TS04

DATA RELIABILITY
CZTSHA0

AH-E455A-MC

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MADE IN USA

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IDENTIFICATION

PRODUCT CODE: AC-E454A-MC

PRODUCT NAME: CZTSHA0 TS11/TS04 DATA RELIAB

MAINTAINER: DIAGNOSTIC ENGINEERING

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USER DOCUMENTATION TABLE OF CONTENTS

6.0 DEVICE INFORMATION

GLOSSARY

ACT	AUTOMATED COMPUTER TEST
APT	AUTOMATED PRODUCT TEST SYSTEM USED IN MANUFACTURING.
BYTE/RECORD/FILE COUNT BRF	IS STORED IN THE 4TH WORD OF THE COMMAND PACKET AND IT'S USE BY THE TS04 DEPENDS ON THE TYPE OF COMMAND.
CMD	TS04 COMMAND (SEE 2.3.14.1 FOR LIST OF COMMANDS).
COMMAND PACKET CMDPKT	FOUR WORD PACKET IN THE CPU MEMORY WHICH CONTAINS ALL INFORMATION NEEDED BY THE TS04 TO EXECUTE A COMMAND.
EXTENDED STATUS	FOUR WORDS OF TS04 STATUS WHICH ARE TRANSFERRED AS PART OF THE MESSAGE PACKET AT THE COMPLETION OF A COMMAND.
MESSAGE PACKET	SEVEN WORD PACKET IN THE CPU MEMORY INTO WHICH THE TS04 STORES STATUS AT THE COMPLETION OF A COMMAND.
PC	PROGRAM COUNTER
PSW	PROCESSOR STATUS WORD
RESIDUAL FRAME COUNT RFC	THIS COUNT IS PART OF THE MESSAGE PACKET AND CONTAINS THE NUMBER OF BYTES/RECORDS /FILES REMAINING TO BE PROCESSED AT THE COMPLETION OF A COMMAND.
TERMINATION CLASS CODE TCC	THREE BIT CODE IN THE TSSR WHICH INDI-CATES THE TYPE OF COMMAND TERMINATION.
TSBA	TAPE SYSTEM BUS ADDRESS REGISTER.
TSDB	TAPE SYSTEM DATA BUFFER PEGISTER.
TSSR	TAPE SYSTEM STATUS REGISTER.
XST0	EXTENDED STATUS REGISTER 0
XST1	EXTENDED STATUS REGISTER 1
XST2	EXTENDED STATUS REGISTER 2
XST3	EXTENDED STATUS REGISTER 3
XXDP	XXDP IS A "CATCH-ALL" NAME FOR A GROUP OF PDP-11 DIAGNOSTIC PACKAGES AVAILABLE ON MULTIMEDIA.

1.0 GENERAL INFORMATION

1.1 PROGRAM ABSTRACT

1.1.1 FUNCTIONAL DESCRIPTION

THIS PROGRAM CAN BE USED AS A BASIC FUNCTION TEST, A DATA RELIABILITY TEST, A COMPATABILITY TEST, OR TO EXECUTE A SEQUENCE OF OPERATOR SELECTED COMMANDS.

