	63-15#	63-35	64-20#
	64-28	65-18#	65-41	66-12#	66-36	67-14#	67-41	68-14#	68-51	69-20#	69-28	70-33#	70-72	71-17#
	71-39	72-18#	72-50	73-13#	73-43	74-17#	74-41	75-21#	75-66	76-12#	76-29	77-28#	77-52	77-72
	78-13#	78-29	79-22#	79-51	80-24#	80-61	81-12#	81-28	82-14#	82-33	83-13#	83-22	83-40	84-18#
	84-64	85-25#	85-74	86-16#	86-100	87-20#	87-26	87-115	88-24#	88-72	89-15#	89-24	89-56	90-15#
	90-24	90-52	91-42#	91-51	91-95	92-39#	92-51	92-113	93-87#	93-93	93-101	93-339	94-31#	94-41
	94-76	95-30#	95-36	95-41	95-83	96-25#	96-49							
T$ARGC	7-427	7-427	7-427	7-427	7-427	7-427	7-427	7-427	7-427	7-427	7-427	7-427#	7-427#	7-427#
	7-427#	7-427#	7-427#	16-99	16-99	16-99	16-99#	16-99#	16-100	16-100	16-100	16-100	16-100#	16-100#
	16-100#	16-104	16-104	16-104#	16-112	16-112	16-112	16-112	16-112	16-112	16-112#	16-112#	16-112#	16-112#
	16-112#	16-117	16-117	16-117	16-117	16-117	16-117	16-117#	16-117#	16-117#	16-117#	16-117#	16-123	16-123
	16-123#	16-128	16-128	16-128	16-128#	16-128#	16-129	16-129	16-129	16-129#	16-129#	16-130	16-130	16-130
	16-130	16-130#	16-130#	16-130#	16-132	16-132	16-132#	16-135	16-135	16-135#	16-141	16-141	16-141#	20-218
	20-218	20-218#	20-219	20-219	20-219	20-219	20-219	20-219	20-219	20-219	20-219	20-219#	20-219#	20-219#
	20-219#	20-219#	20-219#	20-219#	20-219#	20-221	20-221	20-221#	20-222	20-222	20-222	20-222	20-222	20-222
	20-222	20-222	20-222	20-222#	20-222#	20-222#	20-222#	20-222#	20-222#	20-222#	20-222#	20-224	20-224	20-224#
	20-225	20-225	20-225	20-225	20-225	20-225	20-225	20-225	20-225	20-225#	20-225#	20-225#	20-225#	20-225#
	20-225#	20-225#	20-225#	20-229	20-229	20-229#	20-230	20-230	20-230	20-230	20-230#	20-230#	20-230#	21-9
	21-9	21-9#	21-12	21-12	21-12	21-12#	21-12#	21-18	21-18	21-18#	26-17	26-17	26-17	26-17#
	26-17#	26-26	26-26	26-26	26-26#	26-26#	30-27	30-27	30-27#	30-82	30-82	30-82	30-82#	30-82#
	30-95	30-95	30-95	30-95#	30-95#	30-100	30-100	30-100#	77-47	77-47	77-47	77-47#	77-47#	83-18
	83-18	83-18	83-18#	83-18#	87-45	87-45	87-45	87-45	87-45#	87-45#	87-45#	87-52	87-52	87-52
	87-52#	87-52#	87-58	87-58	87-58	87-58#	87-58#	87-64	87-64	87-64	87-64#	87-64#	87-70	87-70
	87-70	87-70#	87-70#	87-76	87-76	87-76	87-76#	87-76#	87-82	87-82	87-82	87-82#	87-82#	87-89
	87-89	87-89	87-89#	87-89#	87-91	87-91	87-91#	87-96	87-96	87-96#	87-106	87-106	87-106	87-106
	87-106	87-106	87-106#	87-106#	87-106#	87-106#	87-106#	87-112	87-112	87-112#	89-20	89-20	89-20	89-20#
	89-20#	90-20	90-20	90-20	90-20#	90-20#	91-47	91-47	91-47	91-47#	91-47#	92-47	92-47	92-47
	92-47#	92-47#	93-92	93-92	93-92	93-92#	93-92#	93-97	93-97	93-97	93-97#	93-97#	93-138	93-138
	93-138#	93-139	93-139	93-139#	93-249	93-249	93-249#	93-304	93-304	93-304#	94-37	94-37	94-37	94-37#
	94-37#	95-43	95-43	95-43#										
T$CODE	60-33	60-33	60-33	60-33#	60-33#	60-33#	60-49	60-49	60-49	60-49#	60-49#	60-49#	95-44	95-44
	95-44	95-44#	95-44#	95-44#	97-54	97-54	97-54	97-54#	97-54#	97-54#	97-56	97-56	97-56	97-56#
	97-56#	97-56#	97-58	97-58	97-58	97-58#	97-58#	97-58#	97-60	97-60	97-60	97-60#	97-60#	97-60#
	98-14	98-14	98-14	98-14#	98-14#	98-14#	98-16	98-16	98-16	98-16#	98-16#	98-16#	98-18	98-18
	98-18	98-18#	98-18#	98-18#	98-20	98-20	98-20	98-20	98-20	98-20	98-20#	98-20#	98-20#	98-20#
	98-22	98-22	98-22	98-22#	98-22#	98-22#	98-24	98-24	98-24	98-24#	98-24#	98-24#		
T$ERRN	7-373#	18-20	18-20#	22-21	22-21#	23-101	23-101#	24-26	24-26#	25-69	25-69#	25-106	25-106#	36-67
	36-67#	37-30	37-30#	37-41	37-41#	41-47	41-47#	41-57	41-57#	41-65	41-65#	41-72	41-72#	41-81
	41-81#	42-45	42-45#	42-57	42-57#	42-65	42-65#	44-43	44-43#	45-48	45-48#	46-48	46-48#	49-35
	49-35#	49-42	49-42#	49-55	49-55#	49-66	49-66#	49-79	49-79#	50-37	50-37#	50-44	50-44#	50-57
	50-57#	50-68	50-68#	50-81	50-81#	51-31	51-31#	51-42	51-42#	52-33	52-33#	52-44	52-44#	53-29
	53-29	53-29	53-[illegible]	53-29#	53-29#	53-29#	53-29#	54-28	54-28	54-28	54-28	54-28#	54-28#	54-28#
	54-28#	55-28	55-28	55-28	55-28	55-28#	55-28#	55-28#	55-28#	56-31	56-31	56-31	56-31	56-31#
	56-31#	56-31#	56-31#	57-29	57-29#	57-40	57-40#	58-31	58-31#	58-41	58-41#	59-31	59-31#	60-46
	60-46#	61-26	61-26#	62-37	62-37#	63-30	63-30#	65-33	65-33#	66-29	66-29#	70-66	70-66#	71-34
	71-34#	72-44	72-44#	73-38	73-38#	74-34	74-34#	74-36	74-36#	75-43	75-43#	75-61	75-61#	76-24
	76-24#	77-67	77-67#	78-24	78-24#	79-36	79-36#	79-46	79-46#	80-38	80-38#	80-45	80-45#	80-56
	80-56#	81-23	81-23#	82-28	82-28#	83-34	83-34#	84-53	84-58#	85-42	85-42#	86-34	86-34#	86-49
	86-49#	86-65	86-65#	86-85	86-85#	88-35	88-35#	89-50	89-50#	90-46	90-46#	91-90	91-90#	92-67
	92-67#	92-87	92-87#	92-106	92-106#	92-110	92-110#	93-117	93-117#	93-156	93-156#	93-194	93-194#	93-217
	93-217#	93-222	93-222#	93-248	93-248#	93-264	93-264#	93-276	93-276#	93-285	93-285#	93-303	93-303#	93-309

CROSS REFERENCE TABLE (CREF V04.00)

	93-309#	93-336	93-336#	94-51	94-51#	94-66	94-66#	95-77	95-77#	96-37	96-37#	96-42	96-42#	96-47
	96-47#													
T$EXCP	95-44	95-44#	97-54	97-54#	97-56	97-56#	97-58	97-58#	97-60	97-60#	98-22	98-22#		
T$FLAG	28-60	28-60#	28-60#	30-20	30-20	30-20#	30-20#	30-126	30-126	30-126#	30-126#	32-42	32-42	32-42#
	32-42#	33-19	33-19#	33-19#	34-20	34-20#	34-20#	41-34	41-34	41-34#	41-34#	46-27	46-27	46-27#
	46-27#	47-21	47-21	47-21#	47-21#	48-21	48-21	48-21#	48-21#	49-49	49-49	49-49#	49-49#	49-73
	49-73	49-73#	49-73#	50-51	50-51	50-51#	50-51#	50-75	50-75	50-75#	50-75#	52-20	52-20	52-20#
	52-20#	53-29	53-29	53-29#	53-29#	54-28	54-28	54-28#	54-28#	55-28	55-28	55-28#	55-28#	56-31
	56-31	56-31#	56-31#	58-32	58-32	58-32#	58-32#	60-28	60-28	60-28#	60-28#	60-31	60-31	60-31#
	60-31#	60-36	60-36	60-36#	60-36#	77-52	77-52	77-52#	77-52#	83-22	83-22	83-22#	83-22#	87-26
	87-26	87-26#	87-26#	89-24	89-24	89-24#	89-24#	90-24	90-24	90-24#	90-24#	91-51	91-51	91-51#
	91-51#	92-51	92-51	92-51#	92-51#	93-93	93-93	93-93#	93-93#	93-101	93-101	93-101#	93-101#	94-41
	94-41	94-41#	94-41#	95-36	95-36	95-36#	95-36#	95-41	95-41	95-41#	95-41#			
T$FREE	98-63	99-22#												
T$GMAN	7-373#	95-44	95-44#	95-44#										
T$HILI	95-44	95-44#	97-54	97-54#	97-56	97-56#	97-58	97-58#	97-60	97-60#	98-22	98-22#		
T$LAST	7-373#	98-63#	99-15											
T$LOLI	95-44	95-44#	97-54	97-54#	97-56	97-56#	97-58	97-58#	97-60	97-60#	98-22	98-22#		
T$LSYM	7-373	7-373#	9-25	10-25	16-105	16-124	16-136	16-142	20-185	27-41	28-75	30-141	31-18	32-57
	33-34	34-35	36-71	37-46	38-24	39-25	40-24	41-86	42-70	43-46	44-50	45-61	46-53	47-30
	48-28	49-85	50-87	51-49	52-51	53-30	54-29	55-29	56-32	57-50	58-48	59-40	60-56	61-31
	62-42	63-35	64-28	65-41	66-36	67-41	68-51	69-28	70-72	71-39	72-50	73-43	74-41	75-66
	76-29	77-72	78-29	79-51	80-61	81-28	82-33	83-40	84-64	85-74	86-100	87-115	88-72	89-56
	90-52	91-95	92-113	93-226	93-320	93-339	94-76	95-83	96-49	97-61	98-33			
T$LTNO	98-63#													
T$NEST	7-373#	7-399	7-399	7-399#	9-9	9-9	9-9#	9-25	9-25	9-25	9-25#	10-8	10-8	10-8#
	10-25	10-25	10-25	10-25#	10-26	10-26	10-26	10-26#	11-51	11-51	11-51#	16-96	16-96	16-96#
	16-105	16-105	16-105	16-105#	16-107	16-107	16-107#	16-124	16-124	16-124	16-124#	16-126	16-126	16-126#
	16-136	16-136	16-136	16-136#	16-138	16-138	16-138#	16-142	16-142	16-142	16-142#	20-179	20-179	20-179#
	20-185	20-185	20-185	20-185#	27-39	27-39	27-39#	27-41	27-41	27-41	27-41#	27-43	27-43	27-43
	27-43#	28-40	28-40	28-40#	28-46	28-46	28-46#	28-75	28-75	28-75	28-75#	29-8	29-8	29-8#
	29-12	29-12	29-12	29-12#	30-8	30-8	30-8#	30-141	30-141	30-141	30-141#	31-10	31-10	31-10#
	31-18	31-18	31-18	31-18#	32-8	32-8	32-8#	32-57	32-57	32-57	32-57#	33-8	33-8	33-8#
	33-34	33-34	33-34	33-34#	34-9	34-9	34-9#	34-35	34-35	34-35	34-35#	34-36	34-36	34-36
	34-36#	36-38	36-38	36-38#	36-60	36-60	36-60#	36-71	36-71	36-71	36-71#	37-19	37-19	37-19#
	37-21	37-21	37-21#	37-32	37-32	37-32	37-32#	37-33	37-33	37-33#	37-43	37-43	37-43	37-43#
	37-46	37-46	37-46	37-46#	38-17	38-17	38-17#	38-21	38-21	38-21	38-21	38-21	38-21	38-21
	38-21	38-21	38-21	38-21	38-21	38-21	38-21	38-21	38-21	38-21	38-21	38-21	38-21	38-21#
	38-21#	38-21#	38-21#	38-21#	38-21#	38-21#	38-21#	38-24	38-24	38-24	38-24#	39-18	39-18	39-18#
	39-22	39-22	39-22	39-22	39-22	39-22	39-22	39-22	39-22	39-22	39-22	39-22	39-22	39-22
	39-22	39-22	39-22	39-22	39-22	39-22	39-22#	39-22#	39-22#	39-22#	39-22#	39-22#	39-22#	39-22#
	39-25	39-25	39-25	39-25#	40-17	40-17	40-17#	40-21	40-21	40-21	40-21	40-21	40-21	40-21
	40-21	40-21	40-21	40-21	40-21	40-21	40-21	40-21	40-21	40-21	40-21	40-21	40-21	40-21#
	40-21#	40-21#	40-21#	40-21#	40-21#	40-21#	40-21#	40-24	40-24	40-24	40-24#	41-31	41-31	41-31#
	41-38	41-38	41-38#	41-39	41-39	41-39#	41-49	41-49	41-49	41-49#	41-50	41-50	41-50#	41-59
	41-59	41-59	41-59#	41-83	41-83	41-83	41-83#	41-86	41-86	41-86	41-86#	42-31	42-31	42-31#
	42-35	42-35	42-35#	42-36	42-36	42-36#	42-47	42-47	42-47	42-47#	42-67	42-67	42-67	42-67#
	42-70	42-70	42-70	42-70#	43-37	43-37	43-37#	43-42	43-42	43-42	43-42	43-42	43-42	43-42
	43-42	43-42	43-42	43-42	43-42	43-42	43-42	43-42	43-42	43-42	43-42	43-42	43-42	43-42#
	43-42#	43-42#	43-42#	43-42#	43-42#	43-42#	43-42#	43-46	43-46	43-46	43-46#	44-26	44-26	44-26#
	44-31	44-31	44-31#	44-47	44-47	44-47	44-47#	44-50	44-50	44-50	44-50#	45-26	45-26	45-26#
	45-31	45-31	45-31#	45-34	45-34	45-34#	45-52	45-52	45-52	45-52#	45-58	45-58	45-58	45-58#
	45-61	45-61	45-61	45-61#	46-24	46-24	46-24#	46-31	46-31	46-31#	46-50	46-50	46-50	46-50#
	46-53	46-53	46-53	46-53#	47-18	47-18	47-18#	47-27	47-27	47-27	47-27	47-27	47-27	47-27
	47-27	47-27	47-27	47-27	47-27	47-27	47-27	47-27	47-27	47-27	47-27	47-27	47-27	47-27#
	47-27#	47-27#	47-27#	47-27#	47-27#	47-27#	47-27#	47-30	47-30	47-30	47-30#	48-18	48-18	48-18#

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48-25	48-25	48-25	48-25	48-25	48-25	48-25	48-25	48-25	48-25	48-25	48-25	48-25	48-25
48-25	48-25	48-25	48-25	48-25	48-25	48-25#	48-25#	48-25#	48-25#	48-25#	48-25#	48-25#	48-25#
48-28	48-28	48-28	48-28#	49-24	49-24	49-24#	49-28	49-28	49-28#	49-45	49-45	49-45	49-45#
49-46	49-46	49-46#	49-58	49-58	49-58	49-58#	49-59	49-59	49-59#	49-69	49-69	49-69	49-69#
49-70	49-70	49-70#	49-82	49-82	49-82	49-82#	49-85	49-85	49-85	49-85#	50-26	50-26	50-26#
50-30	50-30	50-30#	50-47	50-47	50-47	50-47#	50-48	50-48	50-48#	50-60	50-60	50-60	50-60#
50-61	50-61	50-61#	50-71	50-71	50-71	50-71#	50-72	50-72	50-72#	50-84	50-84	50-84	50-84#
50-87	50-87	50-87	50-87#	51-18	51-18	51-18#	51-24	51-24	51-24#	51-34	51-34	51-34	51-34#
51-35	51-35	51-35#	51-45	51-45	51-45	51-45#	51-49	51-49	51-49	51-49#	52-17	52-17	52-17#
52-24	52-24	52-24#	52-36	52-36	52-36	52-36#	52-37	52-37	52-37#	52-47	52-47	52-47	52-47#
52-51	52-51	52-51	52-51#	53-28	53-28	53-28#	53-29	53-29	53-29	53-29	53-29	53-29	53-29
53-29	53-29	53-29	53-29	53-29	53-29	53-29	53-29	53-29#	53-29#	53-29#	53-29#	53-29#	53-29#
53-30	53-30	53-30	53-30#	54-27	54-27	54-27#	54-28	54-28	54-28	54-28	54-28	54-28	54-28
54-28	54-28	54-28	54-28	54-28	54-28	54-28	54-28	54-28#	54-28#	54-28#	54-28#	54-28#	54-28#
54-29	54-29	54-29	54-29#	55-27	55-27	55-27#	55-28	55-28	55-28	55-28	55-28	55-28	55-28
55-28	55-28	55-28	55-28	55-28	55-28	55-28	55-28	55-28#	55-28#	55-28#	55-28#	55-28#	55-28#
55-29	55-29	55-29	55-29#	56-30	56-30	56-30#	56-31	56-31	56-31	56-31	56-31	56-31	56-31
56-31	56-31	56-31	56-31	56-31	56-31	56-31	56-31	56-31#	56-31#	56-31#	56-31#	56-31#	56-31#
56-32	56-32	56-32	56-32#	57-17	57-17	57-17#	57-21	57-21	57-21#	57-31	57-31	57-31	57-31#
57-34	57-34	57-34#	57-42	57-42	57-42	57-42#	57-50	57-50	57-50#	58-18	58-18	58-18	58-18#
58-22	58-22	58-22#	58-33	58-33	58-33	58-33#	58-35	58-35	58-35#	58-43	58-43	58-43	58-43#
58-48	58-48	58-48	58-48#	59-13	59-13	59-13#	59-16	59-16	59-16#	59-33	59-33	59-33	59-33#
59-40	59-40	59-40	59-40#	60-22	60-22	60-22#	60-37	60-37	60-37#	60-47	60-47	60-47	60-47#
60-56	60-56	60-56	60-56#	61-15	61-15	61-15#	61-17	61-17	61-17#	61-28	61-28	61-28	61-28#
61-31	61-31	61-31	61-31#	62-13	62-13	62-13#	62-15	62-15	62-15#	62-39	62-39	62-39	62-39#
62-42	62-42	62-42	62-42#	63-15	63-15	63-15#	63-17	63-17	63-17#	63-32	63-32	63-32	63-32#
63-35	63-35	63-35	63-35#	64-20	64-20	64-20#	64-25	64-25	64-25	64-25	64-25	64-25	64-25
64-25	64-25	64-25	64-25	64-25	64-25	64-25	64-25	64-25	64-25	64-25	64-25	64-25	64-25#
64-25#	64-25#	64-25#	64-25#	64-25#	64-25#	64-25#	64-28	64-28	64-28	64-28#	65-18	65-18	65-18#
65-20	65-20	65-20#	65-38	65-38	65-38	65-38#	65-41	65-41	65-41	65-41#	66-12	66-12	66-12#
66-14	66-14	66-14#	66-33	66-33	66-33	66-33#	66-36	66-36	66-36	66-36#	67-14	67-14	67-14#
67-21	67-21	67-21#	67-38	67-38	67-38	67-38#	67-41	67-41	67-41	67-41#	68-14	68-14	68-14#
68-20	68-20	68-20#	68-48	68-48	68-48	68-48#	68-51	68-51	68-51	68-51#	69-20	69-20	69-20#
69-25	69-25	69-25	69-25	69-25	69-25	69-25	69-25	69-25	69-25	69-25	69-25	69-25	69-25
69-25	69-25	69-25	69-25	69-25	69-25	69-25#	69-25#	69-25#	69-25#	69-25#	69-25#	69-25#	69-25#
69-28	69-28	69-28	69-28#	70-33	70-33	70-33#	70-36	70-36	70-36#	70-68	70-68	70-68	70-68#
70-72	70-72	70-72	70-72#	71-17	71-17	71-17#	71-19	71-19	71-19#	71-36	71-36	71-36	71-36#
71-39	71-39	71-39	71-39#	72-18	72-18	72-18#	72-20	72-20	72-20#	72-46	72-46	72-46	72-46#
72-50	72-50	72-50	72-50#	73-13	73-13	73-13#	73-15	73-15	73-15#	73-40	73-40	73-40	73-40#
73-43	73-43	73-43	73-43#	74-17	74-17	74-17#	74-19	74-19	74-19#	74-38	74-38	74-38	74-38#
74-41	74-41	74-41	74-41#	75-21	75-21	75-21#	75-23	75-23	75-23#	75-63	75-63	75-63	75-63#
75-66	75-66	75-66	75-66#	76-12	76-12	76-12#	76-14	76-14	76-14#	76-26	76-26	76-26	76-26#
76-29	76-29	76-29	76-29#	77-28	77-28	77-28#	77-30	77-30	77-30#	77-69	77-69	77-69	77-69#
77-72	77-72	77-72	77-72#	78-13	78-13	78-13#	78-15	78-15	78-15#	78-26	78-26	78-26	78-26#
78-29	78-29	78-29	78-29#	79-22	79-22	79-22#	79-24	79-24	79-24#	79-48	79-48	79-48	79-48#
79-51	79-51	79-51	79-51#	80-24	80-24	80-24#	80-26	80-26	80-26#	80-58	80-58	80-58	80-58#
80-61	80-61	80-61	80-61#	81-12	81-12	81-12#	81-14	81-14	81-14#	81-25	81-25	81-25	81-25#
81-28	81-28	81-28	81-28#	82-14	82-14	82-14#	82-16	82-16	82-16#	82-30	82-30	82-30	82-30#
82-33	82-33	82-33	82-33#	83-13	83-13	83-13#	83-23	83-23	83-23#	83-36	83-36	83-36	83-36#
83-40	83-40	83-40	83-40#	84-18	84-18	84-18#	84-64	84-64	84-64	84-64#	85-25	85-25	85-25#
85-74	85-74	85-74	85-74#	86-16	86-16	86-16#	86-24	86-24	86-24#	86-37	86-37	86-37	86-37#
86-38	86-38	86-38#	86-52	86-52	86-52	86-52#	86-55	86-55	86-55#	86-68	86-68	86-68	86-68#
86-75	86-75	86-75#	86-88	86-88	86-88	86-88#	86-100	86-100	86-100	86-100#	87-20	87-20	87-20#
87-115	87-115	87-115	87-115#	88-24	88-24	88-24#	88-30	88-30	88-30#	88-39	88-39	88-39	88-39#
88-72	88-72	88-72	88-72#	89-15	89-15	89-15#	89-25	89-25	89-25#	89-52	89-52	89-52	89-52#
89-56	89-56	89-56	89-56#	90-15	90-15	90-15#	90-25	90-25	90-25#	90-48	90-48	90-48	90-48#