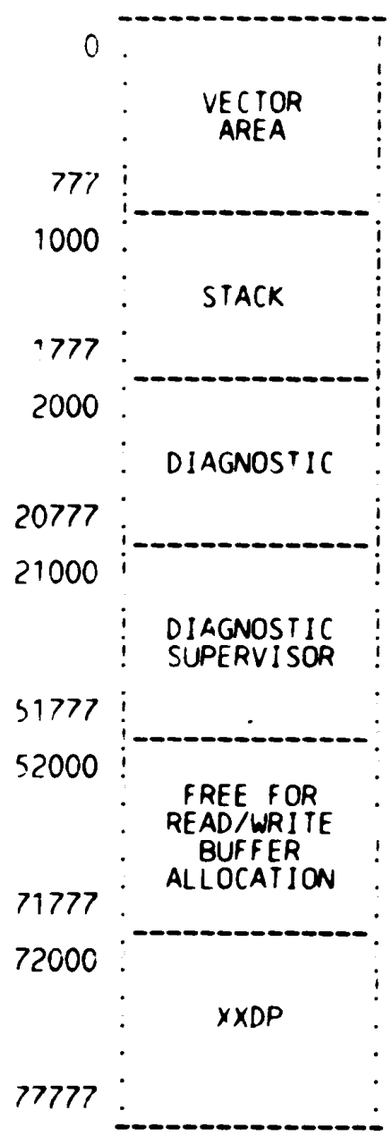
1.1.2 STRUCTURE OF PROGRAM

THIS DIAGNOSTIC OCCUPIES 14.5K WORDS OF MEMORY AND IS COMPATIBLE WITH BOTH XXDP AND ACT. IT CAN BE RUN STANDALONE UNDER XXDP, AND CAN BE CHAINED UNDER XXDP, ACT AND APT IN ACT MODE (SEE "CREATE CORE IMAGE" COMMAND BELOW FOR DETAILS OF CHAINING PROCEDURE). IT IS A SINGLE PROGRAM FROM THE STANDPOINT OF THE DIAGNOSTIC USER, BUT IT CONTAINS A CONTROL MODULE WHICH WILL BE LATER RELEASED INDEPENDENTLY AS A DIAGNOSTIC SUPERVISOR.

WHEN THIS DIAGNOSTIC IS STARTED AT ADDRESS 200, CONTROL GOES FIRST TO THE SUPERVISOR PORTION, WHICH WILL ASK CERTAIN "HARD CORE" QUESTIONS ABOUT THE ENVIRONMENT. THEN IT WILL ENTER COMMAND MODE, INDICATED BY A PROMPT CHARACTER (DS B>). AT COMMAND MODE THE OPERATOR MAY ENTER ANY OF SEVERAL COMMANDS AS DESCRIBED BELOW.

THE SUPERVISOR CODING FOLLOWS IMMEDIATELY THE DIAGNOSTIC TEST CODING, BUT THE SUPERVISOR LISTING HAS BEEN SUPPRESSED FOR GENERAL DISTRIBUTION. A LIMITED DISTRIBUTION HAS BEEN MADE TO FIELD SERVICE OF THE SUPERVISOR ASSEMBLY LISTING, AND IT MAY BE CONSULTED IN EVENT OF A SOFTWARE PROBLEM.

1.1.3 MEMORY MAP



1.1.4 DIAGNOSTIC INFORMATION

THIS DIAGNOSTIC CAN TEST UP TO 4 UNITS SIMULTANEOUSLY. THE 4 UNITS ARE ASSIGNED LOGICAL UNIT NUMBERS 0 - 3 BY THE DIAGNOSTIC.

THERE ARE 5 TESTS IN THIS PROGRAM:

TEST 1 - BASIC FUNCTIONS.
TEST 2 - DATA RELIABILITY.
TEST 3 - WRITE COMPATABILITY/WRITE UTILITY.
TEST 4 - READ COMPATABILITY/READ UTILITY.
TEST 5 - OPERATOR SELECTED SEQUENCE.

ERROR RECOVERY IS PERFORMED ON READ, WRITE AND WRITE TAPE MARK ERRORS UNLESS RECOVERY IS INHIBITED BY THE OEPRATOR. THE WRITE AND WRITE TAPE MARK RETRY LIMIT IS 16. THE READ FORWORD/READ REVERSE RETRY LIMIT IS 16 (8 IN THE SAME DIRECTION AND 8 IN THE OPPOSITE DIRECTION). FOR MORE INFORMATION ON ERROR RECOVERY PROCEDURES, SEE SECTION 3.0 (ERROR REPORTING).