	90-52	90-52	90-52	90-52#	91-42	91-42	91-42#	91-54	91-54	91-54#	91-92	91-92	91-92	91-92#
	91-95	91-9[illegible]	91-95	91-95#	92-39	92-39	92-39#	92-52	92-52	92-52#	92-68	92-68	92-68	92-68#
	92-69	92-69	92-69#	92-89	92-89	92-89	92-89#	92-90	92-90	92-90#	92-112	92-112	92-112	92-112#
	92-113	92-113	92-113	92-113#	93-87	93-87	93-87#	93-105	93-105	93-105#	93-106	93-106	93-106#	93-119
	93-119	93-119	93-119#	93-120	93-120	93-120#	93-196	93-196	93-196	93-196#	93-197	93-197	93-197#	93-225
	93-225	93-225	93-225#	93-22[illegible]	93-226	93-226	93-226#	93-227	93-227	93-227#	93-238	93-238	93-238#	93-315
	93-315	93-315	93-315#	93-320	93-320	93-320	93-320#	93-321	93-321	93-321#	93-338	93-338	93-338	93-338#
	93-339	93-339	93-339	93-339#	94-31	94-31	94-31[illegible]	94-32	94-32	94-32#	94-52	94-52	94-52	94-52#
	94-53	94-53	94-53#	94-75	94-75	94-75	94-75#	94-76	94-76	94-76	94-76#	95-30	95-30	95-30#
	95-72	95-72	95-72#	95-81	95-81	95-81	95-81#	95-83	95-83	95-83	95-83#	96-25	96-25	96-25#
	96-49	96-49	96-49	96-49#	96-51	96-51	96-51	96-51#	97-42	97-42	97-42#	97-52	97-52	97-52#
	97-61	97-61	97-61	97-61#	98-12	98-12	98-12#	98-20	98-33	98-33	98-33	98-33#	98-64	98-64
	98-64	98-64#												
T$NS0	7-399#	10-26	11-51#	27-43	28-40#	34-36	36-38#	96-51	97-42#	98-64				
T$NS1	9-9#	9-25	10-8#	10-25	16-96#	16-105	16-107#	16-124	16-126#	16-136	16-138#	16-142	20-179#	20-185
	27-39#	27-41	28-46#	28-75	29-8#	29-12	30-8#	30-141	31-10#	31-18	32-8#	32-57	33-8#	33-34
	34-9#	34-35	36-60#	36-71	37-19#	37-46	38-17#	38-24	39-18#	39-25	40-17#	40-24	41-31#	41-86
	42-31#	42-70	43-37#	43-46	44-26#	44-50	45-26#	45-61	46-24#	46-53	47-18#	47-30	48-18#	48-28
	49-24#	49-85	50-26#	50-87	51-18#	51-49	52-17#	52-51	53-28#	53-30	54-27#	54-29	55-27#	55-29
	56-30#	56-32	57-17#	57-50	58-18#	58-48	59-13#	59-40	60-22#	60-56	61-15#	61-31	62-13#	62-42
	63-15#	63-35	64-20#	64-28	65-18#	65-41	66-12#	66-36	67-14#	67-41	68-14#	68-51	69-20#	69-28
	70-33#	70-72	71-17#	71-39	72-18#	72-50	73-13#	73-43	74-17#	74-41	75-21#	75-66	76-12#	76-29
	77-28#	77-72	78-13#	78-29	79-22#	79-51	80-24#	80-61	81-12#	81-28	82-14#	82-33	83-13#	83-40
	84-18#	84-64	85-25#	85-74	86-16#	86-100	87-20#	87-115	88-24#	88-72	89-15#	89-56	90-15#	90-52
	91-42#	91-95	92-39#	92-113	93-87#	93-339	94-31#	94-76	95-30#	95-83	96-25#	96-49	97-52#	97-61
	98-12#	98-20	98-33											
T$NS2	37-21#	37-32	37-33#	37-43	38-21	38-21	38-21	38-21#	38-21#	38-21#	39-22	39-22	39-22	39-22#
	39-22#	39-22#	40-21	40-21	40-21	40-21#	40-21#	40-21#	41-38#	41-83	42-35#	42-67	43-42	43-42
	43-42	43-42#	43-42#	43-42#	44-31#	44-47	45-31#	45-58	46-31#	46-50	47-27	47-27	47-27	47-27#
	47-27#	47-27#	48-25	48-25	48-25	48-25#	48-25#	48-25#	49-28#	49-45	49-46#	49-58	49-59#	49-69
	49-70#	49-82	50-30#	50-47	50-48#	50-60	50-61#	50-71	50-72#	50-84	51-24#	51-34	51-35#	51-45
	52-24#	52-36	52-37#	52-47	53-29	53-29	53-29	53-29#	53-29#	53-29#	54-28	54-28	54-28	54-28#
	54-28#	54-28#	55-28	55-28	55-28	55-28#	55-28#	55-28#	56-31	56-31	56-31	56-31#	56-31#	56-31#
	57-21#	57-31	57-34#	57-42	58-22#	58-33	58-35#	58-43	59-16#	59-33	60-37#	60-47	61-17#	61-28
	62-15#	62-39	63-17#	63-32	64-25	64-25	64-25	64-25#	64-25#	64-25#	65-20#	65-38	66-14#	66-33
	67-21#	67-38	68-20#	68-48	69-25	69-25	69-25	69-25#	69-25#	69-25#	70-36#	70-68	71-19#	71-36
	72-20#	72-46	73-15#	73-40	74-19#	74-38	75-23#	75-63	76-14#	76-26	77-30#	77-69	78-15#	78-26
	79-24#	79-48	80-26#	80-58	81-14#	81-25	82-16#	82-30	83-23#	83-36	86-24#	86-37	86-38#	86-52
	86-55#	86-68	86-75#	86-88	88-30#	88-39	89-25#	89-52	90-25#	90-48	91-54#	91-92	92-52#	92-68
	92-69#	92-89	92-90#	92-112	93-105#	93-226	93-227#	93-320	93-321#	93-338	94-32#	94-52	94-53#	94-75
	95-72#	95-81												
T$NS3	38-21	38-21#	39-22	39-22#	40-21	40-21#	41-39#	41-49	41-50#	41-59	42-36#	42-47	43-42	43-42#
	45-34#	45-52	47-27	47-27#	48-25	48-25#	64-25	64-25#	69-25	69-25#	93-106#	93-119	93-120#	93-196
	93-197#	93-225	93-238#	93-315										
T$PCNT	99-15#	99-16	99-16	99-16#										
T$PTAB	99-16	99-16#												
T$PTHV	7-427	99-22#												
T$PTNU	7-373#	99-16	99-16#	99-22	99-22									
T$SAVL	7-373#													
T$SEGL	7-373#	37-21	37-21	37-21#	37-32	37-32	37-32	37-32	37-32#	37-33	37-33	37-33#	37-43	37-43
	37-43	37-43	37-43#	38-21	38-21	38-21	38-21	38-21	38-21	38-21	38-21	38-21	38-21	38-21
	38-21	38-21	38-21	38-21	38-21	38-21	38-21	38-21	38-21	38-21	38-21	38-21	38-21	38-21#
	38-21#	38-21#	38-21#	38-21#	38-21#	38-21#	38-21#	39-22	39-22	39-22	39-22	39-22	39-22	39-22
	39-22	39-22	39-22	39-22	39-22	39-22	39-22	39-22	39-22	39-22	39-22	39-22	39-22	39-22
	39-22	39-22	39-22	39-22#	39-22#	39-[illegible]2#	39-22#	39-22#	39-22#	39-22#	39-22#	40-21	40-21	40-21
	40-21	40-21	40-21	40-21	40-21	40-21	40-21	40-21	40-21	40-21	40-21	40-21	40-21	40-21

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40-21	40-21	40-21	40-21	40-21	40-21	40-21	40-21#	40-21#	40-21#	40-21#	40-21#	40-21#	40-21#
40-21#	41-38	41-38	41-38#	41-39	41-39	41-39#	41-49	41-49	41-49	41-49	41-49#	41-50	41-50
41-50#	41-59	41-59	41-59	41-59	41-59#	41-83	41-83	41-83	41-83	41-83#	42-35	42-35	42-35#
42-36	42-36	42-36#	42-47	42-47	42-47	42-47	42-47#	42-67	42-67	42-67	42-67	42-67#	43-42
43-42	43-42	43-42	43-42	43-42	43-42	43-42	43-42	43-42	43-42	43-42	43-42	43-42	43-42
43-42	43-42	43-42	43-42	43-42	43-42	43-42	43-42	43-42	43-42#	43-42#	43-42#	43-42#	43-42#
43-42#	43-42#	43-42#	44-31	44-31	44-31#	44-47	44-47	44-47	44-47	44-47#	45-31	45-31	45-31#
45-34	45-34	45-34#	45-52	45-52	45-52	45-52	45-52#	45-58	45-58	45-58	45-58	45-58#	46-31
46-31	46-31#	46-50	46-50	46-50	46-50	46-50#	47-27	47-27	47-27	47-27	47-27	47-27	47-27
47-27	47-27	47-27	47-27	47-27	47-27	47-27	47-27	47-27	47-27	47-27	47-27	47-27	47-27
47-27	47-27	47-27	47-27#	47-27#	47-27#	47-27#	47-27#	47-27#	47-27#	47-27#	48-25	48-25	48-25
48-25	48-25	48-25	48-25	48-25	48-25	48-25	48-25	48-25	48-25	48-25	48-25	48-25	48-25
48-25	48-25	48-25	48-25	48-25	48-25	48-25	48-25#	48-25#	48-25#	48-25#	48-25#	48-25#	48-25#
48-25#	49-28	49-28	49-28#	49-45	49-45	49-45	49-45	49-45#	49-46	49-46	49-46#	49-49	49-58
49-58	49-58	49-58	49-58#	49-59	49-59	49-59#	49-69	49-69	49-69	49-69	49-69#	49-70	49-70
49-70#	49-73	49-82	49-82	49-82	49-82	49-82#	50-30	50-30	50-30#	50-47	50-47	50-47	50-47
50-47#	50-48	50-48	50-48#	50-51	50-60	50-60	50-60	50-60	50-60#	50-61	50-61	50-61#	50-71
50-71	50-71	50-71	50-71#	50-72	50-72	50-72#	50-75	50-84	50-84	50-84	50-84	50-84#	51-24
51-24	51-24#	51-34	51-34	51-34	51-34	51-34#	51-35	51-35	51-35#	51-45	51-45	51-45	51-45
51-45#	52-24	52-24	52-24#	52-36	52-36	52-36	52-36	52-36#	52-37	52-37	52-37#	52-47	52-47
52-47	52-47	52-47#	53-29	53-29	53-29	53-29	53-29	53-29	53-29	53-29	53-29	53-29	53-29
53-29	53-29	53-29	53-29	53-29	53-29	53-29	53-29#	53-29#	53-29#	53-29#	53-29#	53-29#	54-28
54-28	54-28	54-28	54-28	54-28	54-28	54-28	54-28	54-28	54-28	54-28	54-28	54-28	54-28
54-28	54-28	54-28	54-28#	54-28#	54-28#	54-28#	54-28#	54-28#	55-28	55-28	55-28	55-28	55-28
55-28	55-28	55-28	55-28	55-28	55-28	55-28	55-28	55-28	55-28	55-28	55-28	55-28	55-28#
55-28#	55-28#	55-28#	55-28#	55-28#	56-31	56-31	56-31	56-31	56-31	56-31	56-31	56-31	56-31
56-31	56-31	56-31	56-31	56-31	56-31	56-31	56-31	56-31	56-31#	56-31#	56-31#	56-31#	56-31#
56-31#	57-21	57-21	57-21#	57-31	57-31	57-31	57-31	57-31#	57-34	57-34	57-34#	57-42	57-42
57-42	57-42	57-42#	58-22	58-22	58-22#	58-33	58-33	58-33	58-33	58-33#	58-35	58-35	58-35#
58-43	58-43	58-43	58-43	58-43#	59-16	59-16	59-16#	59-33	59-33	59-33	59-33	59-33#	60-37
60-37	60-37#	60-47	60-47	60-47	60-47	60-47#	61-17	61-17	61-17#	61-28	61-28	61-28	61-28
61-28#	62-15	62-15	62-15#	62-39	62-39	62-39	62-39	62-39#	63-17	63-17	63-17#	63-32	63-32
63-32	63-32	63-32#	64-25	64-25	64-25	64-25	64-25	64-25	64-25	64-25	64-25	64-25	64-25
64-25	64-25	64-25	64-25	64-25	64-25	64-25	64-25	64-25	64-25	64-25	64-25	64-25	64-25#
64-25#	64-25#	64-25#	64-25#	64-25#	64-25#	64-25#	65-20	65-20	65-20#	65-38	65-38	65-38	65-38
65-38#	66-14	66-14	66-14#	66-33	66-33	66-33	66-33	66-33#	67-21	67-21	67-21#	67-38	67-38
67-38	67-38	67-38#	68-20	68-20	68-20#	68-48	68-48	68-48	68-48	68-48#	69-25	69-25	69-25
69-25	69-25	69-25	69-25	69-25	69-25	69-25	69-25	69-25	69-25	69-25	69-25	69-25	69-25
69-25	69-25	69-25	69-25	69-25	69-25	69-25	69-25#	69-25#	69-25#	69-25#	69-25#	69-25#	69-25#
69-25#	70-36	70-36	70-36#	70-68	70-68	70-68	70-68	70-68#	71-19	71-19	71-19#	71-36	71-36
71-36	71-36	71-36#	72-20	72-20	72-20#	72-46	72-46	72-46	72-46	72-46#	73-15	73-15	73-15#
73-40	73-40	73-40	73-40	73-40#	74-19	74-19	74-19#	74-38	74-38	74-38	74-38	74-38#	75-23
75-23	75-23#	75-63	75-63	75-63	75-63	75-63#	76-14	76-14	76-14#	76-26	76-26	76-26	76-26
76-26#	77-30	77-30	77-30#	77-69	77-69	77-69	77-69	77-69#	78-15	78-15	78-15#	78-26	78-26
78-26	78-26	78-26#	79-24	79-24	79-24#	79-48	79-48	79-48	79-48	79-48#	80-26	80-26	80-26#
80-58	80-58	80-58	80-58	80-58#	81-14	81-14	81-14#	81-25	81-25	81-25	81-25	81-25#	82-16
82-16	82-16#	82-30	82-30	82-30	82-30	82-30#	83-23	83-23	83-23#	83-36	83-36	83-36	83-36
83-36#	86-24	86-24	86-24#	86-37	86-37	86-37	86-37	86-37#	86-38	86-38	86-38#	86-52	86-52
86-52	86-52	86-52#	86-55	86-55	86-55#	86-68	86-68	86-68	86-68	86-68#	86-75	86-75	86-75#
86-88	86-88	86-88	86-88	86-88#	88-30	88-30	88-30#	88-39	88-39	88-39	88-39	88-39#	89-25
89-25	89-25#	89-52	89-52	89-52	89-52	89-52#	90-25	90-25	90-25#	90-48	90-48	90-48	90-48
90-48#	91-54	91-54	91-54#	91-92	91-92	91-92	91-92	91-92#	92-52	92-52	92-52#	92-68	92-68
92-68	92-68	92-68#	92-69	92-69	92-69#	92-89	92-89	92-89	92-89	92-89#	92-90	92-90	92-90#
92-112	92-112	92-112	92-112	92-112#	93-106	93-106	93-106#	93-119	93-119	93-119	93-119	93-119#	93-120
93-120	93-120#	93-196	93-196	93-196	93-196	93-196#	93-197	93-197	93-197#	93-225	93-225	93-225	93-225
93-225#	93-238	93-238	93-238#	93-315	93-315	93-315	93-315	93-315#	93-321	93-321	93-321#	93-338	93-338