1.2 SYSTEM REQUIREMENTS

1.2.1 HARDWARE REQUIREMENTS

PDP-11 PROCESSOR WITH 16K OR MORE OF MEMORY
CONSOLE DEVICE (LA30,LA36,VT50,ETC.)
PROGRAM LOAD DEVICE

1.2.2 SOFTWARE REQUIREMENTS

DIAGNOSTIC SUPERVISOR

1.3 RELATED DOCUMENTS AND STANDARDS

XXDP USERS MANUAL MD-11-DZQXA
DIAGNOSTIC SUPERVISOR PROGRAM LISTING
PDP-11 DIAGNOSTIC SUPERVISOR INTERFACE SPECIFICATION.
PDP-11 DIAGNOSTIC SUPERVISUR PROGRAMMER'S GUIDE.
TS11/TS04 PROGRAMMING SPECIFICATION.
TS11/TS04 ENGINEERING SPECIFICATION.
TS11/TS04 COMMAND PACKET SPECIFICATION.

1.4 DIAGNOSTIC HIERARCHY PREREQUISITES

ORDER OF HOST CPU DIAGNOSTIC JSAGE:

1) CONTROL LOGIC PROGRAM - ALL TESTS.

2) DATA RELIABILITY PROGRAM:

   A) BASIC FUNCTION TEST.
   B) DATA RELIABILITY TEST.

1.5 ASSUMPTIONS

THE HARDWARE OTHER THAN THE SUBSYSTEM BEING TESTED IS ASSUMED TO WORK PROPERLY. FALSE ERRORS MAY BE REPORTED IF THE PROCESSOR, MEMORY, ETC., DO NOT FUNCTION PROPERLY.

1.6 DIAGNOSTIC HISTORY

2.0 OPERATING INSTRUCTIONS

2.1 LOADING AND STARTING PROCEDURES

2.1.1 LOADING PROCEDURES

THIS PROGRAM MAY BE LOADED FROM PAPER TAPE USING THE ABSOLUTE LOADER.
IT MAY ALSO BE LOADED FROM ANY XXDP LOAD MEDIA.

2.1.2 STARTING PROCEDURES

THE PROGRAM STARTS AT LOCATION 200. USE STANDARD DEC PROCEDURES
TO START THE PROGRAM.

2.1.3 STEPS FOR QUICK AND SIMPLE EXECUTION

THE DIAGNOSTIC CAN BE EXECUTED STANDALONE WITHOUT READING THE REMAINDER OF THIS DOCUMENT, AS FOLLOWS:

A) LOAD THE DIAGNOSTIC
B) START AT ADDRESS 200
C) ANSWER THE HARDCORE QUESTIONS
D) RECEIVE PROMPT (DS B>)
E) ENTER STA<CR>
F) ANSWER HARDWARE AND SOFTWARE QUESTIONS
G) GET END OF PASS MESSAGES OR ERROR MESSAGES
H) TO END EXECUTION, ENTER CONTROL/C

2.1.4 THE SIX STEPS OF EXECUTION

THIS DIAGNOSTIC SHOULD BE LOADED AND STARTED USING NORMAL XXDP PROCEDURES. THE START COMMAND SHOULD NOT SPECIFY AN ADDRESS, BECAUSE THE DIAGNOSTIC HAS THE PROPER TRANSFER ADDRESS CODED INTO IT.

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

****
* STEP 1 *
****

A SHORT SERIES OF "HARDCORE QUESTIONS" WILL BE ASKED:

QUESTION	MEANING
L-CLK (L) N ?	IS THERE AN L-CLOCK?
P-CLK (L) N ?	" " " P-CLOCK?
50HZ (L) N ?	IS THE POWER 50 CYCLES (AS IN EUROPE)?

```
LSI (L) N ?          IS MACHINE AN LSI?
LPT (L) N ?          IS THERE A LINE PRINTER?
MEM (K) (D) 16 ?     HOW MANY K OF MEMORY ARE THERE?
```

THE DEFAULTS (SHOWN AFTER EACH QUESTION) CAN BE SELECTED BY HITTING CARRIAGE RETURN. IT IS POSSIBLE THAT NOT ALL OF THE QUESTIONS WILL BE ASKED: FOR EXAMPLE, IF YOU SAY "YES" TO THE L-CLOCK QUESTION, THE P-CLOCK QUESTION WILL NOT BE ASKED.

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

WHEN YOU HAVE ANSWERED ALL THE HARDCORE QUESTIONS, THE DIAGNOSTIC WILL ISSUE THE PROMPT "DS-B>". FROM THIS POINT UNTIL THE TIME WHEN YOU RESTART XXDP, YOU WILL BE TALKING TO THE DIAGNOSTIC, NOT XXDP. WE WILL REFER TO THE PRESENCE OF THIS PROMPT AS BEING IN DIAGNOSTIC COMMAND MODE, AS OPPOSED TO XXDP COMMAND MODE.

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

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

THINGS TO NOTE HERE:

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

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

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

```
LOE     LOOP ONE ERROR
HOE     HALT ON ERROR
IER     INHIBIT ERROR PRINTOUT
```

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

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

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

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

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

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

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

SEE 2.3.13 FOR HARDWARE PARAMETERS

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

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

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

SEE 2.3.14 FOR SOFTWARE PARAMETERS

B 2

****
* STEP 6 *
****

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

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

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

   HOE SET: THE ERROR WILL BE REPORTED ON THE CONSOLE AND THE DIAGNOSTIC WILL RETURN TO COMMAND MODE.
   LOE SET: THE DIAGNOSTIC WILL LOOP ENLESSLY ON THE BLOCK OF CODE THAT DETECTED THE ERROR.
   NEITHER HOE NOR LOE SET: THE ERROR WILL BE REPORTED ON THE CONSOLE AND NORMAL EXECUTION WILL RESUME AS IF NO ERROR HAD OCCURED.

2.2 SPECIA ENVIRONMENTS

ACT

APT

2.3 PROGRAM OPTIONS

2.3.1 START COMMAND

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

2.3.1.1 TESTS SWITCH (/TESTS:<TEST-LIST>)

<TEST-LIST> IS A SEQUENCE OF DECIMAL NUMBERS (1:2 ETC.) OR RANGES OF DECIMAL NUMBERS (1-5:8-10 ETC.) THAT SPECIFY THE TESTS TO BE EXECUTED. THE NUMBERS ARE SEPARATED BY COLONS. THE NUMBERS RANGE FROM 1 TO THE LARGEST TEST NUMBER IN THE DIAGNOSTIC. THEY MAY BE SPECIFIED IN ANY ORDER. TESTS WILL BE EXECUTED IN NUMERICAL ORDER REGARDLESS OF THE ORDER OF SPECIFICATION. THE DEFAULT IS TO EXECUTE ALL TESTS. ON THIS AND ALL SWITCHES, THE ANGLE BRACKETS <> ARE PUNCTUATION USED IN THE DEFINITION ONLY, AND ARE NOT TO BE TYPED BY THE OPERATOR. SEE EXAMPLE

AT END OF 2.3.1.

2.3.1.2 PASS SWITCH (/PASS:<PASS-CNT>)

<PASS-CNT> IS A DECIMAL NUMBER INDICATING THE DESIRED NUMBER OF PASSES. A PASS IS DEFINED AS THE EXECUTION OF THE FULL DIAGNOSTIC (ALL SELECTED TESTS) AGAINST ALL UNITS SUBMITTED. THE DEFAULT IS NON-ENDING EXECUTION. IN THIS CASE EXIT FROM THE PROGRAM IS ACCOMPLISHED EITHER BY TYPING A CONTROL/C OR BY OCCURANCE OF AN ERROR WITH THE HALT ON ERROR FLAG BEING SET. THE EXIT IS A RETURN TO COMMAND MODE. SEE EXAMPLE AT END OF 2.3.1.