	93-338	93-338	93-338#	94-32	94-32	94-32#	94-52	94-52	94-52	94-52	94-52#	94-53	94-53	94-53#
	94-75	94-75	94-75	94-75	94-75#	95-72	95-72	95-72#	95-81	95-81	95-81	95-81	95-81#	
T$SEK0	37-21#	37-32	37-33#	37-43	38-21	38-21	38-21	38-21#	38-21#	38-21#	39-22	39-22	39-22	39-22#
	39-22#	39-22#	40-21	40-21	40-21	40-21#	40-21#	40-21#	41-38#	41-83	42-35#	42-67	43-42	43-42
	43-42	43-42#	43-42#	43-42#	44-31#	44-47	45-31#	45-58	46-31#	46-50	47-27	47-27	47-27	47-27#
	47-27#	47-27#	48-25	48-25	48-25	48-25#	48-25#	48-25#	49-28#	49-45	49-46#	49-49	49-58	49-59#
	49-69	49-70#	49-73	49-82	50-30#	50-47	50-48#	50-51	50-60	50-61#	50-71	50-72#	50-75	50-84
	51-24#	51-34	51-35#	51-45	52-24#	52-36	52-37#	52-47	53-29	53-29	53-29	53-29#	53-29#	53-29#
	54-28	54-28	54-28	54-28#	54-28#	54-28#	55-28	55-28	55-28	55-28#	55-28#	55-28#	56-31	56-31
	56-31	56-31#	56-31#	56-31#	57-21#	57-31	57-34#	57-42	58-22#	58-33	58-35#	58-43	59-16#	59-33
	60-37#	60-47	61-17#	61-28	62-15#	62-39	63-17#	63-32	64-25	64-25	64-25	64-25#	64-25#	64-25#
	65-20#	65-38	66-14#	66-33	67-21#	67-38	68-20#	68-48	69-25	69-25	69-25	69-25#	69-25#	69-25#
	70-36#	70-68	71-19#	71-36	72-20#	72-46	73-15#	73-40	74-19#	74-38	75-23#	75-63	76-14#	76-26
	77-30#	77-69	78-15#	78-26	79-24#	79-48	80-26#	80-58	81-14#	81-25	82-16#	82-30	83-23#	83-36
	86-24#	86-37	86-38#	86-52	86-55#	86-68	86-75#	86-88	88-30#	88-39	89-25#	89-52	90-25#	90-48
	91-54#	91-92	92-52#	92-68	92-69#	92-89	92-90#	92-112	93-106#	93-119	93-120#	93-196	93-197#	93-225
	93-238#	93-315	93-321#	93-338	94-32#	94-52	94-53#	94-75	95-72#	95-81				
T$SEK1	38-21	38-21#	39-22	39-22#	40-21	40-21#	41-39#	41-49	41-50#	41-59	42-36#	42-47	43-42	43-42#
	45-34#	45-52	47-27	47-27#	48-25	48-25#	64-25	64-25#	69-25	69-25#				
T$SIZE	98-63	99-22#												
T$SUBN	7-373#	36-60#	37-19#	38-17#	39-18#	40-17#	41-31#	42-31#	43-37#	44-26#	45-26#	46-24#	47-18#	48-18#
	49-24#	50-26#	51-18#	52-17#	53 28#	54-27#	55-27#	56-30#	57-17#	58-18#	59-13#	60-22#	61-15#	62-13#
	63-15#	64-20#	65-18#	66-12#	67-14#	68-14#	69-20#	70-33#	71-17#	72-18#	73-13#	74-17#	75-21#	76-12#
	77-28#	78-13#	79-22#	80-24#	81-12#	82-14#	83-13#	84-18#	85-25#	86-16#	87-20#	88-24#	89-15#	90-15#
	91-42#	92-39#	93-87#	93-105	93-105	93-105#	93-227	93-227	93-227#	94-31#	95-30#	96-25#		
T$TAGL	7-373#													
T$TAGN	7-373#	9-9	9-9	9-9#	10-8	10-8	10-8#	16-96	16-96	16-96#	16-107	16-107	16-107#	16-126
	16-126	16-126#	16-138	16-138	16-138#	20-179	20-179	20-179#	27-39	27-39	27-39#	28-46	28-46	28-46#
	29-8	29-8	29-8#	30-8	30-8	30-8#	31-10	31-10	31-10#	32-8	32-8	32-8#	33-8	33-8
	33-8#	34-9	34-9	34-9#	36-60	36-60	36-60#	37-19	37-19	37-19#	38-17	38-17	38-17#	39-18
	39-18	39-18#	40-17	40-17	40-17#	41-31	41-31	41-31#	42-31	42-31	42-31#	43-37	43-37	43-37#
	44-26	44-26	44-26#	45-26	45-26	45-26#	46-24	46-24	46-24#	47-18	47-18	47-18#	48-18	48-18
	48-18#	49-24	49-24	49-24#	50-26	50-26	50-26#	51-18	51-18	51-18#	52-17	52-17	52-17#	53-28
	53-28	53-28#	54-27	54-27	54-27#	55-27	55-27	55-27#	56-30	56-30	56-30#	57-17	57-17	57-17#
	58-18	58-18	58-18#	59-13	59-13	59-13#	60-22	60-22	60-22#	61-15	61-15	61-15#	62-13	62-13
	62-13#	63-15	63-15	63-15#	64-20	64-20	64-20#	65-18	65-18	65-18#	66-12	66-12	66-12#	67-14
	67-14	67-14#	68-14	68-14	68-14#	69-20	69-20	69-20#	70-33	70-33	70-33#	71-17	71-17	71-17#
	72-18	72-18	72-18#	73-13	73-13	73-13#	74-17	74-17	74-17#	75-21	75-21	75-21#	76-12	76-12
	76-12#	77-28	77-28	77-28#	78-13	78-13	78-13#	79-22	79-22	79-22#	80-24	80-24	80-24#	81-12
	81-12	81-12#	82-14	82-14	82-14#	83-13	83-13	83-13#	84-18	84-18	84-18#	85-25	85-25	85-25#
	86-16	86-16	86-16#	87-20	87-20	87-20#	88-24	88-24	88-24#	89-15	89-15	89-15#	90-15	90-15
	90-15#	91-42	91-42	91-42#	92-39	92-39	92-39#	93-87	93-87	93-87#	93-105	93-105	93-105#	93-227
	93-227	93-227#	94-31	94-31	94-31#	95-30	95-30	95-30#	96-25	96-25	96-25#	97-52	97-52	97-52#
	98-12	98-12	98-12#	99-15	99-15	99-15#	99-16	99-16	99-16	99-16	99-16#	99-16#		
T$TEMP	8-8	8-8	8-8	8-8	8-8	8-8	8-8	8-8	8-8	8-8	8-8	8-8	8-8	8-8
	8-8	8-8	8-8	8-8	8-8	8-8	8-8	8-8	8-8	8-8	8-8	8-8	8-8	8-8
	8-8	8-8	8-8	8-8	8-8	8-8	8-8	8-8	8-8	8-8	8-8	8-8	8-8	8-8
	8-8	8-8	8-8	8-8	8-8	8-8	8-8	8-8	8-8	8-8	8-8	8-8	8-8	8-8
	8-8	8-8	8-8	8-8	8-8	8-8	8-8	8-8	8-8	8-8	8-8	8-8	8-8	8-8
	8-8	8-8	8-8	8-8	8-8	8-8	8-8	8-8	8-8	8-8	8-8	8-8	8-8	8-8
	8-8	8-8	8-8	8-8	8-8	8-8	8-8	8-8	8-8	8-8	8-8	8-8	8-8	8-8
	8-8	8-8	8-8	8-8	8-8	8-8	8-8	8-8	8-8	8-8	8-8	8-8	8-8	8-8
	8-8	8-8	8-8	8-8	8-8	8-8	8-8	8-8	8-8	8-8	8-8#	8-8#	8-8#	8-8#
	8-8#	8-8#	8-8#	8-8#	8-8#	8-8#	8-8#	8-8#	8-8#	8-8#	8-8#	8-8#	8-8#	8-8#
	8-8#	8-8#	8-8#	8-8#	8-8#	8-8#	8-8#	8-8#	8-8#	8-8#	8-8#	8-8#	8-8#	8-8#
	8-8#	8-8#	8-8#	8-8#	8-8#	8-8#	8-8#	8-8#	8-8#	8-8#	8-8#	8-8#	8-8#	8-8#

CROSS REFERENCE TABLE (CREF V04.00)

	8-8#	8-8#	8-8#	8-8#	8-8#	8-8#	8-8#	8-8#	8-8#	8-8#	8-8#	8-8#	8-8#	8-8#
	8-8#	8-8#	9-25	9-25#	10-25	10-25#	10-26	10-26#	16-105	16-105#	16-124	16-124#	16-136	16-136#
	16-142	16-142#	20-185	20-185#	27-41	27-41#	27-43	27-43#	28-60	28-60#	28-75	28-75#	29-12	29-12#
	30-20	30-20#	30-126	30-126#	30-141	30-141#	31-18	31-18#	32-42	32-42#	32-57	32-57#	33-19	33-19#
	33-34	33-34#	34-20	34-20#	34-35	34-35#	34-36	34-36#	36-71	36-71#	37-32	37-32#	37-43	37-43#
	37-46	37-46#	38-21	38-21	38-21	38-21	38-21#	38-21#	38-21#	38-21#	38-24	38-24#	39-22	39-22
	39-22	39-22	39-22#	39-22#	39-22#	39-22#	39-25	39-25#	40-21	40-21	40-21	40-21	40-21#	40-21#
	40-21#	40-21#	40-24	40-24#	41-34	41-34#	41-49	41-49#	41-59	41-59#	41-83	41-83#	41-86	41-86#
	42-47	42-47#	42-67	42-67#	42-70	42-70#	43-42	43-42	43-42	43-42	43-42#	43-42#	43-42#	43-42#
	43-46	43-46#	44-47	44-47#	44-50	44-50#	45-52	45-52#	45-58	45-58#	45-61	45-61#	46-27	46-27#
	46-50	46-50#	46-53	46-53#	47-21	47-21#	47-27	47-27	47-27	47-27	47-27#	47-27#	47-27#	47-27#
	47-30	47-30#	48-21	48-21#	48-25	48-25	48-25	48-25	48-25#	48-25#	48-25#	48-25#	48-28	48-28#
	49-45	49-45#	49-49	49-49#	49-49#	49-58	49-58#	49-69	49-69#	49-73	49-73#	49-73#	49-82	49-82#
	49-85	49-85#	50-47	50-47#	50-51	50-51#	50-51#	50-60	50-60#	50-71	50-71#	50-75	50-75#	50-75#
	50-84	50-84#	50-87	50-87#	51-34	51-34#	51-45	51-45#	51-49	51-49#	52-20	52-20#	52-36	52-36#
	52-47	52-47#	52-51	52-51#	53-29	53-29	53-29	53-29	53-29#	53-29#	53-29#	53-29#	53-30	53-30#
	54-28	54-28	54-28	54-28	54-28#	54-28#	54-28#	54-28#	54-29	54-29#	55-28	55-28	55-28	55-28
	55-28#	55-28#	55-28#	55-28#	55-29	55-29#	56-31	56-31	56-31	56-31	56-31#	56-31#	56-31#	56-31#
	56-32	56-32#	57-31	57-31#	57-42	57-42#	57-50	57-50#	58-32	58-32#	58-33	58-33#	58-43	58-43#
	58-48	58-48#	59-33	59-33#	59-40	59-40#	60-28	60-28#	60-31	60-31#	60-33	60-33	60-33	60-33#
	60-33#	60-33#	60-36	60-36#	60-47	60-47#	60-49	60-49	60-49	60-49#	60-49#	60-49#	60-56	60-56#
	61-28	61-28#	61-31	61-31#	62-39	62-39#	62-42	62-42#	63-32	63-32#	63-35	63-35#	64-25	64-25
	64-25	64-25	64-25#	64-25#	64-25#	64-25#	64-28	64-28#	65-38	65-38#	65-41	65-41#	66-33	66-33#
	66-36	66-36#	67-38	67-38#	67-41	67-41#	68-48	68-48#	68-51	68-51#	69-25	69-25	69-25	69-25
	69-25#	69-25#	69-25#	69-25#	69-28	69-28#	70-68	70-68#	70-72	70-72#	71-36	71-36#	71-39	71-39#
	72-46	72-46#	72-50	72-50#	73-40	73-40#	73-43	73-43#	74-38	74-38#	74-41	74-41#	75-63	75-63#
	75-66	75-66#	76-26	76-26#	76-29	76-29#	77-52	77-52#	77-69	77-69#	77-72	77-72#	78-26	78-26#
	78-29	78-29#	79-48	79-48#	79-51	79-51#	80-58	80-58#	80-61	80-61#	81-25	81-25#	81-28	81-28#
	82-30	82-30#	82-33	82-33#	83-22	83-22#	83-36	83-36#	83-40	83-40#	84-64	84-64#	85-74	85-74#
	86-37	86-37#	86-52	86-52#	86-68	86-68#	86-88	86-88#	86-100	86-100#	87-26	87-26#	87-115	87-115#
	88-39	88-39#	88-72	88-72#	89-24	89-24#	89-52	89-52#	89-56	89-56#	90-24	90-24#	90-48	90-48#
	90-52	90-52#	91-51	91-51#	91-92	91-92#	91-95	91-95#	92-51	92-51#	92-68	92-68#	92-89	92-89#
	92-112	92-112#	92-113	92-113#	93-93	93-93#	93-101	93-101#	93-119	93-119#	93-196	93-196#	93-225	93-225#
	93-226	93-226#	93-315	93-315#	93-320	93-320#	93-338	93-338#	93-339	93-339#	94-41	94-41#	94-52	94-52#
	94-75	94-75#	94-76	94-76#	95-36	95-36#	95-41	95-41#	95-44	95-44	95-44	95-44#	95-44#	95-44#
	95-81	95-81#	95-83	95-83#	96-49	96-49#	96-51	96-51#	97-54	97-54	97-54	97-54#	97-54#	97-54#
	97-56	97-56	97-56	97-56#	97-56#	97-56#	97-58	97-58	97-58	97-58#	97-58#	97-58#	97-60	97-60
	97-60	97-60#	97-60#	97-60#	97-61	97-61#	98-14	98-14	98-14	98-14#	98-14#	98-14#	98-16	98-16
	98-16	98-16#	98-16#	98-16#	98-18	98-18	98-18	98-18#	98-18#	98-18#	98-22	98-22	98-22	98-22#
	98-22#	98-22#	98-24	98-24	98-24	98-24#	98-24#	98-24#	98-33	98-33#	98-64	98-64#		
T$TEST	7-373#	36-60	36-60	36-60#	37-19	37-19	37-19#	38-17	38-17	38-17#	39-18	39-18	39-18#	40-17
	40-17	40-17#	41-31	41-31	41-31#	42-31	42-31	42-31#	43-37	43-37	43-37#	44-26	44-26	44-26#
	45-26	45-26	45-26#	46-24	46-24	46-24#	47-18	47-18	47-18#	48-18	48-18	48-18#	49-24	49-24
	49-24#	50-26	50-26	50-26#	51-18	51-18	51-18#	52-17	52-17	52-17#	53-28	53-28	53-28#	54-27
	54-27	54-27#	55-27	55-27	55-27#	56-30	56-30	56-30#	57-17	57-17	57-17#	58-18	58-18	58-18#
	59-13	59-13	59-13#	60-22	60-22	60-22#	61-15	61-15	61-15#	62-13	62-13	62-13#	63-15	63-15
	63-15#	64-20	64-20	64-20#	65-18	65-18	65-18#	66-12	66-12	66-12#	67-14	67-14	67-14#	68-14
	68-14	68-14#	69-20	69-20	69-20#	70-33	70-33	70-33#	71-17	71-17	71-17#	72-18	72-18	72-18#
	73-13	73-13	73-13#	74-17	74-17	74-17#	75-21	75-21	75-21#	76-12	76-12	76-12#	77-28	77-28
	77-28#	78-13	78-13	78-13#	79-22	79-22	79-22#	80-24	80-24	80-24#	81-12	81-12	81-12#	82-14
	82-14	82-14#	83-13	83-13	83-13#	84-18	84-18	84-18#	85-25	85-25	85-25#	86-16	86-16	86-16#
	87-20	87-20	87-20#	88-24	88-24	88-24#	89-15	89-15	89-15#	90-15	90-15	90-15#	91-42	91-42
	91-42#	92-39	92-[illegible]	92-39#	93-87	93-87	93-87#	93-105	93-227	94-31	94-31	94-31#	95-30	95-30
	95-30#	96-25	96-[illegible]	96-25#	98-63									
T$TSTM	7-373#	16-99	16-[illegible]	16-104	16-105	16-112	16-117	16-123	16-124	16-128	16-129	16-130	16-132	16-135
	16-136	16-141	16-142	18-20	18-33	18-44	20-101	20-120	20-154	20-161	20-218	20-219	20-221	20-222

CROSS REFERENCE TABLE (CREF V04.00)

20-224	20-225	20-229	20-230	21-9	21-12	21-18	22-21	23-101	24-26	24-36	24-48	25-69	25-106
26-17	26-26	28-75	30-10	30-12	30-16	30-20	30-22	30-27	30-37	30-82	30-95	30-100	30-126
30-141	31-18	32-18	32-26	32-29	32-31	32-42	32-57	33-34	34-35	36-62	36-64	36-67	36-71
37-21	37-30	37-32	37-33	37-41	37-43	37-46	38-21	38-21	38-21	38-21	38-21	38-21	38-21
38-21	38-24	39-22	39-22	39-22	39-22	39-22	39-22	39-22	39-22	39-25	40-21	40-21	40-21
40-21	40-21	40-21	40-21	40-21	40-24	41-34	41-38	41-39	41-47	41-49	41-50	41-57	41-59
41-65	41-72	41-81	41-83	41-86	42-35	42-36	42-45	42-47	42-57	42-65	42-67	42-70	43-42
43-42	43-42	43-42	43-42	43-42	43-42	43-42	43-46	44-31	44-43	44-47	44-50	45-31	45-34
45-48	45-52	45-58	45-61	46-27	46-31	46-48	46-50	46-53	47-21	47-26	47-27	47-27	47-27
47-27	47-27	47-27	47-27	47-27	47-30	48-21	48-25	48-25	48-25	48-25	48-25	48-25	48-25
48-25	48-28	49-28	49-35	49-42	49-45	49-46	49-49	49-55	49-58	49-59	49-66	49-69	49-70
49-73	49-79	49-82	49-85	50-30	50-37	50-44	50-47	50-48	50-51	50-57	50-60	50-61	50-68
50-71	50-72	50-75	50-81	50-84	50-87	51-23	51-24	51-31	51-34	51-35	51-42	51-45	51-48
51-49	52-20	52-24	52-26	52-33	52-36	52-37	52-44	52-47	52-50	52-51	53-29	53-29	53-29
53-29	53-29	53-29	53-29	53-29	53-29	53-29	53-29	53-30	54-28	54-28	54-28	54-28	54-28
54-28	54-28	54-28	54-28	54-28	54-28	54-29	55-28	55-28	55-28	55-28	55-28	55-28	55-28
55-28	55-28	55-28	55-28	55-29	56-31	56-31	56-31	56-31	56-31	56-31	56-31	56-31	56-31
56-31	56-31	56-32	57-21	57-29	57-31	57-32	57-34	57-35	57-40	57-42	57-49	57-50	58-22
58-31	58-32	58-33	58-34	58-35	58-36	58-41	58-43	58-47	58-48	59-15	59-16	59-26	59-31
59-33	59-37	59-39	59-40	60-28	60-29	60-31	60-33	60-36	60-37	60-46	60-47	60-49	60-56
61-17	61-26	61-28	61-31	62-15	62-37	62-39	62-42	63-17	63-30	63-32	63-35	64-25	64-25
64-25	64-25	64-25	64-25	64-25	64-25	64-28	65-20	65-33	65-38	65-41	66-14	66-29	66-33
66-36	67-21	67-38	67-41	68-20	68-48	68-51	69-25	69-25	69-25	69-25	69-25	69-25	69-25
69-25	69-28	70-36	70-66	70-68	70-72	71-19	71-34	71-36	71-39	72-20	72-44	72-46	72-50
73-15	73-38	73-40	73-43	74-19	74-34	74-36	74-38	74-41	75-23	75-43	75-61	75-63	75-66
76-14	76-24	76-26	76-29	77-30	77-47	77-52	77-67	77-69	77-72	78-15	78-24	78-26	78-29
79-24	79-36	79-46	79-48	79-51	80-26	80-38	80-45	80-56	80-58	80-61	81-14	81-23	81-25
81-28	82-16	82-28	82-30	82-33	83-18	83-22	83-23	83-34	83-36	83-40	84-58	84-64	85-42
85-74	86-24	86-34	86-37	86-38	86-49	86-52	86-55	86-65	86-68	86-75	86-85	86-88	86-100
87-26	87-45	87-52	87-58	87-64	87-70	87-76	87-82	87-89	87-91	87-96	87-106	87-112	87-115
88-30	88-35	88-39	88-72	89-20	89-24	89-25	89-50	89-52	89-56	90-20	90-24	90-25	90-46
90-48	90-52	91-47	91-51	91-54	91-90	91-92	91-95	92-47	92-51	92-52	92-67	92-68	92-69
92-87	92-89	92-90	92-106	92-110	92-112	92-113	93-92	93-93	93-97	93-101	93-105	93-106	93-117
93-119	93-120	93-138	93-139	93-156	93-194	93-196	93-197	93-217	93-222	93-225	93-226	93-227	93-238
93-248	93-249	93-264	93-276	93-285	93-303	93-304	93-309	93-315	93-320	93-321	93-336	93-338	93-339
94-32	94-37	94-41	94-51	94-52	94-53	94-66	94-75	94-76	95-36	95-39	95-41	95-43	95-44
95-72	95-77	95-81	95-83	96-37	96-42	96-47	96-49						