2.3.1.3 FLAGS SWITCH (/FLAGS:<FLAG-LIST>)

<FLAG-LIST> IS A SEQUENCE OF ELEMENTS OF THE FORM <FLAG>, <FLAG=1>, OR <FLAG=0>, SEPARATED BY COLONS, WHERE <FLAG> HAS ONE OF THE FOLLOWING VALUES:

HOE	HALT ON ERROR, CAUSING COMMAND MODE TO BE ENTERED WHEN AN ERROR IS ENCOUNTERED
LOE	LOOP ON ERROR, CAUSING THE DIAGNOSTIC TO LOOP CONTINUOUSLY WITHIN THE SMALLEST DEFINED BLOCK OF CODING (SEGMENT, SUBTEST, OR TEST) CONTAINING THE ERROR
IER	INHIBIT ERROR REPORTING
IBE	INHIBIT BASIC ERROR REPORTS
IXE	INHIBIT EXTENDED ERROR REPORTS
PRI	DIRECT ALL MESSAGES TO A LINE PRINTER
PNT	PRINT NUMBER OF TEST BEING EXECUTED
BOE	BELL ON ERROR
UAM	RUN IN UNATTENDED MODE, BYPASSING MANUAL INTERVENTION TESTS
ISR	INHIBIT STATISTICAL REPORTS
IDU	INHIBIT DROPPING OF UNITS BY DIAGNOSTIC

THE FLAGS NAMED OR EQUATED TO 1 ARE SET, THOSE EQUATED TO 0 ARE CLEARED. A FLAG NOT SPECIFIED IS CLEARED. IF THE FLAGS SWITCH IS NOT GIVEN ALL FLAGS ARE CLEARED. SEE EXAMPLE AT END OF 2.3.1.

2.3.1.4 END OF PASS SWITCH (/EOP:<INCR>)

<INCR> IS A DECIMAL NUMBER INDICATING HOW OFTEN (IN TERMS OF PASSES) IT IS DESIRED THAT THE END OF PASS MESSAGE BE PRINTED. THE DEFAULT IS AT THE END OF EVERY PASS. SEE EXAMPLE AT END OF 2.3.1.

2.3.1.5 EFFECT OF COMMAND

THE EFFECT OF THE START COMMAND IS TO INITIATE THE HARDWARE PARAMETER DIALOGUE, THE SOFTWARE PARAMETER DIALOGUE, AND THEN THE DIAGNOSTIC TESTS THEMSELVES.

THE HARDWARE PARAMETER DIALOGUE COMMENCES WITH THE QUESTION "# UNITS?" TO WHICH THE OPERATOR REPLIES WITH A DECIMAL NUMBER N FROM 1 TO 64. THE TERM "UNIT" REFERS TO THE DEVICE TO WHICH THIS SERIES OF DIAGNOSTICS IS DEDICATED. FOLLOWING THIS ARE THE QUESTIONS WHEREBY THE P-TABLES THEMSELVES WILL BE BUILT. EACH P-TABLE IS A CORE-RESIDENT TABLE CONTAINING ALL THE HARDWARE INFORMATION FOR ONE UNIT. THE OPERATOR MUST SUPPLY

N (NUMBER OF UNITS) VALUES FOR EACH QUESTION. HE MAY
DO THIS BY GIVING ONE ANSWER TO EACH QUESTION (IN WHICH CASE THE
SERIES OF QUESTIONS WILL BE POSED N TIMES) OR BY GIVING N VALUES,
SEPARATED BY COMMAS, TO EACH QUESTION (SERIES WILL BE POSED ONCE).
EACH QUESTION IS FOLLOWED BY THE RESPONSE RADIX (D FOR DECIMAL, B
FOR BINARY, O FOR OCTAL, L FOR YES/NO) IN PARENTHESES AND THE DEFAULT
VALUE AFTER THE PARENTHESES.

FOLLOWING THE HARDWARE QUESTIONS ARE THE SOFTWARE QUESTIONS TO
BUILD THE SOFTWARE TABLES, WHICH DEFINE THE MODE (QUICK VERIFY ETC.)
THAT THE DIAGNOSTIC WILL EXECUTE IN.

WHEN THE QUESTION "# UNITS?" IS ANSWERED, MEMORY STORAGE
IS ALLOCATED FOR THE P-TABLES, AND IF THERE IS NOT ENOUGH
TO ACCOMMODATE THEM THE MESSAGE "TOO MANY UNITS" IS ISSUED. IN THIS CASE
THE DIAGNOSTIC MUST BE EXECUTED MORE THAN ONCE TO TEST ALL UNITS.