T$TSTS	7-373#	36-60#	37-19#	38-17#	39-18#	40-17#	41-31#	42-31#	43-37#	44-26#	45-26#	46-24#	47-18#	48-18#
	49-24#	50-26#	51-18#	52-17#	53-28#	54-27#	55-27#	56-30#	57-17#	58-18#	59-13#	60-22#	61-15#	62-13#
	63-15#	64-20#	65-18#	66-12#	67-14#	68-14#	69-20#	70-33#	71-17#	72-18#	73-13#	74-17#	75-21#	76-12#
	77-28#	78-13#	79-22#	80-24#	81-12#	82-14#	83-13#	84-18#	85-25#	86-16#	87-20#	88-24#	89-15#	90-15#
	91-42#	92-39#	93-87#	94-31#	95-30#	96-25#								

T1	8-8	36-60#
T10	8-8	45-26#
T11	8-8	46-24#
T12	8-8	47-18#
T13	8-8	48-18#
T14	8-8	49-24#
T15	8-8	50-26#
T16	8-8	51-18#
T17	8-8	52-17#
T18	8-8	53-28#
T19	8-8	54-27#
T2	8-8	37-19#
T20	8-8	55-27#
T21	8-8	56-30#

CROSS REFERENCE TABLE (CREF V04.00)

CROSS REFERENCE TABLE (CREF V04.00)

	62-34*	63-27*	70-63*	71-21*	72-38*	73-33*	75-49*	78-20*	79-32*	79-42*	80-34*	80-52*	84-54*	85-29*
	86-22*	90-35*	91-87*	92-64*	92-99*	93-333*	94-43*							
TRAKAD	10-14#	88-53												
TRE	12-11#	20-9	22-68	22-73	41-42	41-46	41-60	41-64	41-76	41-80	46-43	46-47	53-29	53-29
	54-28	54-28	55-28	55-28	56-31	56-31	58-26	58-30	65-26	65-30	73-21	73-31	88-36	91-72
	92-74	92-78	92-102	93-214	93-278	93-279	93-284	93-300	95-78	96-44				
TST03	13-141#	38-21												
TST04	13-147#	39-22												
TST05	13-153#	40-21												
TST08	13-159#	43-42												
TST11	13-166#	47-27												
TST12	13-172#	48-25												
TST28	13-178#	64-25												
TST33	13-185#	68-21	68-27	68-40										
TST34	13-190#	69-25												
TST49	13-202#	84-23	84-44											
UAM	11-57#													
UNABLE	13-50#	30-68*	32-13*	60-33	60-34	60-49	60-50	60-55*						
UNIT	13-54#	30-28*	30-29*	30-37										
UNS	12-92#													
UPE	12-38#													
US1	12-25#													
US2	12-26#													
US4	12-27#													
VV	12-64#													
WAIT	18-16	22-18	22-50#	26-14	26-23	53-29	54-28	55-28	56-31	60-52	65-25	72-27	73-23	75-28
	76-16	77-35	77-59	79-28	80-31	82-20	83-26	90-30	90-38	92-59	92-73	92-94	93-110	93-258
	96-33													
WAITMS	22-36#	30-77												
WATDRY	26-9#	30-63												
WATIME	20-184*	22-36*	22-37	22-42#										
WCE	12-39#	93-259	93-263											
WCF	12-83#													
WCKD	12-213#	93-254	93-289											
WCKHD	12-214#	93-198												
WLE	12-89#													
WOR	12-187#													
WRDTA	12-215#	93-240												
WRL	12-69#	93-94												
WRTD	12-217#													
WRU	12-186#													
WTCKD	16-39#	93-275	93-298											
WTCKHD	16-38#	93-211												
X$ALWA	7-373#													
X$FALS	7-373#	98-20												
X$OFFS	7-373#	98-20												
X$TRUE	7-373#													