EXAMPLE:

STA/TESTS:1:2-4:6:8-10/PASS:3/FLAGS:IER:HOE=1:UAM:LOE

THIS COMMAND WILL CAUSE THREE PASSES TO BE MADE, EACH PASS CONSISTING
OF TESTS 1,2,3,4,6,8,9, AND 10 EXECUTED AGAINST ALL UNITS. THERE IS NO
DIFFERENCE BETWEEN SAYING <FLAG> AND SAYING <FLAG=1>. THE
NOTATION <FLAG=0> IS MEANINGFUL ONLY ON A COMMAND OTHER THAN
START TO CLEAR A FLAG THAT WAS PREVIOUSLY SET. NOTE THAT
ON ALL COMMANDS ONLY THE FIRST THREE LETTERS ARE SCANNED.

2.3.2 RESTART COMMAND

****
RES(TART)/TESTS:<TEST-LIST>/PASS:<PASS-CNT>/FLAGS:<FLAG-LIST>/UNITS:<UNIT-LIST>
****

2.3.2.1 TESTS, PASS, AND FLAGS SWITCHES

<TEST-LIST>, <PASS-CNT>, AND <FLAG-LIST> ARE AS IN THE START COMMAND.

2.3.2.2 UNITS SWITCH (/UNITS:<UNIT-LIST>)

<UNIT-LIST> IS A SEQUENCE OF DECIMAL NUMBERS (1,2 ETC.) OR RANGES
OF DECIMAL NUMBERS (1-5, 8-10 ETC.) THAT SPECIFY THE UNITS TO BE TESTED.
THE NUMBERS ARE SEPARATED BY COLONS. THE NUMBERS MAY RANGE FROM 1 THRU
N (N IS THE NUMBER OF UNITS SPECIFIED IN THE PREVIOUS START COMMAND).
THE NUMBER INDICATES THE POSITION OF THE P-TABLE AS THE DATA WAS ENTERED
DURING THE HARDWARE DIAGLOGUE. THE UNITS WHICH ARE
SELECTED MUST NOT HAVE BEEN DROPPED BY THE DROP COMMAND. SEE THE
DISCUSSION OF ADD AND DROP COMMANDS BELOW. DEFAULT
IS TO TEST ALL UNITS WHICH HAVE NOT BEEN DROPPED BY A DROP COMMAND.

2.3.2.3 EFFECT OF COMMAND

THE RESTART COMMAND DIFFERS FROM THE START COMMAND IN THAT THE P-TABLES

FROM THE PREVIOUS START COMMAND (THERE MUST HAVE BEEN ONE) ARE USED, INSTEAD OF NEW ONES BEING BUILT. THE UNITS SWITCH GIVES THE ABILITY TO SELECT A SUBSET OF THESE. THE SOFTWARE DIALOGUE MAY OPTIONALLY BE REEXECUTED (OPERATOR WILL BE ASKED). THE COMMAND CAN BE USED AFTER COMMAND MODE HAS BEEN REENTERED IN ANY OF THE THREE NORMAL WAYS: A) THE REQUESTED NUMBER OF PASSES HAVE BEEN MADE B) AN ERROR WAS ENCOUNTERED WITH THE HALT ON ERROR FLAG SET C) A CONTROL/C WAS ENTERED BY THE OPERATOR.

2.3.3 CONTINUE COMMAND

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

2.3.3.1 PASS SWITCH (/PASS:<PASS-CNT>)

<PASS-CNT> IS SAME AS IN START COMMAND, BUT THE DEFAULT IS THE UNSATISFIED PASS-CNT FROM THE PREVIOUS START OR RESTART. IF NONE REMAINS, THE DEFAULT IS NON-ENDING EXECUTION.

2.3.3.2 FLAG SWITCH (/FLAGS:<FLAG-LIST>)

<FLAG-LIST> IS SAME AS IN START COMMAND, BUT UNSPECIFIED FLAGS RETAIN THEIR CURRENT VALUE.