CROSS REFERENCE TABLE (CREF V04.00)

```
BCOMPL   1-15#    7-373#  30-14    60-30    95-40
BERROR   1-19#    7-373#
BGNAU    1-23#    7-373#  34-9
BGNAUT   1-31#    7-373#  31-10
BGNCLN   1-39#    7-373#  32-8
BGNDU    1-47#    7-373#  33-8
BGNHRD   1-55#    7-373#  97-52
BGNHW    1-66#    7-373#   9-9
BGNINI   1-77#    7-373#  30-8
BGNMOD   1-85#    7-373#   7-399   11-51    28-40    36-38    97-42
BGNMSG   1-98#    7-373#  16-96    16-107   16-126   16-138
BGNPRO   1-106#   7-373#  29-8
BGNPTA   1-114#   7-373#  99-16
BGNRPT   1-144#   7-373#  28-46
BGNSEG   1-152#   7-373#  37-21    37-33    38-21    38-21    38-21    38-21    39-22    39-22    39-22    39-22    40-21    40-21
         40-21    40-21   41-38    41-39    41-50    42-35    42-36    43-42    43-42    43-42    43-42    44-31    45-31    45-34
         46-31    47-27   47-27    47-27    47-27    48-25    48-25    48-25    48-25    49-28    49-46    49-59    49-70    50-30
         50-48    50-61   50-72    51-24    51-35    52-24    52-37    53-29    53-29    53-29    54-28    54-28    54-28    55-28
         55-28    55-28   56-31    56-31    56-31    57-21    57-34    58-22    58-35    59-16    60-37    61-17    62-15    63-17
         64-25    64-25   64-25    64-25    65-20    66-14    67-21    68-20    69-25    69-25    69-25    69-25    70-36    71-19
         72-20    73-15   74-19    75-23    76-14    77-30    78-15    79-24    80-26    81-14    82-16    83-23    86-24    86-38
         86-55    86-75   88-30    89-25    90-25    91-54    92-52    92-69    92-90    93-106   93-120   93-197   93-238   93-321
         94-32    94-53   95-72
BGNSET   1-161#   7-373#  99-15
BGNSFT   1-182#   7-373#  98-12
BGNSRV   1-193#   7-373#  20-179   27-39
BGNSUB   1-201#   7-373#  93-105   93-227
BGNSW    1-225#   7-373#  10-8
BGNTST   1-236#   7-373#  36-60    37-19    38-17    39-18    40-17    41-31    42-31    43-37    44-26    45-26    46-24    47-18
         48-18    49-24   50-26    51-18    52-17    53-28    54-27    55-27    56-30    57-17    58-18    59-13    60-22    61-15
         62-13    63-15   64-20    65-18    66-12    67-14    68-14    69-20    70-33    71-17    72-18    73-13    74-17    75-21
         76-12    77-28   78-13    79-22    80-24    81-12    82-14    83-13    84-18    85-25    86-16    87-20    88-24    89-15
         90-15    91-42   92-39    93-87    94-31    95-30    96-25
BNCOMP   1-266#   7-373#  20-103   20-122   30-18    30-24    30-38
BNERRO   1-270#   7-373#
BREAK    1-274#   7-373#  18-33    18-44    24-36    24-48
BRESET   1-278#   7-373#  30-10
CKLOOP   1-282#   7-373#
CLOCK    1-286#   7-373#  20-101   20-120
CLOSE    1-292#   7-373#
CLRVEC   1-296#   7-373#  32-26    32-29    32-31    36-64    57-49    58-47    59-37
COMMEN   1-301#   7-373#
DELAY    1-322#   7-373#  22-50    42-39    42-51    57-37    58-38    59-28
DESCRI   1-317#   7-373#  15-27
DEVTYP   1-341#   7-373#  15-17
DISPAT   1-346#   7-373#   8-8
DISPLA   1-360#   7-373#
DOCLN    1-376#   7-373#
DODU     1-380#   7-373#
DORPT    1-385#   7-373#
ENDAU    1-389#   7-373#  34-35
ENDAUT   1-401#   7-373#  31-18
ENDCLN   1-413#   7-373#  32-57
ENDCOM   1-425#   7-373#
ENDDU    1-441#   7-373#  33-34
ENDHRD   1-453#   7-373#  97-61
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ENDHW    1-465#  7-373#  9-25
ENDINI   1-475#  7-373#  30-141
ENDMOD   1-487#  7-373#  10-26   27-43   34-36   96-51   98-64
ENDMSG   1-500#  7-373#  16-105  16-124  16-136  16-142
ENDPRO   1-512#  7-373#  29-12
ENDPTA   1-520#  7-373#  99-21
ENDRPT   1-529#  7-373#  28-75
ENDSEG   1-541#  7-373#  37-32   37-43   38-21   38-21   38-21   38-21   39-22   39-22   39-22   39-22   40-21   40-21
         40-21   40-21   41-49   41-59   41-83   42-47   42-67   43-42   43-42   43-42   43-42   44-47   45-52   45-58
         46-50   47-27   47-27   47-27   47-27   48-25   48-25   48-25   48-25   49-45   49-58   49-69   49-82   50-47
         50-60   50-71   50-84   51-34   51-45   52-36   52-47   53-29   53-29   53-29   54-28   54-28   54-28   55-28
         55-28   55-28   56-31   56-31   56-31   57-31   57-42   58-33   58-43   59-33   60-47   61-28   62-39   63-32
         64-25   64-25   64-25   64-25   65-38   66-33   67-38   68-48   69-25   69-25   69-25   69-25   70-68   71-36
         72-46   73-40   74-38   75-63   76-26   77-69   78-26   79-48   80-58   81-25   82-30   83-36   86-37   86-52
         86-68   86-88   88-39   89-52   90-48   91-92   92-68   92-89   92-112  93-119  93-196  93-225  93-315  93-338
         94-52   94-75   95-81
ENDSET   1-555#  7-373#  99-22
ENDSFT   1-568#  7-373#  98-33
ENDSRV   1-580#  7-373#  20-185  27-41
ENDSUB   1-596#  7-373#  93-226  93-320
ENDSW    1-614#  7-373#  10-25
ENDTST   1-624#  7-373#  36-71   37-46   38-24   39-25   40-24   41-86   42-70   43-46   44-50   45-61   46-53   47-30
         48-28   49-85   50-87   51-49   52-51   53-30   54-29   55-29   56-32   57-50   58-48   59-40   60-56   61-31
         62-42   63-35   64-28   65-41   66-36   67-41   68-51   69-28   70-72   71-39   72-50   73-43   74-41   75-66
         76-29   77-72   78-29   79-51   80-61   81-28   82-33   83-40   84-64   85-74   86-100  87-115  88-72   89-56
         90-52   91-95   92-113  93-339  94-76   95-83   96-49
EQUALS   1-642#  7-373#  11-57
ERRDF    1-714#  7-373#  22-21
ERRHRD   1-718#  7-373#  18-20   23-101  24-26   25-69   25-106  36-67   37-30   37-41   41-47   41-57   41-65   41-72
         41-81   42-45   42-57   42-65   44-43   45-48   46-48   49-35   49-42   49-55   49-66   49-79   50-37   50-44
         50-57   50-68   50-81   51-31   51-42   52-33   52-44   53-29   53-29   53-29   53-29   54-28   54-28   54-28
         54-28   55-28   55-28   55-28   55-28   56-31   56-31   56-31   56-31   57-29   57-40   58-31   58-41   59-31
         60-46   61-26   62-37   63-30   65-33   66-29   70-66   71-34   72-44   73-38   74-34   74-36   75-43   75-61
         76-24   77-67   78-24   79-36   79-46   80-38   80-45   80-56   81-23   82-28   83-34   84-58   85-42   86-34
         86-49   86-65   86-85   88-35   89-50   90-46   91-90   92-67   92-87   92-106  92-110  93-117  93-156  93-194
         93-217  93-222  93-248  93-264  93-276  93-285  93-303  93-309  93-336  94-51   94-66   95-77   96-37   96-42
         96-47
ERROR    1-722#  7-373#
ERRSF    1-726#  7-373#
ERRSOF   1-730#  7-373#
ERRTBL   1-734#  7-373#
ESCAPE   1-744#  7-373#
EXIT     1-771#  7-373#  28-60   30-20   30-126  32-42   33-19   34-20   41-34   46-27   47-21   48-21   49-49   49-73
         50-51   50-75   52-20   53-29   54-28   55-28   56-31   58-32   60-28   60-31   60-36   77-52   83-22   87-26
         89-24   90-24   91-51   92-51   93-93   93-101  94-41   95-36   95-41
FEQUAL   1-810#  7-373#
GETBYT   1-824#  7-373#
GETPRI   1-834#  7-373#
GETWOR   1-829#  7-373#
GMANIA   1-839#  7-373#
GMANID   1-848#  7-373#  95-44
GMANIL   1-859#  7-373#  60-33   60-49
GPHARD   1-868#  7-373#  30-37
GPRMA    1-874#  7-373#  97-54   97-56
GPRMD    1-903#  7-373#  95-44   95-44#  97-58   97-60   98-22
GPRML    1-934#  7-373#  60-33   60-33#  60-49   60-49#  98-14   98-16   98-18   98-24
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CROSS REFERENCE TABLE (CREF V04.00)

HEADER	1-954#	7-373#	7-427											
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IOSETU	1-966#	7-373#												
IOSTAR	1-974#	7-373#												
IPCKTS	7-127#	53-29	54-28	55-28	56-31									
KT11	1-982#	7-373#												
LASTAD	1-:47#	7-373#	98-63											
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M$CHEC	1-E18#	7-373#	28-60	28-60#	30-20	30-20#	30-126	30-126#	32-42	32-42#	33-19	33-19#	34-20	34-20#
	41-34	41-34#	46-27	46-27#	47-21	47-21#	48-21	48-21#	49-49	49-49#	49-73	49-73#	50-51	50-51#
	50-75	50-75#	52-20	52-20#	53-29	53-29#	54-28	54-28#	55-28	55-28#	56-31	56-31#	58-32	58-32#
	60-28	60-28#	60-31	60-31#	60-36	60-36#	77-52	77-52#	83-22	83-22#	87-26	87-26#	89-24	89-24#
	90-24	90-24#	91-51	91-51#	92-51	92-51#	93-93	93-93#	93-101	93-101#	94-41	94-41#	95-36	95-36#
	95-41	95-41#												
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	97-60	97-60#	98-14	98-14#	98-16	98-16#	98-18	98-18#	98-22	98-22#	98-24	98-24#		
M$COUN	1-D66#	7-373#	16-99	16-99#	16-100	16-100	16-100#	16-104	16-104#	16-112	16-112	16-112	16-112	16-112#
	16-117	16-117	16-117	16-117	16-117#	16-123	16-123#	16-128	16-128#	16-129	16-129#	16-130	16-130	16-130#
	16-132	16-132#	16-135	16-135#	16-141	16-141#	20-218	20-218#	20-219	20-219	20-219	20-219	20-219	20-219
	20-219	20-219#	20-221	20-221#	20-222	20-222	20-222	20-222	20-222	20-222	20-222	20-222#	20-224	20-224#
	20-225	20-225	20-225	20-225	20-225	20-225	20-225	20-225#	20-229	20-229#	20-230	20-230	20-230#	21-9
	21-9#	21-12	21-12#	21-18	21-18#	26-17	26-17#	26-26	26-26#	30-27	30-27#	30-82	30-82#	30-95
	30-95#	30-100	30-100#	77-47	77-47#	83-18	83-18#	87-45	87-45	87-45#	87-52	87-52#	87-58	87-58#
	87-64	87-64#	87-70	87-70#	87-76	87-76#	87-82	87-82#	87-89	87-89#	87-91	87-91#	87-96	87-96#
	87-106	87-106	87-106	87-106	87-106#	87-112	87-112#	89-20	89-20#	90-20	90-20#	91-47	91-47#	92-47
	92-47#	93-92	93-92#	93-97	93-97#	93-138	93-138#	93-139	93-139#	93-249	93-249#	93-304	93-304#	94-37
	94-37#	95-43	95-43#											
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	7-427	7-427	7-427	7-427	7-427	7-427	7-427	7-427	7-427	7-427	7-427	7-427#	7-427#	15-17
	15-17#	15-27	15-27#											
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	16-142	16-142#	20-195	20-185#	27-41	27-41#	27-43	27-43#	28-75	28-75#	29-12	29-12#	30-141	30-141#
	31-18	31-18#	32-57	32-57#	33-34	33-34#	34-35	34-35#	34-36	34-36#	36-71	36-71#	37-32	37-32
	37-32#	37-32#	37-43	37-43	37-43#	37-43#	37-46	37-46#	38-21	38-21	38-21	38-21	38-21	38-21
	38-21	38-21	38-21#	38-21#	38-21#	38-21#	38-21#	38-21#	38-21#	38-21#	38-24	38-24#	39-22	39-22
	39-22	39-22	39-22	39-22	39-22	39-22	39-22#	39-22#	39-22#	39-22#	39-22#	39-22#	39-22#	39-22#
	39-25	39-25#	40-21	40-21	40-21	40-21	40-21	40-21	40-21	40-21	40-21#	40-21#	40-21#	40-21#
	40-21#	40-21#	40-21#	40-21#	40-24	40-24#	41-49	41-49	41-49#	41-49#	41-59	41-59	41-59#	41-59#
	41-83	41-83	41-83#	41-83#	41-86	41-86#	42-47	42-47	42-47#	42-47#	42-67	42-67	42-67#	42-67#
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	43-42#	43-42#	43-42#	43-42#	43-46	43-46#	44-47	44-47	44-47#	44-47#	44-50	44-50#	45-52	45-52
	45-52#	45-52#	45-58	45-58	45-58#	45-58#	45-61	45-61#	46-50	46-50	46-50#	46-50#	46-53	46-53#
	47-27	47-27	47-27	47-27	47-27	47-27	47-27	47-27	47-27#	47-27#	47-27#	47-27#	47-27#	47-27#
	47-27#	47-27#	47-30	47-30#	48-25	48-25	48-25	48-25	48-25	48-25	48-25	48-25	48-25#	48-25#
	48-25#	48-25#	48-25#	48-25#	48-25#	48-25#	48-28	48-28#	49-45	49-45	49-45#	49-45#	49-58	49-58
	49-58#	49-58#	49-69	49-69	49-69#	49-69#	49-82	49-82	49-82#	49-82#	49-85	49-85#	50-47	50-47
	50-47#	50-47#	50-60	50-60	50-60#	50-60#	50-71	50-71	50-71#	50-71#	50-84	50-84	50-84#	50-84#
	50-87	50-87#	51-34	51-34	51-34#	51-34#	51-45	51-45	51-45#	51-45#	51-49	51-49#	52-36	52-36
	52-36#	52-36#	52-47	52-47	52-47#	52-47#	52-51	52-51#	53-29	53-29	53-29	53-29	53-29	53-29
	53-29#	53-29#	53-29#	53-29#	53-29#	53-29#	53-30	53-30#	54-28	54-28	54-28	54-28	54-28	54-28
	54-28#	54-28#	54-28#	54-28#	54-28#	54-28#	54-29	54-29#	55-28	55-28	55-28	55-28	55-28	55-28
	55-28#	55-28#	55-28#	55-28#	55-28#	55-28#	55-29	55-29#	56-31	56-31	56-31	56-31	56-31	56-31
	56-31#	56-31#	56-31#	56-31#	56-31#	56-31#	56-32	56-32#	57-31	57-31	57-31#	57-31#	57-42	57-42
	57-42#	57-42#	57-50	57-50#	58-33	58-33	58-33#	58-33#	58-43	58-43	58-43#	58-43#	58-48	58-48#
	59-33	59-33	59-33#	59-33#	59-40	59-40#	60-47	60-47	60-47#	60-47#	60-56	60-56#	61-28	61-28

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        77-52#   83-22    83-22#  87-26    87-26#  89-24   89-24#  90-24   90-24#  91-51   91-51#  92-51   92-51#  93-93
        93-93#   93-101   93-101# 94-41    94-41#  95-36   95-36#  95-41   95-41#
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        91-92#   91-95    91-95#   92-39   92-39#  92-68   92-68#  92-89   92-89#  92-112  92-112# 92-113  92-113# 93-87
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	41-83	41-83	41-83#	41-83#	41-86	41-86#	42-47	42-47	42-47#	42-47#	42-67	42-67	42-67#	42-67#
	42-70	42-70#	43-42	43-42	43-42	43-42	43-42	43-42	43-42	43-42	43-42#	43-42#	43-42#	43-42#
	43-42#	43-42#	43-42#	43-42#	43-46	43-46#	44-47	44-47	44-47#	44-47#	44-50	44-50#	45-52	45-52
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	49-85	49-85#	50-47	50-47	50-47#	50-47#	50-51	50-51#	50-60	50-60	50-60#	50-60#	50-71	50-71
	50-71#	50-71#	50-75	50-75#	50-84	50-84	50-84#	50-84#	50-87	50-87#	51-34	51-34	51-34#	51-34#
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	93-225	93-225	93-225#	93-225#	93-226	93-226#	93-315	93-315	93-315#	93-315#	93-320	93-320#	93-338	93-338
	93-338#	93-338#	93-339	93-339#	94-52	94-52	94-52#	94-52#	94-75	94-75	94-75#	94-75#	94-76	94-76#
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	98-20#													
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	87-45	87-45	87-45#	87-45#	87-45#	87-45#	87-45#	87-45#	87-52	87-52	87-52	87-52	87-52	87-52
	87-52#	87-52#	87-52#	87-52#	87-52#	87-58	87-58	87-58	87-58	87-58	87-58	87-58#	87-58#	87-58#
	87-58#	87-58#	87-64	87-64	87-64	87-64	87-64	87-64	87-64#	87-64#	87-64#	87-64#	87-64#	87-70
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	87-76	87-76	87-76#	87-76#	87-76#	87-76#	87-76#	87-82	87-82	87-82	87-82	87-82	87-82	87-82#
	87-82#	87-82#	87-82#	87-82#	87-89	87-89	87-89	87-89	87-89	87-89	87-89#	87-89#	87-89#	87-89#
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	87-96	87-96#	87-96#	87-96#	87-96#	87-106	87-106	87-106	87-106	87-106	87-106	87-106	87-106	87-106
	87-106#	87-106#	87-106#	87-106#	87-106#	87-106#	87-106#	87-106#	87-112	87-112	87-112	87-112	87-112	87-112#
	87-112#	87-112#	87-112#	87-115	87-115#	88-30	88-30#	88-35	88-35	88-35	88-35	88-35#	88-35#	88-35#
	88-35#	88-35#	88-39	88-39#	88-72	88-72#	89-20	89-20	89-20	89-20	89-20	89-20	89-20#	89-20#
	89-20#	89-20#	89-20#	89-24	89-24	89-24#	89-24#	89-25	89-25#	89-50	89-50	89-50	89-50	89-50#
	89-50#	89-50#	89-50#	89-50#	89-52	89-52#	89-56	89-56#	90-20	90-20	90-20	90-20	90-20	90-20
	90-20#	90-20#	90-20#	90-20#	90-20#	90-24	90-24	90-24#	90-24#	90-25	90-25#	90-46	90-46	90-46
	90-46	90-46#	90-46#	90-46#	90-46#	90-46#	90-48	90-48#	90-52	90-52#	91-47	91-47	91-47	91-47
	91-47	91-47	91-47#	91-47#	91-47#	91-47#	91-47#	91-51	91-51	91-51#	91-51#	91-54	91-54#	91-90
	91-90	91-90	91-90	91-90#	91-90#	91-90#	91-90#	91-90#	91-92	91-92#	91-95	91-95#	92-47	92-47
	92-47	92-47	92-47	92-47	92-47#	92-47#	92-47#	92-47#	92-47#	92-51	92-51	92-51#	92-51#	92-52
	92-52#	92-67	92-67	92-67	92-67	92-67#	92-67#	92-67#	92-67#	92-67#	92-68	92-68#	92-69	92-69#
	92-87	92-87	92-87	92-87	92-87#	92-87#	92-87#	92-87#	92-87#	92-89	92-89#	92-90	92-90#	92-106
	92-106	92-106	92-106	92-106#	92-106#	92-106#	92-106#	92-106#	92-110	92-110	92-110	92-110	92-110#	92-110#
	92-110#	92-110#	92-110#	92-112	92-112#	92-113	92-113#	93-92	93-92	93-92	93-92	93-92	93-92	93-92#
	93-92#	93-92#	93-92#	93-92#	93-93	93-93	93-93#	93-93#	93-97	93-97	93-97	93-97	93-97	93-97
	93-97#	93-97#	93-97#	93-97#	93-97#	93-101	93-101	93-101#	93-101#	93-105	93-105#	93-106	93-106#	93-117
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	93-138	93-138	93-138	93-138#	93-138#	93-138#	93-138#	93-139	93-139	93-139	93-139	93-139	93-139#	93-139#
	93-139#	93-139#	93-156	93-156	93-156	93-156	93-156#	93-156#	93-156#	93-156#	93-156#	93-194	93-194	93-194
	93-194	93-194#	93-194#	93-194#	93-194#	93-194#	93-196	93-196#	93-197	93-197#	93-217	93-217	93-217	93-217
	93-217#	93-217#	93-217#	93-217#	93-217#	93-222	93-222	93-222	93-222	93-222#	93-222#	93-222#	93-222#	93-222#
	93-225	93-225#	93-226	93-226#	93-227	93-227#	93-238	93-238#	93-248	93-248	93-248	93-248	93-248#	93-243#
	93-248#	93-248#	93-248#	93-249	93-249	93-249	93-249	93-249	93-249#	93-249#	93-249#	93-249#	93-264	93-264
	93-264	93-264	93-264#	93-264#	93-264#	93-264#	93-264#	93-276	93-276	93-276	93-276	93-276#	93-276#	93-276#
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	93-303	93-303#	93-303#	93-303#	93-303#	93-303#	93-304	93-304	93-304	93-304	93-304	93-304#	93-304#	93-304#
	93-304#	93-309	93-309	93-309	93-309	93-309#	93-309#	93-309#	93-309#	93-309#	93-315	93-315#	93-320	93-320#
	93-321	93-321#	93-336	93-336	93-336	93-336	93-336#	93-336#	93-336#	93-336#	93-336#	93-338	93-338#	93-339
	93-339#	94-32	94-32#	94-37	94-37	94-37	94-37	94-37	94-37	94-37#	94-37#	94-37#	94-37#	94-37#
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	94-76	94-76#	95-36	95-36	95-36#	95-36#	95-39	95-39#	95-40	95-40#	95-41	95-41	95-41#	95-41#
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	98-22#	98-24	98-24	98-24	98-24#	98-33	98-33#	98-63	98-63	98-63	98-63#	99-16	99-16	99-16#
	99-16#													
M$GNLS	1-C13#	7-373#	37-32	37-32#	37-43	37-43#	38-21	38-21	38-21	38-21	38-21#	38-21#	38-21#	38-21#
	39-22	39-22	39-22	39-22	39-22#	39-22#	39-22#	39-22#	40-21	40-21	40-21	40-21	40-21#	40-21#
	40-21#	40-21#	41-49	41-49#	41-59	41-59#	41-83	41-83#	42-47	42-47#	42-67	42-67#	43-42	43-42
	43-42	43-42	43-42#	43-42#	43-42#	43-42#	44-47	44-47#	45-52	45-52#	45-58	45-58#	46-50	46-50#

CROSS REFERENCE TABLE (CREF V04.00)

	47-27	47-27	47-27	47-27	47-27#	47-27#	47-27#	47-27#	48-25	48-25	48-25	48-25	48-25#	48-25#
	48-25#	48-25#	49-45	49-45#	49-58	49-58#	49-69	49-69#	49-82	49-82#	50-47	50-47#	50-60	50-60#
	50-71	50-71#	50-84	50-84#	51-34	51-34#	51-45	51-45#	52-36	52-36#	52-47	52-47#	53-29	53-29
	53-29	53-29#	53-29#	53-29#	54-28	54-28	54-28	54-28#	54-28#	54-28#	55-28	55-28	55-28	55-28#
	55-28#	55-28#	56-31	56-31	56-31	56-31#	56-31#	56-31#	57-31	57-31#	57-42	57-42#	58-33	58-33#
	58-43	58-43#	59-33	59-33#	60-33	60-33#	60-47	60-47#	60-49	60-49#	61-28	61-28#	62-39	62-39#
	63-32	63-32#	64-25	64-25	64-25	64-25	64-25#	64-25#	64-25#	64-25#	65-38	65-38#	66-33	66-33#
	67-38	67-38#	68-48	68-48#	69-25	69-25	69-25	69-25	69-25#	69-25#	69-25#	69-25#	70-68	70-68#
	71-36	71-36#	72-46	72-46#	73-40	73-40#	74-38	74-38#	75-63	75-63#	76-26	76-26#	77-69	77-69#
	78-26	78-26#	79-48	79-48#	80-58	80-58#	81-25	81-25#	82-30	82-30#	83-36	83-36#	86-37	86-37#
	86-52	86-52#	86-68	86-68#	86-88	86-88#	88-39	88-39#	89-52	89-52#	90-48	90-48#	91-92	91-92#
	92-68	92-68#	92-89	92-89#	92-112	92-112#	93-119	93-119#	93-196	93-196#	93-225	93-225#	93-315	93-315#
	93-338	93-338#	94-52	94-52#	94-75	94-75#	95-44	95-44#	95-81	95-81#				
M$GNSU	1-B98#	7-373#	93-105	93-105#	93-227	93-227#								
M$GNTA	1-B90#	7-373#	9-25	9-25#	10-25	10-25#	16-105	16-105#	16-124	16-124#	16-136	16-136#	16-142	16-142#
	20-185	20-185#	27-41	27-41#	28-75	28-75#	30-141	30-141#	31-18	31-18#	32-57	32-57#	33-34	33-34#
	34-35	34-35#	36-71	36-71#	37-46	37-46#	38-24	38-24#	39-25	39-25#	40-24	40-24#	41-86	41-86#
	42-70	42-70#	43-46	43-46#	44-50	44-50#	45-61	45-61#	46-53	46-53#	47-30	47-30#	48-28	48-28#
	49-85	49-85#	50-87	50-87#	51-49	51-49#	52-51	52-51#	53-30	53-30#	54-29	54-29#	55-29	55-29#
	56-32	56-32#	57-50	57-50#	58-48	58-48#	59-40	59-40#	60-56	60-56#	61-31	61-31#	62-42	62-42#
	63-35	63-35#	64-28	64-28#	65-41	65-41#	66-36	66-36#	67-41	67-41#	68-51	68-51#	69-28	69-28#
	70-72	70-72#	71-39	71-39#	72-50	72-50#	73-43	73-43#	74-41	74-41#	75-66	75-66#	76-29	76-29#
	77-72	77-72#	78-29	78-29#	79-51	79-51#	80-61	80-61#	81-28	81-28#	82-33	82-33#	83-40	83-40#
	84-64	84-64#	85-74	85-74#	86-100	86-100#	87-115	87-115#	88-72	88-72#	89-56	89-56#	90-52	90-52#
	91-95	91-95#	92-113	92-113#	93-226	93-226#	93-320	93-320#	93-339	93-339#	94-76	94-76#	95-83	95-83#
	96-49	96-49#	97-61	97-61#	98-33	98-33#	99-16	99-16#	99-21	99-21#				
M$GNTE	1-B94#	7-373#	36-60	36-60#	37-19	37-19#	38-17	38-17#	39-18	39-18#	40-17	40-17#	41-31	41-31#
	42-31	42-31#	43-37	43-37#	44-26	44-26#	45-26	45-26#	46-24	46-24#	47-18	47-18#	48-18	48-18#
	49-24	49-24#	50-26	50-26#	51-18	51-18#	52-17	52-17#	53-28	53-28#	54-27	54-27#	55-27	55-27#
	56-30	56-30#	57-17	57-17#	58-18	58-18#	59-13	59-13#	60-22	60-22#	61-15	61-15#	62-13	62-13#
	63-15	63-15#	64-20	64-20#	65-18	65-18#	66-12	66-12#	67-14	67-14#	68-14	68-14#	69-20	69-20#
	70-33	70-33#	71-17	71-17#	72-18	72-18#	73-13	73-13#	74-17	74-17#	75-21	75-21#	76-12	76-12#
	77-28	77-28#	78-13	78-13#	79-22	79-22#	80-24	80-24#	81-12	81-12#	82-14	82-14#	83-13	83-13#
	84-18	84-18#	85-25	85-25#	86-16	86-16#	87-20	87-20#	88-24	88-24#	89-15	89-15#	90-15	90-15#
	91-42	91-42#	92-39	92-39#	93-87	93-87#	94-31	94-31#	95-30	95-30#	96-25	96-25#		
M$HAPT	1-A39#	7-373#	7-427	7-427#										
M$HNAP	1-B24#	7-373#	7-427	7-427#										
M$INCR	1-D26#	7-373#	7-399	7-399#	9-9	9-9	9-9#	9-9#	10-8	10-8	10-8#	10-8#	11-51	11-51#
	16-96	16-96	16-96#	16-96#	16-99#	16-100#	16-104#	16-105#	16-107	16-107	16-107#	16-107#	16-112#	16-117#
	16-123#	16-124#	16-126	16-126	16-126#	16-126#	16-128#	16-129#	16-130#	16-132#	16-135#	16-136#	16-138	16-138
	16-138#	16-138#	16-141#	16-142#	18-20#	18-33#	18-44#	20-101#	20-120#	20-154#	20-161#	20-179	20-179	20-179#
	20-179#	20-218#	20-219#	20-221#	20-222#	20-224#	20-225#	20-229#	20-230#	21-9#	21-12#	21-18#	22-21#	23-101#
	24-26#	24-36#	24-48#	25-69#	25-106#	26-17#	26-26#	27-39	27-39	27-39#	27-39#	28-40	28-40#	28-46
	28-46	28-46#	28-56#	28-75#	29-8	29-8	29-8#	29-8#	30-8	30-8	30-8#	30-8#	30-10#	30-12#
	30-16#	30-20#	30-22#	30-27#	30-37#	30-82#	30-95#	30-100#	30-126#	30-141#	31-10	31-10	31-10#	31-10#
	31-18#	32-8	32-8	32-8#	32-8#	32-18#	32-26#	32-29#	32-31#	32-42#	32-57#	33-8	33-8	33-8#
	33-8#	33-34#	34-9	34-9	34-9#	34-9#	34-35#	36-38	36-38#	36-60	36-60	36-60	36-60#	36-60#
	36-60#	36-62#	36-64#	36-67#	36-71#	37-19	37-19	37-19	37-19#	37-19#	37-19#	37-21	37-21	37-21
	37-21#	37-21#	37-21#	37-21#	37-30#	37-32#	37-33	37-33	37-33	37-33#	37-33#	37-33#	37-33#	37-41#
	37-43#	37-46#	38-17	38-17	38-17	38-17#	38-17#	38-17#	38-21	38-21	38-21	38-21	38-21	38-21
	38-21	38-21	38-21	38-21	38-21	38-21	38-21#	38-21#	38-21#	38-21#	38-21#	38-21#	38-21#	38-21#
	38-21#	38-21#	38-21#	38-21#	38-21#	38-21#	38-21#	38-21#	38-21#	38-21#	38-21#	38-21#	38-24#	39-18
	39-18	39-18	39-18#	39-18#	39-18#	39-22	39-22	39-22	39-22	39-22	39-22	39-22	39-22	39-22
	39-22	39-22	39-22	39-22#	39-22#	39-22#	39-22#	39-22#	39-22#	39-22#	39-22#	39-22#	39-22#	39-22#
	39-22#	39-22#	39-22#	39-22#	39-22#	39-22#	39-22#	39-22#	39-22#	39-25#	40-17	40-17	40-17	40-17#
	40-17#	40-17#	40-21	40-21	40-21	40-21	40-21	40-21	40-21	40-21	40-21	40-21	40-21	40-21

CROSS REFERENCE TABLE (CREF V04.00)

40-21#	40-21#	40-21#	40-21#	40-21#	40-21#	40-21#	40-21#	40-21#	40-21#	40-21#	40-21#	40-21#	40-21#
40-21#	40-21#	40-21#	40-21#	40-21#	40-21#	40-24#	41-31	41-31	41-31	41-31#	41-31#	41-31#	41-34#
41-38	41-38	41-38	41-38#	41-38#	41-38#	41-38#	41-39	41-39	41-39	41-39#	41-39#	41-39#	41-39#
41-47#	41-49#	41-50	41-50	41-50	41-50#	41-50#	41-50#	41-50#	41-57#	41-59#	41-65#	41-72#	41-81#
41-83#	41-86#	42-31	42-31	42-31	42-31#	42-31#	42-31#	42-35	42-35	42-35	42-35#	42-35#	42-35#
42-35#	42-36	42-36	42-36	42-36#	42-36#	42-36#	42-36#	42-45#	42-47#	42-57#	42-65#	42-67#	42-70#
43-37	43-37	43-37	43-37#	43-37#	43-37#	43-42	43-42	43-42	43-42	43-42	43-42	43-42	43-42
43-42	43-42	43-42	43-42	43-42#	43-42#	43-42#	43-42#	43-42#	43-42#	43-42#	43-42#	43-42#	43-42#
43-42#	43-42#	43-42#	43-42#	43-42#	43-42#	43-42#	43-42#	43-42#	43-42#	43-46#	44-26	44-26	44-26
44-26#	44-26#	44-26#	44-31	44-31	44-31	44-31#	44-31#	44-31#	44-31#	44-43#	44-47#	44-50#	45-26
45-26	45-26	45-26#	45-26#	45-26#	45-31	45-31	45-31	45-31#	45-31#	45-31#	45-31#	45-34	45-34
45-34	45-34#	45-34#	45-34#	45-34#	45-48#	45-52#	45-58#	45-61#	46-24	46-24	46-24	46-24#	46-24#
46-24#	46-27#	46-31	46-31	46-31	46-31#	46-31#	46-31#	46-31#	46-48#	46-50#	46-53#	47-18	47-18
47-18	47-18#	47-18#	47-18#	47-21#	47-26#	47-27	47-27	47-27	47-27	47-27	47-27	47-27	47-27
47-27	47-27	47-27	47-27	47-27#	47-27#	47-27#	47-27#	47-27#	47-27#	47-27#	47-27#	47-27#	47-27#
47-27#	47-27#	47-27#	47-27#	47-27#	47-27#	47-27#	47-27#	47-27#	47-27#	47-30#	48-18	48-18	48-18
48-18#	48-18#	48-18#	48-21#	48-25	48-25	48-25	48-25	48-25	48-25	48-25	48-25	48-25	48-25
48-25	48-25	48-25#	48-25#	48-25#	48-25#	48-25#	48-25#	48-25#	48-25#	48-25#	48-25#	48-25#	48-25#
48-25#	48-25#	48-25#	48-25#	48-25#	48-25#	48-25#	48-25#	48-28#	49-24	49-24	49-24	49-24#	49-24#
49-24#	49-28	49-28	49-28	49-28#	49-28#	49-28#	49-28#	49-35#	49-42#	49-45#	49-46	49-46	49-46
49-46#	49-46#	49-46#	49-46#	49-49#	49-55#	49-58#	49-59	49-59	49-59	49-59#	49-59#	49-59#	49-59#
49-66#	49-69#	49-70	49-70	49-70	49-70#	49-70#	49-70#	49-70#	49-73#	49-79#	49-82#	49-85#	50-26
50-26	50-26	50-26#	50-26#	50-26#	50-30	50-30	50-30	50-30#	50-30#	50-30#	50-30#	50-37#	50-44#
50-47#	50-48	50-48	50-48	50-48#	50-48#	50-48#	50-48#	50-51#	50-57#	50-60#	50-61	50-61	50-61
50-61#	50-61#	50-61#	50-61#	50-68#	50-71#	50-72	50-72	50-72	50-72#	50-72#	50-72#	50-72#	50-75#
50-81#	50-84#	50-87#	51-18	51-18	51-18	51-18#	51-18#	51-18#	51-23#	51-24	51-24	51-24	51-24#
51-24#	51-24#	51-24#	51-31#	51-34#	51-35	51-35	51-35	51-35#	51-35#	51-35#	51-35#	51-42#	51-45#
51-48#	51-49#	52-17	52-17	52-17	52-17#	52-17#	52-17#	52-20#	52-24	52-24	52-24	52-24#	52-24#
52-24#	52-24#	52-26#	52-33#	52-36#	52-37	52-37	52-37	52-37#	52-37#	52-37#	52-37#	52-44#	52-47#
52-50#	52-51#	53-28	53-28	53-28	53-28#	53-28#	53-28#	53-29	53-29	53-29	53-29	53-29	53-29
53-29	53-29	53-29	53-29#	53-29#	53-29#	53-29#	53-29#	53-29#	53-29#	53-29#	53-29#	53-29#	53-29#
53-29#	53-29#	53-29#	53-29#	53-29#	53-29#	53-29#	53-29#	53-29#	53-30#	54-27	54-27	54-27	54-27#
54-27#	54-27#	54-28	54-28	54-28	54-28	54-28	54-28	54-28	54-28	54-28	54-28#	54-28#	54-28#
54-28#	54-28#	54-28#	54-28#	54-28#	54-28#	54-28#	54-28#	54-28#	54-28#	54-28#	54-28#	54-28#	54-28#
54-28#	54-28#	54-28#	54-29#	55-27	55-27	55-27	55-27#	55-27#	55-27#	55-28	55-28	55-28	55-28
55-28	55-28	55-28	55-28	55-28	55-28#	55-28#	55-28#	55-28#	55-28#	55-28#	55-28#	55-28#	55-28#
55-28#	55-28#	55-28#	55-28#	55-28#	55-28#	55-28#	55-28#	55-28#	55-28#	55-28#	55-29#	56-30	56-30
56-30	56-30#	56-30#	56-30#	56-31	56-31	56-31	56-31	56-31	56-31	56-31	56-31	56-31	56-31#
56-31#	56-31#	56-31#	56-31#	56-31#	56-31#	56-31#	56-31#	56-31#	56-31#	56-31#	56-31#	56-31#	56-31#
56-31#	56-31#	56-31#	56-31#	56-31#	56-32#	57-17	57-17	57-17	57-17#	57-17#	57-17#	57-21	57-21
57-21	57-21#	57-21#	57-21#	57-21#	57-29#	57-31#	57-32#	57-34	57-34	57-34	57-34#	57-34#	57-34#
57-34#	57-35#	57-40#	57-42#	57-49#	57-50#	58-18	58-18	58-18	58-18#	58-18#	58-18#	58-22	58-22
58-22	58-22#	58-22#	58-22#	58-22#	58-31#	58-32#	58-33#	58-34#	58-35	58-35	58-35	58-35#	58-35#
58-35#	58-35#	58-36#	58-41#	58-43#	58-47#	58-48#	59-13	59-13	59-13	59-13#	59-13#	59-13#	59-15#
59-16	59-16	59-16	59-16#	59-16#	59-16#	59-16#	59-26#	59-31#	59-33#	59-37#	59-39#	59-40#	60-22
60-22	60-22	60-22#	60-22#	60-22#	60-28#	60-29#	60-31#	60-33	60-33#	60-33#	60-36#	60-37	60-37
60-37	60-37#	60-37#	60-37#	60-37#	60-46#	60-47#	60-49	60-49#	60-49#	60-56#	61-15	61-15	61-15
61-15#	61-15#	61-15#	61-17	61-17	61-17	61-17#	61-17#	61-17#	61-17#	61-26#	61-28#	61-31#	62-13
62-13	62-13	62-13#	62-13#	62-13#	62-15	62-15	62-15	62-15#	62-15#	62-15#	62-15#	62-37#	62-39#
62-42#	63-15	63-15	63-15	63-15#	63-15#	63-15#	63-17	63-17	63-17	63-17#	63-17#	63-17#	63-17#
63-30#	63-32#	63-35#	64-20	64-20	64-20	64-20#	64-20#	64-20#	64-25	64-25	64-25	64-25	64-25
64-25	64-25	64-25	64-25	64-25	64-25	64-25	64-25#	64-25#	64-25#	64-25#	64-25#	64-25#	64-25#
64-25#	64-25#	64-25#	64-25#	64-25#	64-25#	64-25#	64-25#	64-25#	64-25#	64-25#	64-25#	64-25#	64-28#
65-18	65-18	65-18	65-18#	65-18#	65-18#	65-20	65-20	65-20	65-20#	65-20#	65-20#	65-20#	65-33#
65-38#	65-41#	66-12	66-12	66-12	66-12#	66-12#	66-12#	66-14	66-14	66-14	66-14#	66-14#	66-14#
66-14#	66-29#	66-33#	66-36#	67-14	67-14	67-14	67-14#	67-14#	67-14#	67-21	67-21	67-21	67-21#

CROSS REFERENCE TABLE (CREF V04.00)

	67-21#	67-21#	67-21#	67-38#	67-41#	68-14	68-14	68-14	68-14#	68-14#	68-14#	68-20	68-20	68-20
	68-20#	68-20#	68-20#	68-20#	68-48#	68-51#	69-20	69-20	69-20	69-20#	69-20#	69-20#	69-25	69-25
	69-25	69-25	69-25	69-25	69-25	69-25	69-25	69-25	69-25	69-25	69-25#	69-25#	69-25#	69-25#
	69-25#	69-25#	69-25#	69-25#	69-25#	69-25#	69-25#	69-25#	69-25#	69-25#	69-25#	69-25#	69-25#	69-25#
	69-25#	69-25#	69-28#	70-33	70-33	70-33	70-33#	70-33#	70-33#	70-36	70-36	70-36	70-36#	70-36#
	70-36#	70-36#	70-66#	70-68#	70-72#	71-17	71-17	71-17	71-17#	71-17#	71-17#	71-19	71-19	71-19
	71-19#	71-19#	71-19#	71-19#	71-34#	71-36#	71-39#	72-18	72-18	72-18	72-18#	72-18#	72-18#	72-20
	72-20	72-20	72-20#	72-20#	72-20#	72-20#	72-44#	72-46#	72-50#	73-13	73-13	73-13	73-13#	73-13#
	73-13#	73-15	73-15	73-15	73-15#	73-15#	73-15#	73-15#	73-38#	73-40#	73-43#	74-17	74-17	74-17
	74-17#	74-17#	74-17#	74-19	74-19	74-19	74-19#	74-19#	74-19#	74-19#	74-34#	74-36#	74-38#	74-41#
	75-21	75-21	75-21	75-21#	75-21#	75-21#	75-23	75-23	75-23	75-23#	75-23#	75-23#	75-23#	75-43#
	75-61#	75-63#	75-66#	76-12	76-12	76-12	76-12#	76-12#	76-12#	76-14	76-14	76-14	76-14#	76-14#
	76-14#	76-14#	76-24#	76-26#	76-29#	77-28	77-28	77-28	77-28#	77-28#	77-28#	77-30	77-30	77-30
	77-30#	77-30#	77-30#	77-30#	77-47#	77-52#	77-67#	77-69#	77-72#	78-13	78-13	78-13	78-13#	78-13#
	78-13#	78-15	78-15	78-15	78-15#	78-15#	78-15#	78-15#	78-24#	78-26#	78-29#	79-22	79-22	79-22
	79-22#	79-22#	79-22#	79-24	79-24	79-24	79-24#	79-24#	79-24#	79-24#	79-36#	79-46#	79-48#	79-51#
	80-24	80-24	80-24	80-24#	80-24#	80-24#	80-26	80-26	80-26	80-26#	80-26#	80-26#	80-26#	80-38#
	80-45#	80-56#	80-58#	80-61#	81-12	81-12	81-12	81-12#	81-12#	81-12#	81-14	81-14	81-14	81-14#
	81-14#	81-14#	81-14#	81-23#	81-25#	81-28#	82-14	82-14	82-14	82-14#	82-14#	82-14#	82-16	82-16
	82-16	82-16#	82-16#	82-16#	82-16#	82-28#	82-30#	82-33#	83-13	83-13	83-13	83-13#	83-13#	83-13#
	83-18#	83-22#	83-23	83-23	83-23	83-23#	83-23#	83-23#	83-23#	83-34#	83-36#	83-40#	84-18	84-18
	84-18	84-18#	84-18#	84-18#	84-58#	84-64#	85-25	85-25	85-25	85-25#	85-25#	85-25#	85-42#	85-74#
	86-16	86-16	86-16	86-16#	86-16#	86-16#	86-24	86-24	86-24	86-24#	86-24#	86-24#	86-24#	86-34#
	86-37#	86-38	86-38	86-38	86-38#	86-38#	86-38#	86-38#	86-49#	86-52#	86-55	86-55	86-55	86-55#
	86-55#	86-55#	86-55#	86-65#	86-68#	86-75	86-75	86-75	86-75#	86-75#	86-75#	86-75#	86-85#	86-88#
	86-100#	87-20	87-20	87-20	87-20#	87-20#	87-20#	87-26#	87-45#	87-52#	87-58#	87-64#	87-70#	87-76#
	87-82#	87-89#	87-91#	87-96#	87-106#	87-112#	87-115#	88-24	88-24	88-24	88-24#	88-24#	88-24#	88-30
	88-30	88-30	88-30#	88-30#	88-30#	88-30#	88-35#	88-39#	88-72#	89-15	89-15	89-15	89-15#	89-15#
	89-15#	89-20#	89-24#	89-25	89-25	89-25	89-25#	89-25#	89-25#	89-25#	89-50#	89-52#	89-56#	90-15
	90-15	90-15	90-15#	90-15#	90-15#	90-20#	90-24#	90-25	90-25	90-25	90-25#	90-25#	90-25#	90-25#
	90-46#	90-48#	90-52#	91-42	91-42	91-42	91-42#	91-42#	91-42#	91-47#	91-51#	91-54	91-54	91-54
	91-54#	91-54#	91-54#	91-54#	91-90#	91-92#	91-95#	92-39	92-39	92-39	92-39#	92-39#	92-39#	92-47#
	92-51#	92-52	92-52	92-52	92-52#	92-52#	92-52#	92-52#	92-67#	92-68#	92-69	92-69	92-69	92-69#
	92-69#	92-69#	92-69#	92-87#	92-89#	92-90	92-90	92-90	92-90#	92-90#	92-90#	92-90#	92-106#	92-110#
	92-112#	92-113#	93-87	93-87	93-87	93-87#	93-87#	93-87#	93-92#	93-93#	93-97#	93-101#	93-105	93-105
	93-105	93-105#	93-105#	93-105#	93-106	93-106	93-106	93-106#	93-106#	93-106#	93-106#	93-117#	93-119#	93-120
	93-120	93-120	93-120#	93-120#	93-120#	93-120#	93-138#	93-139#	93-156#	93-194#	93-196#	93-197	93-197	93-197
	93-197#	93-197#	93-197#	93-197#	93-217#	93-222#	93-225#	93-226#	93-227	93-227	93-227	93-227#	93-227#	93-227#
	93-238	93-238	93-238	93-238#	93-238#	93-238#	93-238#	93-248#	93-249#	93-264#	93-276#	93-285#	93-303#	93-304#
	93-309#	93-315#	93-320#	93-321	93-321	93-321	93-321#	93-321#	93-321#	93-321#	93-336#	93-338#	93-339#	94-31