2.3.3.3 EFFECT OF COMMAND

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

2.3.4 PROCEED COMMAND

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

2.3.4.1 FLAGS SWITCH (/FLAGS:<FLAG-LIST>)

<FLAG-LIST> IS AS IN THE START COMMAND, BUT UNSPECIFIED FLAGS RETAIN THEIR CURRENT VALUE.

2.3.4.2 EFFECT OF COMMAND

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

2.3.5 CREATE CORE IMAGE COMMAND

```
**********************************************************
CCI/TESTS:<TEST-LIST>/PASS:<PASS-CNT>/FLAGS:<FLAG-LIST>
**********************************************************
```

2.3.5.1 TESTS, PASS, AND FLAGS SWITCHES

<TEST-LIST>, <PASS-CNT>, <FLAG-LIST>, AND ARE AS IN THE START COMMAND, EXCEPT THAT THE UAM (UNATTENDED MODE) FLAG DEFAULTS TO THE SET POSITION.

2.3.5.2 EFFECT OF COMMAND

THE PURPOSE OF THIS COMMAND IS TO CREATE A BIC FILE SUITABLE FOR CHAIN MODE EXECUTION. THE XXDP PROCEDURE IS AS FOLLOWS:

```
INVOKE THE XXDP UTILITY UPD1 OR UPD2
LOAD XXN:FILE.BIN
START 200
<QUESTIONS AND ANSWERS>
RESTART UPD1 USING RESTART ADDRESS
HICORE ADDRESS (IF 'PASSED 14.5K'' MESSAGE CAME)
DUMP XXN:FILE.BIC
```

THE OPERATOR DIALOGUE (HARDWARE AND SOFTWARE) WILL BE EXECUTED AS IN THE START COMMAND, BUT AT THE END OF THE QUESTIONS THE HALT STATE WILL BE ENTERED. THE OPERATOR SHOULD THEN DUMP THE PROGRAM TO THE XXDP LIBRARY USING A BIC EXTENSION TO INDICATE THAT THIS FILE IS CHAINABLE. HE SHOULD USE THE XXDP UTILITY UPD1 OR UPD2 TO DO THIS. IF THE P-TABLES EXTEND BEYOND 14.5K, A MESSAGE WILL BE ISSUED GIVING THE NEW UPPER CORE LIMIT, TO WHICH THE OPERATOR MUST ADJUST BEFORE DUMPING. HE MAY NOW DELETE THE NON-CHAINABLE BIN FILE IF DESIRED, SINCE THE BIC FILE HAS ALL THE CAPABILITIES OF IT.

WHEN THIS BIC FILE IS SUBSEQUENTLY EXECUTED IN CHAIN MODE, THE OPERATOR DIALOGUES WILL BE BYPASSED. HOWEVER, IF IT IS EXECUTED STANDALONE, THE DIALOGUE WILL BE REISSUED.

NOTE THAT IF THE MESSAGE 'TOO MANY UNITS'' IS ISSUED, TWO OR MORE CORE IMAGES MUST BE CREATED (WITH DIFFERENT NAMES) TO TEST ALL UNITS.

NOTE THAT ALTHOUGH THE CHAINABLE IMAGE CAN BE EXECUTED ON A 16K MACHINE, THE ORIGINAL CCI CREATION MUST BE DONE ON A LARGE MACHINE, THE EXACT SIZE BEING DEPENDENT ON WHICH UPDATE UTILITY IS USED.

2.3.6 ADD COMMAND

```
**********************
ADD/UNITS:<UNIT-LIST>
**********************
```

2.3.6.1 UNITS SWITCH (/UNITS:<UNIT-LIST>

<UNIT-LIST> IS AS IN THE RESTART COMMAND.

2.3.6.2 EFFECT OF COMMAND

THE UNITS SPECIFIED ARE ADDED TO THE TEST SEQUENCE. EACH UNIT MUST HAVE A P-TABLE IN MEMORY DUE TO AN EARLIER HARDWARE DIALOGUE. THIS COMMAND MUST BE FOLLOWED BY A RESTART OR CONTINUE. THE UNITS SWITCH MUST BE SPECIFIED. THE ADD COMMAND IS MEANINGFUL ONLY FOR UNITS THAT WERE PREVIOUSLY DROPPED.