	94-31	94-31	94-31#	94-31#	94-31#	94-32	94-32	94-32	94-32#	94-32#	94-32#	94-32#	94-37#	94-41#
	94-51#	94-52#	94-53	94-53	94-53	94-53#	94-53#	94-53#	94-53#	94-66#	94-75#	94-76#	95-30	95-30
	95-30	95-30#	95-30#	95-30#	95-36#	95-39#	95-41#	95-43#	95-44	95-44#	95-44#	95-72	95-72	95-72
	95-72#	95-72#	95-72#	95-72#	95-77#	95-81#	95-83#	96-25	96-25	96-25	96-25#	96-25#	96-25#	96-37#
	96-42#	96-47#	96-49#	97-42	97-42#	97-52	97-52	97-52#	97-52#	98-12	98-12	98-12#	98-12#	99-15
	99-15#	99-16	99-16	99-16	99-16#									
MSIOSE	1-A00#	7-373#												
MSLDRO	1-C42#	7-373#	20-101	20-101#	20-120	20-120#	30-12	30-12#	30-16	30-16#	30-22	30-22#	30-37	30-37#
	32-18	32-18#	32-26	32-26#	32-29	32-29#	32-31	32-31#	36-64	36-64#	47-26	47-26#	51-23	51-23#
	51-48	51-48#	52-26	52-26#	52-50	52-50#	57-35	57-35#	57-49	57-49#	58-36	58-36#	58-47	58-47#
	59-26	59-26#	59-37	59-37#	59-39	59-39#								
MSMASK	1-a71#	7-373#												
MSMCHI	1-4#	7-373	7-373#	7-373#										
MSMCLO	1-a24#	7-373	7-373#	7-373#										
MSMSK1	1-a77#	7-373#												
MSPOP	1-B81#	7-373#	9-25	9-25#	10-25	10-25#	10-26	10-26#	16-105	16-105#	16-124	16-124#	16-136	16-136#

CROSS REFERENCE TABLE (CREF V04.00)

	16-142	16-142#	20-185	20-185#	27-41	27-41#	27-43	27-43#	28-75	28-75#	29-12	29-12#	30-141	30-141#
	31-18	31-18#	32-57	32-57#	33-34	33-34#	34-35	34-35#	34-36	34-36#	36-71	36-71#	37-32	37-32
	37-32#	37-43	37-43	37-43#	37-46	37-46#	38-21	38-21	38-21	38-21	38-21	38-21	38-21	38-21
	38-21#	38-21#	38-21#	38-21#	38-24	38-24#	39-22	39-22	39-22	39-22	39-22	39-22	39-22	39-22
	39-22#	39-22#	39-22#	39-22#	39-25	39-25#	40-21	40-21	40-21	40-21	40-21	40-21	40-21	40-21
	40-21#	40-21#	40-21#	40-21#	40-24	40-24#	41-49	41-49	41-49#	41-59	41-59	41-59#	41-83	41-83
	41-83#	41-86	41-86#	42-47	42-47	42-47#	42-67	42-67	42-67#	42-70	42-70#	43-42	43-42	43-42
	43-42	43-42	43-42	43-42	43-42	43-42#	43-42#	43-42#	43-42#	43-46	43-46#	44-47	44-47	44-47#
	44-50	44-50#	45-52	45-52	45-52#	45-58	45-58	45-58#	45-61	45-61#	46-50	46-50	46-50#	46-53
	46-53#	47-27	47-27	47-27	47-27	47-27	47-27	47-27	47-27	47-27#	47-27#	47-27#	47-27#	47-30
	47-30#	48-25	48-25	48-25	48-25	48-25	48-25	48-25	48-25	48-25#	48-25#	48-25#	48-25#	48-28
	48-28#	49-45	49-45	49-45#	49-58	49-58	49-58#	49-69	49-69	49-69#	49-82	49-82	49-82#	49-85
	49-85#	50-47	50-47	50-47#	50-60	50-60	50-60#	50-71	50-71	50-71#	50-84	50-84	50-84#	50-87
	50-87#	51-34	51-34	51-34#	51-45	51-45	51-45#	51-49	51-49#	52-36	52-36	52-36#	52-47	52-47
	52-47#	52-51	52-51#	53-29	53-29	53-29	53-29	53-29	53-29	53-29#	53-29#	53-29#	53-30	53-30#
	54-28	54-28	54-28	54-28	54-28	54-28	54-28#	54-28#	54-28#	54-29	54-29#	55-28	55-28	55-28
	55-28	55-28	55-28	55-28#	55-28#	55-28#	55-29	55-29#	56-31	56-31	56-31	56-31	56-31	56-31
	56-31#	56-31#	56-31#	56-32	56-32#	57-31	57-31	57-31#	57-42	57-42	57-42#	57-50	57-50#	58-33
	58-33	58-33#	58-43	58-43	58-43#	58-48	58-48#	59-33	59-33	59-33#	59-40	59-40#	60-47	60-47
	60-47#	60-56	60-56#	61-28	61-28	61-28#	61-31	61-31#	62-39	62-39	62-39#	62-42	62-42#	63-32
	63-32	63-32#	63-35	63-35#	64-25	64-25	64-25	64-25	64-25	64-25	64-25	64-25	64-25#	64-25#
	64-25#	64-25#	64-28	64-28#	65-38	65-38	65-38#	65-41	65-41#	66-33	66-33	66-33#	66-36	66-36#
	67-38	67-38	67-38#	67-41	67-41#	68-48	68-48	68-48#	68-51	68-51#	69-25	69-25	69-25	69-25
	69-25	69-25	69-25	69-25	69-25#	69-25#	69-25#	69-25#	69-25	69-28#	70-68	70-68	70-68#	70-72
	70-72#	71-36	71-36	71-36#	71-39	71-39#	72-46	72-46	72-46#	72-50	72-50#	73-40	73-40	73-40#
	73-43	73-43#	74-38	74-38	74-38#	74-41	74-41#	75-63	75-63	75-63#	75-66	75-66#	76-26	76-26
	76-26#	76-29	76-29#	77-69	77-69	77-69#	77-72	77-72#	78-26	78-26	78-26#	78-29	78-29#	79-48
	79-48	79-48#	79-51	79-51#	80-58	80-58	80-58#	80-61	80-61#	81-25	81-25	81-25#	81-28	81-28#
	82-30	82-30	82-30#	82-33	82-33#	83-36	83-36	83-36#	83-40	83-40#	84-64	84-64#	85-74	85-74#
	86-37	86-37	86-37#	86-52	86-52	86-52#	86-68	86-68	86-68#	86-88	86-88	[illegible]58#	86-100	86-100#
	87-115	87-115#	88-39	88-39	88-39#	88-72	88-72#	89-52	89-52	89-52#	89-56	89-56#	90-48	90-48
	90-48#	90-52	90-52#	91-92	91-92	91-92#	91-95	91-95#	92-68	92-68	92-68#	92-89	92-89	92-89#
	92-112	92-112	92-112#	92-113	92-113#	93-119	93-119	93-119#	93-196	93-196	93-196#	93-225	93-225	93-225#
	93-226	93-226#	93-315	93-315	93-315#	93-320	93-320#	93-338	93-338	93-338#	93-339	93-339#	94-52	94-52
	94-52#	94-75	94-75	94-75#	94-76	94-76#	95-81	95-81	95-81#	95-83	95-83#	96-49	96-49#	96-51
	96-51#	97-61	97-61#	98-33	98-33#	98-64	98-64#							
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	16-128	16-128#	16-129	16-129#	16-130	16-130#	16-132	16-132#	16-135	16-135#	16-141	16-141#	20-218	20-218#
	20-219	20-219#	20-221	20-221#	20-222	20-222#	20-224	20-224#	20-225	20-225#	20-229	20-229#	20-230	20-230#
	21-9	21-9#	21-12	21-12#	21-18	21-18#	26-17	26-17#	26-26	26-26#	30-27	30-27#	30-82	30-82#
	30-95	30-95#	30-100	30-100#	77-47	77-47#	83-18	83-18#	87-45	87-45#	87-52	87-52#	87-58	87-58#
	87-64	87-64#	87-70	87-70#	87-76	87-76#	87-82	87-82#	87-89	87-89#	87-91	87-91#	87-96	87-96#
	87-106	87-106#	87-112	87-112#	89-20	89-20#	90-20	90-20#	91-47	91-47#	92-47	92-47#	93-92	93-92#
	93-97	93-97#	93-138	93-138#	93-139	93-139#	93-249	93-249#	93-304	93-304#	94-37	94-37#	95-43	95-43#
MSPUSH	1-a31#	7-373#	7-399	7-399#	9-9	9-9#	10-8	10-8#	11-51	11-51#	16-96	16-96#	16-107	16-107#
	16-126	16-126#	16-138	16-138#	20-179	20-179#	27-39	27-39#	28-40	28-40#	28-46	28-46#	29-8	29-8#
	30-8	30-8#	31-10	31-10#	32-8	32-8#	33-8	33-8#	34-9	34-9#	36-38	36-38#	36-60	36-60#
	37-19	37-19#	37-21	37-21	37-21#	37-33	37-33	37-33#	38-17	38-17#	38-21	38-21	38-21	38-21
	38-21	38-21	38-21	38-21	38-21#	38-21#	38-21#	38-21#	39-18	39-18#	39-22	39-22	39-22	39-22
	39-22	39-22	39-22	39-22	39-22#	39-22#	39-22#	39-22#	40-17	40-17#	40-21	40-21	40-21	40-21
	40-21	40-21	40-21	40-21	40-21#	40-21#	40-21#	40-21#	41-31	41-31#	41-38	41-38	41-38#	41-39
	41-39	41-39#	41-50	41-50	41-50#	42-31	42-31#	42-35	42-35	42-35#	42-36	42-36	42-36#	43-37
	43-37#	43-42	43-42	43-42	43-42	43-42	43-42	43-42	43-42	43-42#	43-42#	43-42#	43-42#	44-26
	44-26#	44-31	44-31	44-31#	45-26	45-26#	45-31	45-31	45-31#	45-34	45-34	45-34#	46-24	46-24#
	46-31	46-31	46-31#	47-18	47-18#	47-27	47-27	47-27	47-27	47-27	47-27	47-27	47-27	47-27#
	47-27#	47-27#	47-27#	48-18	48-18#	48-25	48-25	48-25	48-25	48-25	48-25	48-25	48-25	48-25#

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        73-13#  73-15   73-15   73-15#  74-17   74-17#  74-19   74-19   74-19#  75-21   75-21#  75-23   75-23   75-23#
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        78-15#  79-22   79-22#  79-24   79-24   79-24#  80-24   80-24#  80-26   80-26   80-26#  81-12   81-12#  81-14
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        86-75   86-75#  87-20   87-20#  88-24   88-24#  88-30   88-30   88-30#  89-15   89-15#  89-25   89-25   89-25#
        90-15   90-15#  90-25   90-25   90-25#  91-42   91-42#  91-54   91-54   91-54#  92-39   92-39#  92-52   92-52
        92-52#  92-69   92-69   92-69#  92-90   92-90   92-90#  93-87   93-87#  93-105  93-105#  93-106  93-106  93-106#
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        96-25#  97-42   97-42#  97-52   97-52#  98-12   98-12#
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        16-130  16-130#  16-132  16-132  16-132#  16-135  16-135  16-135#  16-141  16-141  16-141#  20-154  20-154  20-154
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        20-219  20-219  20-219  20-219  20-219  20-219#  20-221  20-221  20-221#  20-222  20-222  20-222  20-222  20-222
        20-222  20-222  20-222  20-222  20-222#  20-224  20-224  20-224#  20-225  20-225  20-225  20-225  20-225  20-225
        20-225  20-225  20-225  20-225#  20-229  20-229  20-229#  20-230  20-230  20-230  20-230  20-230#  21-9    21-9
        21-9#  21-12   21-12   21-12   21-12#  21-18   21-18   21-18#  26-17   26-17   26-17   26-17#  26-26   26-26
        26-26   26-26#  30-27   30-27   30-27#  30-82   30-82   30-82   30-82#  30-95   30-95   30-95   30-95#  30-100
        30-100  30-100#  36-62   36-62   36-62   36-62   36-62#  57-32   57-32   57-32   57-32   57-32#  58-34   58-34
        58-34   58-34   58-34#  59-15   59-15   59-15   59-15   59-15#  77-47   77-47   77-47   77-47#  83-18   83-18
        83-18   83-18#  87-45   87-45   87-45   87-45   87-45#  87-52   87-52   87-52   87-52#  87-58   87-58   87-58
        87-58#  87-64   87-64   87-64   87-64#  87-70   87-70   87-70   87-70#  87-76   87-76   87-76   87-76#  87-82
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        93-92#  93-97   93-97   93-97   93-97#  93-138  93-138  93-138#  93-139  93-139  93-139#  93-249  93-249  93-249#
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        16-132#  16-132#  16-135  16-135  16-135#  16-135#  16-141  16-141  16-141#  16-141#  20-154  20-154  20-154  20-154
        20-154#  20-154#  20-154#  20-154#  20-161  20-161  20-161  20-161  20-161#  20-161#  20-161#  20-161#  20-218  20-218
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	21-12#	21-12#	21-18	21-18	21-18#	21-18#	26-17	26-17	26-17	26-17#	26-17#	26-17#	26-26	26-26
	26-26	26-26#	26-26#	26-26#	30-27	30-27	30-27#	30-27#	30-82	30-82	30-82	30-82#	30-82#	30-82#
	30-95	30-95	30-95	30-95#	30-95#	30-95#	30-100	30-100	30-100#	30-100#	36-62	36-62	36-62	36-62
	36-62#	36-62#	36-62#	36-62#	57-32	57-32	57-32	57-32	57-32#	57-32#	57-32#	57-32#	58-34	58-34
	58-34	58-34	58-34#	58-34#	58-34#	58-34#	59-15	59-15	59-15	59-15	59-15#	59-15#	59-15#	59-15#
	77-47	77-47	77-47	77-47#	77-47#	77-47#	83-18	83-18	83-18	83-18#	83-18#	83-18#	87-45	87-45
	87-45	87-45	87-45#	87-45#	87-45#	87-45#	87-52	87-52	87-52	87-52#	87-52#	87-52#	87-58	87-58
	87-58	87-58#	87-58#	87-58#	87-64	87-64	87-64	87-64#	87-64#	87-64#	87-70	87-70	87-70	87-70#
	87-70#	87-70#	87-76	87-76	87-76	87-76#	87-76#	87-76#	87-82	87-82	87-82	87-82#	87-82#	87-82#
	87-89	87-89	87-89	87-89#	87-89#	87-89#	87-91	87-91	87-91#	87-91#	87-96	87-96	87-96#	87-96#
	87-106	87-106	87-106	87-106	87-106	87-106	87-106#	87-106#	87-106#	87-106#	87-106#	87-106#	87-112	87-112
	87-112#	87-112#	89-20	89-20	89-20	89-20#	89-20#	89-20#	90-20	90-20	90-20	90-20#	90-20#	90-20#
	91-47	91-47	91-47	91-47#	91-47#	91-47#	92-47	92-47	92-47	92-47#	92-47#	92-47#	93-92	93-92
	93-92	93-92#	93-92#	93-92#	93-97	93-97	93-97	93-97#	93-97#	93-97#	93-138	93-138	93-138#	93-138#
	93-139	93-139	93-139#	93-139#	93-249	93-249	93-249#	93-249#	93-304	93-304	93-304#	93-304#	94-37	94-37
	94-37	94-37#	94-37#	94-37#	95-43	95-43	95-43#	95-43#						
M$RADI	1-D77#	7-373#	60-33	60-33#	60-49	60-49#	95-44	95-44#	97-54	97-54#	97-56	97-56#	97-58	97-58#
	97-60	97-60#	98-14	98-14#	98-16	98-16#	98-18	98-18#	98-22	98-22#	98-24	98-24#		
M$RBRO	1-C52#	7-373#												
M$RNRO	1-C62#	7-373#	20-101	20-101#	20-120	20-120#	30-37	30-37#						
M$SETS	1-D32#	7-373#	7-399	7-399#	9-9	9-9#	10-8	10-8#	11-51	11-51#	16-96	16-96#	16-107	16-107#
	16-126	16-126#	16-138	16-138#	20-179	20-179#	27-39	27-39#	28-40	28-40#	28-46	28-46#	29-8	29-8#
	30-8	30-8#	31-10	31-10#	32-8	32-8#	33-8	33-8#	34-9	34-9#	36-38	36-38#	36-60	36-60#
	37-19	37-19#	37-21	37-21	37-21#	37-21#	37-33	37-33	37-33#	37-33#	38-17	38-17#	38-21	38-21
	38-21	38-21	38-21	38-21	38-21	38-21	38-21#	38-21#	38-21#	38-21#	38-21#	38-21#	38-21#	38-21#
	39-18	39-18#	39-22	39-22	39-22	39-22	39-22	39-22	39-22	39-22	39-22#	39-22#	39-22#	39-22#
	39-22#	39-22#	39-22#	39-22#	40-17	40-17#	40-21	40-21	40-21	40-21	40-21	40-21	40-21	40-21
	40-21#	40-21#	40-21#	40-21#	40-21#	40-21#	40-21#	40-21#	41-31	41-31#	41-38	41-38	41-38#	41-38#
	41-39	41-39	41-39#	41-39#	41-50	41-50	41-50#	41-50#	42-31	42-31#	42-35	42-35	42-35#	42-35#
	42-36	42-36	42-36#	42-36#	43-37	43-37	43-42	43-42	43-42	43-42	43-42	43-42	43-42	43-42
	43-42#	43-42#	43-42#	43-42#	43-42#	43-42#	43-42#	43-42#	44-26	44-26#	44-31	44-31	44-31#	44-31#
	45-26	45-26#	45-31	45-31	45-31#	45-31#	45-34	45-34	45-34#	45-34#	46-24	46-24#	46-31	46-31
	46-31#	46-31#	47-18	47-18#	47-27	47-27	47-27	47-27	47-27	47-27	47-27	47-27	47-27#	47-27#
	47-27#	47-27#	47-27#	47-27#	47-27#	47-27#	48-18	48-18#	48-25	48-25	48-25	48-25	48-25	48-25
	48-25	48-25	48-25#	48-25#	48-25#	48-25#	48-25#	48-25#	48-25#	48-25#	49-24	49-24#	49-28	49-28
	49-28#	49-28#	49-46	49-46	49-46#	49-46#	49-59	49-59	49-59#	49-59#	49-70	49-70	49-70#	49-70#
	50-26	50-26#	50-30	50-30	50-30#	50-30#	50-48	50-48	50-48#	50-48#	50-61	50-61	50-61#	50-61#
	50-72	50-72	50-72#	50-72#	51-18	51-18#	51-24	51-24	51-24#	51-24#	51-35	51-35	51-35#	51-35#
	52-17	52-17#	52-24	52-24	52-24#	52-24#	52-37	52-37	52-37#	52-37#	53-28	53-28#	53-29	53-29
	53-29	53-29	53-29	53-29	53-29#	53-29#	53-29#	53-29#	53-29#	53-29#	54-27	54-27#	54-28	54-28
	54-28	54-28	54-28	54-28	54-28#	54-28#	54-28#	54-28#	54-28#	54-28#	55-27	55-27#	55-28	55-28
	55-28	55-28	55-28	55-28	55-28#	55-28#	55-28#	55-28#	55-28#	55-28#	56-30	56-30#	56-31	56-31
	56-31	56-31	56-31	56-31	56-31#	56-31#	56-31#	56-31#	56-31#	56-31#	57-17	57-17#	57-21	57-21
	57-21#	57-21#	57-34	57-34	57-34#	57-34#	58-18	58-18#	58-22	58-22	58-22#	58-22#	58-35	58-35
	58-35#	58-35#	59-13	59-13#	59-16	59-16	59-16#	59-16#	60-22	60-22#	60-37	60-37	60-37#	60-37#
	61-15	61-15#	61-17	61-17	61-17#	61-17#	62-13	62-13#	62-15	62-15	62-15#	62-15#	63-15	63-15#
	63-17	63-17	63-17#	63-17#	64-20	64-20#	64-25	64-25	64-25	64-25	64-25	64-25	64-25	64-25
	64-25#	64-25#	64-25#	64-25#	64-25#	64-25#	64-25#	64-25#	65-18	65-18#	65-20	65-20	65-20#	65-20#
	66-12	66-12#	66-14	66-14	66-14#	66-14#	67-14	67-14#	67-21	67-21	67-21#	67-21#	68-14	68-14#
	68-20	68-20	68-20#	68-20#	69-20	69-20#	69-25	69-25	69-25	69-25	69-25	69-25	69-25	69-25
	69-25#	69-25#	69-25#	69-25#	69-25#	69-25#	69-25#	69-25#	70-33	70-33#	70-36	70-36	70-36#	70-36#
	71-17	71-17#	71-19	71-19	71-19#	71-19#	72-18	72-18#	72-20	72-20	72-20#	72-20#	73-13	73-13#
	73-15	73-15	73-15#	73-15#	74-17	74-17#	74-19	74-19	74-19#	74-19#	75-21	75-21#	75-23	75-23
	75-23#	75-23#	76-12	76-12#	76-14	76-14	76-14#	76-14#	77-28	77-28#	77-30	77-30	77-30#	77-30#
	78-13	78-13#	78-15	78-15	78-15#	78-15#	79-22	79-22#	79-24	79-24	79-24#	79-24#	80-24	80-24#

CROSS REFERENCE TABLE (CREF V04.00)

	80-26	80-26	80-26#	80-26#	81-12	81-12#	81-14	81-14	81-14#	81-14#	82-14	82-14#	82-16	82-16
	82-16#	82-16#	83-13	83-13#	83-23	83-23	83-23#	83-23#	84-18	84-18#	85-25	85-25#	86-16	86-16#
	86-24	86-24	86-24#	86-24#	86-38	86-38	86-38#	86-38#	86-55	86-55	86-55#	86-55#	86-75	86-75
	86-75#	86-75#	87-20	87-20#	88-24	88-24#	88-30	88-30	88-30#	88-30#	89-15	89-15#	89-25	89-25
	89-25#	89-25#	90-15	90-15#	90-25	90-25	90-25#	90-25#	91-42	91-42#	91-54	91-54	91-54#	91-54#
	92-39	92-39#	92-52	92-52	92-52#	92-52#	92-69	92-69	92-69#	92-69#	92-90	92-90	92-90#	92-90#
	93-87	93-87#	93-105	93-105#	93-106	93-106	93-106#	93-106#	93-120	93-120	93-120#	93-120#	93-197	93-197
	93-197#	93-197#	93-227	93-227#	93-238	93-238	93-238#	93-238#	93-321	93-321	93-321#	93-321#	94-31	94-31#
	94-32	94-32	94-32#	94-32#	94-53	94-53	94-53#	94-53#	95-30	95-30#	95-72	95-72	95-72#	95-72#
	96-25	96-25#	97-42	97-42#	97-52	97-52#	98-12	98-12#						
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	16-123	16-123#	16-124	16-124#	16-128	16-128#	16-129	16-129#	16-130	16-130#	16-132	16-132#	16-135	16-135#
	16-136	16-136#	16-141	16-141#	16-142	16-142#	18-20	18-33	18-33#	18-44	18-44#	20-101	20-101#	20-120
	20-120#	20-154	20-154#	20-161	20-161#	20-218	20-218#	20-219	20-219#	20-221	20-221#	20-222	20-222#	20-224
	20-224#	20-225	20-225#	20-229	20-229#	20-230	20-230#	21-9	21-9#	21-12	21-12#	21-18	21-18#	22-21
	23-101	24-26	24-36	24-36#	24-48	24-48#	25-69	25-106	26-17	26-17#	26-26	26-26#	28-60#	28-75
	28-75#	30-10	30-10#	30-12	30-12#	30-16	30-16#	30-20	30-20#	30-22	30-22#	30-27	30-27#	30-37
	30-37#	30-82	30-82#	30-95	30-95#	30-100	30-100#	30-126	30-126#	30-141	30-141#	31-18	31-18#	32-18
	32-18#	32-26	32-26#	32-29	32-29#	32-31	32-31#	32-42	32-42#	32-57	32-57#	33-19#	33-34	33-34#
	34-20#	34-35	34-35#	36-62	36-62#	36-64	36-64#	36-67	36-71	36-71#	37-21	37-21#	37-30	37-32
	37-32#	37-33	37-33#	37-41	37-43	37-43#	37-46	37-46#	38-21	38-21	38-21	38-21	38-21	38-21
	38-21	38-21	38-21#	38-21#	38-21#	38-21#	38-21#	38-21#	38-21#	38-21#	38-24	38-24#	39-22	39-22
	39-22	39-22	39-22	39-22	39-22	39-22	39-22#	39-22#	39-22#	39-22#	39-22#	39-22#	39-22#	39-22#
	39-25	39-25#	40-21	40-21	40-21	40-21	40-21	40-21	40-21	40-21	40-21#	40-21#	40-21#	40-21#
	40-21#	40-21#	40-21#	40-21#	40-24	40-24#	41-34	41-34#	41-38	41-38#	41-39	41-39#	41-47	41-49
	41-49#	41-50	41-50#	41-57	41-59	41-59#	41-65	41-72	41-81	41-83	41-83#	41-86	41-86#	42-35
	42-35#	42-36	42-36#	42-45	42-47	42-47#	42-57	42-65	42-67	42-67#	42-70	42-70#	43-42	43-42
	43-42	43-42	43-42	43-42	43-42	43-42	43-42#	43-42#	43-42#	43-42#	43-42#	43-42#	43-42#	43-42#
	43-46	43-46#	44-31	44-31#	44-43	44-47	44-47#	44-50	44-50#	45-31	45-31#	45-34	45-34#	45-48
	45-52	45-52#	45-58	45-58#	45-61	45-61#	46-27	46-27#	46-31	46-31#	46-48	46-50	46-50#	46-53
	46-53#	47-21	47-21#	47-26	47-26#	47-27	47-27	47-27	47-27	47-27	47-27	47-27	47-27	47-27#
	47-27#	47-27#	47-27#	47-27#	47-27#	47-27#	47-27#	47-30	47-30#	48-21	48-21#	48-25	48-25	48-25
	48-25	48-25	48-25	48-25	48-25	48-25#	48-25#	48-25#	48-25#	48-25#	48-25#	48-25#	48-25#	48-28
	48-28#	49-28	49-28#	49-35	49-42	49-45	49-45#	49-46	49-46#	49-49	49-49#	49-55	49-58	49-58#
	49-59	49-59#	49-66	49-69	49-69#	49-70	49-70#	49-73	49-73#	49-79	49-82	49-82#	49-85	49-85#
	50-30	50-30#	50-37	50-44	50-47	50-47#	50-48	50-48#	50-51	50-51#	50-57	50-60	50-60#	50-61
	50-61#	50-68	50-71	50-71#	50-72	50-72#	50-75	50-75#	50-81	50-84	50-84#	50-87	50-87#	51-23
	51-23#	51-24	51-24#	51-31	51-34	51-34#	51-35	51-35#	51-42	51-45	51-45#	51-48	51-48#	51-49
	51-49#	52-20	52-20#	52-24	52-24#	52-26	52-26#	52-33	52-36	52-36#	52-37	52-37#	52-44	52-47
	52-47#	52-50	52-50#	52-51	52-51#	53-29	53-29	53-29	53-29	53-29	53-29	53-29	53-29	53-29
	53-29	53-29	53-29#	53-29#	53-29#	53-29#	53-29#	53-29#	53-29#	53-30	53-30#	54-28	54-28	54-28
	54-28	54-28	54-28	54-28	54-28	54-28	54-28	54-28	54-28#	54-28#	54-28#	54-28#	54-28#	54-28#
	54-28#	54-29	54-29#	55-28	55-28	55-28	55-28	55-28	55-28	55-28	55-28	55-28	55-28	55-28
	55-28#	55-28#	55-28#	55-28#	55-28#	55-28#	55-28#	55-29	55-29#	56-31	56-31	56-31	56-31	56-31
	56-31	56-31	56-31	56-31	56-31	56-31	56-31#	56-31#	56-31#	56-31#	56-31#	56-31#	56-31#	56-32
	56-32#	57-21	57-21#	57-29	57-31	57-31#	57-32	57-32#	57-34	57-34#	57-35	57-35#	57-40	57-42
	57-42#	57-49	57-49#	57-50	57-50#	58-22	58-22#	58-31	58-32	58-32#	58-33	58-33#	58-34	58-34#
	58-35	58-35#	58-36	58-36#	58-41	58-43	58-43#	58-47	58-47#	58-48	58-48#	59-15	59-15#	59-16
	59-16#	59-26	59-26#	59-31	59-33	59-33#	59-37	59-37#	59-39	59-39#	59-40	59-40#	60-28	60-28#
	60-29	60-29#	60-31	60-31#	60-33	60-33#	60-36	60-36#	60-37	60-37#	60-46	60-47	60-47#	60-49
	60-49#	60-56	60-56#	61-17	61-17#	61-26	61-28	61-28#	61-31	61-31#	62-15	62-15#	62-37	62-39
	62-39#	62-42	62-42#	63-17	63-17#	63-30	63-32	63-32#	63-35	63-35#	64-25	64-25	64-25	64-25
	64-25	64-25	64-25	64-25	64-25#	64-25#	64-25#	64-25#	64-25#	64-25#	64-25#	64-25#	64-28	64-28#
	65-20	65-20#	65-33	65-38	65-38#	65-41	65-41#	66-14	66-14#	66-29	66-33	66-33#	66-36	66-36#
	67-21	67-21#	67-38	67-38#	67-41	67-41#	68-20	68-20#	68-48	68-48#	68-51	68-51#	69-25	69-25

CROSS REFERENCE TABLE (CREF V04.00)

	69-25	69-25	69-25	69-25	69-25	69-25	69-25#	69-25#	69-25#	69-25#	69-25#	69-25#	69-25#	69-25#
	69-28	69-28#	70-36	70-36#	70-66	70-68	70-68#	70-72	70-72#	71-19	71-19#	71-34	71-36	71-36#
	71-39	71-39#	72-20	72-20#	72-44	72-46	72-46#	72-50	72-50#	73-15	73-15#	73-38	73-40	73-40#
	73-43	73-43#	74-19	74-19#	74-34	74-36	74-38	74-38#	74-41	74-41#	75-23	75-23#	75-43	75-61
	75-63	75-63#	75-66	75-66#	76-14	76-14#	76-24	76-26	76-26#	76-29	76-29#	77-30	77-30#	77-47
	77-47#	77-52	77-52#	77-67	77-69	77-69#	77-72	77-72#	78-15	78-15#	78-24	78-26	78-26#	78-29
	78-29#	79-24	79-24#	79-36	79-46	79-48	79-48#	79-51	79-51#	80-26	80-26#	80-38	80-45	80-56
	80-58	80-58#	80-61	80-61#	81-14	81-14#	81-23	81-25	81-25#	81-28	81-28#	82-16	82-16#	82-28
	82-30	82-30#	82-33	82-33#	83-18	83-18#	83-22	83-22#	83-23	83-23#	83-34	83-36	83-36#	83-40
	83-40#	84-58	84-64	84-64#	85-42	85-74	85-74#	86-24	86-24#	86-34	86-37	86-37#	86-38	86-38#
	86-49	86-52	86-52#	86-55	86-55#	86-65	86-68	86-68#	86-75	86-75#	86-85	86-88	86-88#	86-100
	86-100#	87-26	87-26#	87-45	87-45#	87-52	87-52#	87-58	87-58#	87-64	87-64#	87-70	87-70#	87-76
	87-76#	87-82	87-82#	87-89	87-89#	87-91	87-91#	87-96	87-96#	87-106	87-106#	87-112	87-112#	87-115
	87-115#	88-30	88-30#	88-35	88-39	88-39#	88-72	88-72#	89-20	89-20#	89-24	89-24#	89-25	89-25#
	89-50	89-52	89-52#	89-56	89-56#	90-20	90-20#	90-24	90-24#	90-25	90-25#	90-46	90-48	90-48#
	90-52	90-52#	91-47	91-47#	91-51	91-51#	91-54	91-54#	91-90	91-92	91-92#	91-95	91-95#	92-47
	92-47#	92-51	92-51#	92-52	92-52#	92-67	92-68	92-68#	92-69	92-69#	92-87	92-89	92-89#	92-90
	92-90#	92-106	92-110	92-112	92-112#	92-113	92-113#	93-92	93-92#	93-93	93-93#	93-97	93-97#	93-101
	93-101#	93-105	93-105#	93-106	93-106#	93-117	93-119	93-119#	93-120	93-120#	93-138	93-138#	93-139	93-139#
	93-156	93-194	93-196	93-196#	93-197	93-197#	93-217	93-222	93-225	93-225#	93-226	93-226#	93-227	93-227#
	93-238	93-238#	93-248	93-249	93-249#	93-264	93-276	93-285	93-303	93-304	93-304#	93-309	93-315	93-315#
	93-320	93-320#	93-321	93-321#	93-336	93-338	93-338#	93-339	93-339#	94-32	94-32#	94-37	94-37#	94-41
	94-41#	94-51	94-52	94-52#	94-53	94-53#	94-66	94-75	94-75#	94-76	94-76#	95-36	95-36#	95-39
	95-39#	95-41	95-41#	95-43	95-43#	95-44	95-44#	95-72	95-72#	95-77	95-81	95-81#	95-83	95-83#
	96-37	96-42	96-47	96-49	96-49#									
M$TLAB	1-C29#	7-373#	16-99#	16-100#	16-104#	16-105#	16-112#	16-117#	16-123#	16-124#	16-128#	16-129#	16-130#	16-132#
	16-135#	16-136#	16-141#	16-142#	18-20#	18-33#	18-44#	20-101#	20-120#	20-154#	20-161#	20-218#	20-219#	20-221#
	20-222#	20-224#	20-225#	20-229#	20-230#	21-9#	21-12#	21-18#	22-21#	23-101#	24-26#	24-36#	24-48#	25-69#
	25-106#	26-17#	26-26#	28-75#	30-10#	30-12#	30-16#	30-20#	30-22#	30-27#	30-37#	30-82#	30-95#	30-100#
	30-126#	30-141#	31-18#	32-18#	32-26#	32-29#	32-31#	32-42#	32-57#	33-34#	34-35#	36-62#	36-64#	36-67#
	36-71#	37-21#	37-30#	37-32#	37-33#	37-41#	37-43#	37-46#	38-21#	38-21#	38-21#	38-21#	38-21#	38-21#
	38-21#	38-21#	38-24#	39-22#	39-22#	39-22#	39-22#	39-22#	39-22#	39-22#	39-22#	39-25#	40-21#	40-21#
	40-21#	40-21#	40-21#	40-21#	40-21#	40-21#	40-24#	41-34#	41-38#	41-39#	41-47#	41-49#	41-50#	41-57#
	41-59#	41-65#	41-72#	41-81#	41-83#	41-86#	42-35#	42-36#	42-45#	42-47#	42-57#	42-65#	42-67#	42-70#
	43-42#	43-42#	43-42#	43-42#	43-42#	43-42#	43-42#	43-42#	43-46#	44-31#	44-43#	44-47#	44-50#	45-31#
	45-34#	45-48#	45-52#	45-58#	45-61#	46-27#	46-31#	46-48#	46-50#	46-53#	47-21#	47-26#	47-27#	47-27#
	47-27#	47-27#	47-27#	47-27#	47-27#	47-27#	47-30#	48-21#	48-25#	48-25#	48-25#	48-25#	48-25#	48-25#
	48-25#	48-25#	48-28#	49-28#	49-35#	49-42#	49-45#	49-46#	49-49#	49-55#	49-58#	49-59#	49-66#	49-69#
	49-70#	49-73#	49-79#	49-82#	49-85#	50-30#	50-37#	50-44#	50-47#	50-48#	50-51#	50-57#	50-60#	50-61#
	50-68#	50-71#	50-72#	50-75#	50-81#	50-84#	50-87#	51-23#	51-24#	51-31#	51-34#	51-35#	51-42#	51-45#
	51-48#	51-49#	52-20#	52-24#	52-26#	52-33#	52-36#	52-37#	52-44#	52-47#	52-50#	52-51#	53-29#	53-29#
	53-29#	53-29#	53-29#	53-29#	53-29#	53-29#	53-29#	53-29#	53-29#	53-30#	54-28#	54-28#	54-28#	54-28#
	54-28#	54-28#	54-28#	54-28#	54-28#	54-28#	54-28#	54-29#	55-28#	55-28#	55-28#	55-28#	55-28#	55-28#
	55-28#	55-28#	55-28#	55-28#	55-28#	55-29#	56-31#	56-31#	56-31#	56-31#	56-31#	56-31#	56-31#	56-31#
	56-31#	56-31#	56-31#	56-32#	57-21#	57-29#	57-31#	57-32#	57-34#	57-35#	57-40#	57-42#	57-49#	57-50#
	58-22#	58-31#	58-32#	58-33#	58-34#	58-35#	58-36#	58-41#	58-43#	58-47#	58-48#	59-15#	59-16#	59-26#
	59-31#	59-33#	59-37#	59-39#	59-40#	60-28#	60-29#	60-31#	60-33#	60-36#	60-37#	60-46#	60-47#	60-49#
	60-56#	61-17#	61-26#	61-28#	61-31#	62-15#	62-37#	62-39#	62-42#	63-17#	63-30#	63-32#	63-35#	64-25#
	64-25#	64-25#	64-25#	64-25#	64-25#	64-25#	64-25#	64-28#	65-20#	65-33#	65-38#	65-41#	66-14#	66-29#
	66-33#	66-36#	67-21#	67-38#	67-41#	68-20#	68-48#	68-51#	69-25#	69-25#	69-25#	69-25#	69-25#	69-25#
	69-25#	69-25#	69-28#	70-36#	70-66#	70-68#	70-72#	71-19#	71-34#	71-36#	71-39#	72-20#	72-44#	72-46#
	72-50#	73-15#	73-38#	73-40#	73-43#	74-19#	74-34#	74-36#	74-38#	74-41#	75-23#	75-43#	75-61#	75-63#
	75-66#	76-14#	76-24#	76-26#	76-29#	77-30#	77-47#	77-52#	77-67#	77-69#	77-72#	78-15#	78-24#	78-26#
	78-29#	79-24#	79-36#	79-46#	79-48#	79-51#	80-26#	80-38#	80-45#	80-56#	80-58#	80-61#	81-14#	81-23#
	81-25#	81-28#	82-16#	82-28#	82-30#	82-33#	83-18#	83-22#	83-23#	83-34#	83-36#	83-40#	84-58#	84-64#
	85-42#	85-74#	86-24#	86-34#	86-37#	86-38#	86-49#	86-52#	86-55#	86-65#	86-68#	86-75#	86-85#	86-88#

	86-100#	87-26#	87-45#	87-52#	87-58#	87-64#	87-70#	87-76#	87-82#	87-89#	87-91#	87-96#	87-106#	87-112#
	87-115#	88-30#	88-35#	88-39#	88-72#	89-20#	89-24#	89-25#	89-50#	89-52#	89-56#	90-20#	90-24#	90-25#
	90-46#	90-48#	90-52#	91-47#	91-51#	91-54#	91-90#	91-92#	91-95#	92-47#	92-51#	92-52#	92-67#	92-68#
	92-69#	92-87#	92-89#	92-90#	92-106#	92-110#	92-112#	92-113#	93-92#	93-93#	93-97#	93-101#	93-105#	93-106#
	93-117#	93-119#	93-120#	93-138#	93-139#	93-156#	93-194#	93-196#	93-197#	93-217#	93-222#	93-225#	93-226#	93-227#
	93-238#	93-248#	93-249#	93-264#	93-276#	93-285#	93-303#	93-304#	93-309#	93-315#	93-320#	93-321#	93-336#	93-338#
	93-339#	94-32#	94-37#	94-41#	94-51#	94-52#	94-53#	94-66#	94-75#	94-76#	95-36#	95-39#	95-41#	95-43#
	95-44#	95-72#	95-77#	95-81#	95-83#	96-37#	96-42#	96-47#	96-49#					
M$TSTL	1-C21#	7-373#	16-99	16-99#	16-100	16-100#	16-104	16-104#	16-105	16-105#	16-112	16-112#	16-117	16-117#
	16-123	16-123#	16-124	16-124#	16-128	16-128#	16-129	16-129#	16-130	16-130#	16-132	16-132#	16-135	16-135#
	16-136	16-136#	16-141	16-141#	16-142	16-142#	18-20	18-20#	18-20#	18-33	18-33#	18-44	18-44#	20-101
	20-101#	20-120	20-120#	20-154	20-154#	20-161	20-161#	20-218	20-218#	20-219	20-219#	20-221	20-221#	20-222
	20-222#	20-224	20-224#	20-225	20-225#	20-229	20-229#	20-230	20-230#	21-9	21-9#	21-12	21-12#	21-18
	21-18#	22-21	22-21#	22-21#	23-101	23-101#	23-101#	24-26	24-26#	24-26#	24-36	24-36#	24-48	24-48#
	25-69	25-69#	25-69#	25-106	25-106#	25-106#	26-17	26-17#	26-26	26-26#	28-75	28-75#	30-10	30-10#
	30-12	30-12#	30-16	30-16#	30-20	30-20#	30-22	30-22#	30-27	30-27#	30-37	30-37#	30-82	30-82#
	30-95	30-95#	30-100	30-100#	30-126	30-126#	30-141	30-141#	31-18	31-18#	32-18	32-18#	32-26	32-26#
	32-29	32-29#	32-31	32-31#	32-42	32-42#	32-57	32-57#	33-34	33-34#	34-35	34-35#	36-62	36-62#
	36-64	36-64#	36-67	36-67#	36-67#	36-71	36-71#	37-21	37-21#	37-30	37-30#	37-30#	37-32	37-32#
	37-33	37-33#	37-41	37-41#	37-41#	37-43	37-43#	37-46	37-46#	38-21	38-21	38-21	38-21	38-21
	38-21	38-21	38-21	38-21#	38-21#	38-21#	38-21#	38-21#	38-21#	38-21#	38-21#	38-24	38-24#	39-22
	39-22	39-22	39-22	39-22	39-22	39-22	39-22	39-22#	39-22#	39-22#	39-22#	39-22#	39-22#	39-22#
	39-22#	39-25	39-25#	40-21	40-21	40-21	40-21	40-21	40-21	40-21	40-21	40-21#	40-21#	40-21#
	40-21#	40-21#	40-21#	40-21#	40-21#	40-24	40-24#	41-34	41-34#	41-38	41-38#	41-39	41-39#	41-47
	41-47#	41-47#	41-49	41-49#	41-50	41-50#	41-57	41-57#	41-57#	41-59	41-59#	41-65	41-65#	41-65#
	41-72	41-72#	41-72#	41-81	41-81#	41-81#	41-83	41-83#	41-86	41-86#	42-35	42-35#	42-36	42-36#
	42-45	42-45#	42-45#	42-47	42-47#	42-57	42-57#	42-57#	42-65	42-65#	42-65#	42-67	42-67#	42-70
	42-70#	43-42	43-42	43-42	43-42	43-42	43-42	43-42	43-42	43-42#	43-42#	43-42#	43-42#	43-42#
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	45-31	45-31#	45-34	45-34#	45-48	45-48#	45-48#	45-52	45-52#	45-58	45-58#	45-61	45-61#	46-27
	46-27#	46-31	46-31#	46-48	46-48#	46-48#	46-50	46-50#	46-53	46-53#	47-21	47-21#	47-26	47-26#
	47-27	47-27	47-27	47-27	47-27	47-27	47-27	47-27	47-27#	47-27#	47-27#	47-27#	47-27#	47-27#
	47-27#	47-27#	47-30	47-30#	48-21	48-21#	48-25	48-25	48-25	48-25	48-25	48-25	48-25	48-25
	48-25#	48-25#	48-25#	48-25#	48-25#	48-25#	48-25#	48-25#	48-28	48-28#	48-28	49-28#	49-35	49-35#
	49-35#	49-42	49-42#	49-42#	49-45	49-45#	49-46	49-46#	49-49	49-49#	49-55	49-55#	49-55#	49-58
	49-58#	49-59	49-59#	49-66	49-66#	49-66#	49-69	49-69#	49-70	49-70#	49-73	49-73#	49-79	49-79#
	49-79#	49-82	49-82#	49-85	49-85#	50-30	50-30#	50-37	50-37#	50-37#	50-44	50-44#	50-44#	50-47
	50-47#	50-48	50-48#	50-51	50-51#	50-57	50-57#	50-57#	50-60	50-60#	50-61	50-61#	50-68	50-68#
	50-68#	50-71	50-71#	50-72	50-72#	50-75	50-75#	50-81	50-81#	50-81#	50-84	50-84#	50-87	50-87#
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	51-45	51-45#	51-48	51-48#	51-49	51-49#	52-20	52-20#	52-24	52-24#	52-26	52-26#	52-33	52-33#
	52-33#	52-36	52-36#	52-37	52-37#	52-44	52-44#	52-44#	52-47	52-47#	52-50	52-50#	52-51	52-51#
	53-29	53-29	53-29	53-29	53-29	53-29	53-29	53-29	53-29	53-29	53-29	53-29#	53-29#	53-29#
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	54-28#	54-28#	54-28#	54-28#	54-28#	54-28#	54-28#	54-28#	54-28#	54-28#	54-28#	54-28#	54-29	54-29#
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	55-28#	55-28#	55-28#	55-28#	55-28#	55-28#	55-28#	55-28#	55-28#	55-28#	55-28#	55-28#	55-29	55-29#
	56-31	56-31	56-31	56-31	56-31	56-31	56-31	56-31	56-31	56-31	56-31	56-31#	56-31#	56-31#
	56-31#	56-31#	56-31#	56-31#	56-31#	56-31#	56-31#	56-31#	56-31#	56-31#	56-31#	56-31#	56-32	56-32#
	57-21	57-21#	57-29	57-29#	57-29#	57-31	57-31#	57-32	57-32#	57-34	57-34#	57-35	57-35#	57-40
	57-40#	57-40#	57-42	57-42#	57-49	57-49#	57-50	57-50#	58-22	58-22#	58-31	58-31#	58-31#	58-32
	58-32#	58-33	58-33#	58-34	58-34#	58-35	58-35#	58-36	58-36#	58-41	58-41#	58-41#	58-43	58-43#
	58-47	58-47#	58-48	58-48#	59-15	59-15#	59-16	59-16#	59-26	59-26#	59-31	59-31#	59-31#	59-33
	59-33#	59-37	59-37#	59-39	59-39#	59-40	59-40#	60-28	60-28#	60-29	60-29#	60-31	60-31#	60-33
	60-33#	60-36	60-36#	60-37	60-37#	60-46	60-46#	60-46#	60-47	60-47#	60-49	60-49#	60-56	60-56#

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        62-39   62-39#  62-42   62-42#  63-17   63-17#  63-30   63-30#  63-30#  63-32   63-32#  63-35   63-35#  64-25
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        73-40#  73-43   73-43#  74-19   74-19#  74-34   74-34#  74-34#  74-36   74-36#  74-36#  74-38   74-38#  74-41
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        77-67   77-67#  77-67#  77-69   77-69#  77-72   77-72#  78-15   78-15#  78-24   78-24#  78-24#  78-26   78-26#
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        93-197# 93-217  93-217# 93-217# 93-222  93-222# 93-222# 93-225  93-225# 93-226  93-226# 93-227  93-227# 93-238
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        95-77#  95-81   95-81#  95-83   95-83#  96-37   96-37#  96-37#  96-42   96-42#  96-42#  96-47   96-47#  96-47#
        96-49   96-49#
M$WORD  1-C94#  7-373#  7-427   7-427#  8-8     8-8     8-8     8-8     8-8     8-8     8-8     8-8     8-8     8-8
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        8-8     8-8     8-8     8-8     8-8     8-8     8-8     8-8     8-8     8-8     8-8#    18-20   18-20   18-20
        18-20#  22-21   22-21   22-21   22-21#  23-101  23-101  23-101  23-101# 24-26   24-26   24-26   24-26#  25-69
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        34-20   34-20#  36-67   36-67   36-67   36-67#  37-30   37-30   37-30   37-30#  37-41   37-41   37-41   37-41#
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        46-48   46-48   46-48   46-48#  47-21#  48-21#  49-35   49-35   49-35   49-35#  49-42   49-42   49-42   49-42#
        49-49#  49-55   49-55   49-55   49-55#  49-66   49-66   49-66   49-66#  49-73#  49-79   49-79   49-79   49-79#
        50-37   50-37   50-37   50-37#  50-44   50-44   50-44   50-44#  50-51#  50-57   50-57   50-57   50-57#  50-68
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CROSS REFERENCE TABLE (CREF V04.00)