2.3.7 DROP COMMAND

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

2.3.7.1 UNITS SWITCH (/UNITS:<UNIT-LIST>)

<UNIT-LIST> IS AS IN THE RESTART COMMAND.

2.3.7.2 EFFECT OF COMMAND

THE UNITS SPECIFIED WILL BE DROPPED FROM TESTING. THE UNITS WILL BE RESELECTED ONLY BY THE EXECUTION OF AN ADD OR START COMMAND. THE UNITS SWITCH MUST BE ENTERED. THIS COMMAND MUST BE FOLLOWED BY A RESTART OR A CONTINUE COMMAND.

2.3.8 PRINT COMMAND

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

2.3.8.1 EFFECT OF COMMAND

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

2.3.9 DISPLAY COMMAND

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

2.3.9.1 UNITS SWITCH (/UNITS:<UNIT-LIST>)

<UNIT-LIST> IS AS IN THE RESTART COMMAND.

2.3.9.2 EFFECT OF COMMAND

THE HARDWARE P-TABLES FOR ALL UNITS UNDER TEST ARE PRINTED OUT IN THE

FORMAT IN WHICH THEY WERE ENTERED. ANY UNITS THAT WERE DROPPED BY THE OPERATOR 'DROP' COMMAND ARE SO DESIGNATED.

2.3.10 FLAGS COMMAND

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

2.3.10.1 EFFECT OF COMMAND

THE CURRENT SETTINGS OF ALL FLAGS ARE PRINTED.

2.3.11 ZFLAGS COMMAND

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

2.3.11.1 EFFECT OF COMMAND

ALL FLAGS ARE CLEARED.

2.3.12 CONTROL CHARACTERS

A CONTROL C (^C) ENTERED DURING THE EXECUTION OF A DIAGNOSTIC CAUSES A RETURN TO COMMAND MODE.

A CONTROL Z (^Z) ENTERED DURING ONE OF THE THREE OPERATOR DIALOGUES (HARD CORE QUESTIONS (SEE 1.1.1), HARDWARE DIALOGUE (SEE 2.3.1.5), OR SOFTWARE DIALOGUE (SEE 2.3.1.5) CAUSES THE DEFAULTS TO BE TAKEN FOR THE REMAINDER OF THAT DIALOGUE.

A CONTROL O (^O) ENTERED DURING THE EXECUTION OF A DIAGNOSTIC CAUSES ALL TELETYPE OUTPUT TO BE SURPRESSED FOR THE REMAINDER OF THE DIAGNOSTIC OR UNTIL ANOTHER ^O IS TYPED, WHICH RESTORES NORMAL TELETYPE OUTPUT.

2.3.13 HARDWARE PARAMETERS

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

TSDB ADDRESS (172520) ?

VECTOR (150) ?

2.3.14 SOFTWARE PARAMETERS

THE FOLLOWING QUESTIONS ARE ASKED IF REQUESTED ON A START, RESTART, OR CONTINUE. THEY ALLOW FLEXABILITY IN THE WAY THE PROGRAM BEHAVES.

CLEAR COUNTERS (L) Y ?

RESET RANDOM VARIABLES (L) N ?

HALT AFTER EACH CMD (L) N ?

DISABLE INTERRUPTS (L) N ?

INHIBIT RECOVERY (L) N ?

CHANGE CMD SEQUENCE (L) N ?

NOTE: THIS QUESTION SHOULD BE ANSWERED (N) UNLESS AN OPERATOR SELECTED SEQUENCE IS TO BE EXECUTED. IF THIS QUESTION WAS ANSWERED (N), NO MORE QUESTIONS WILL BE ASKED. IF THIS QUESTION WAS ANSWERED Y, THE FOLLOWING QUESTIONS MUST BE ANSWERED OR DEFAULTED WITH A <CR> ONLY:

INHIBIT RFC ERROR REPORTS (L) N ?		
CHARACTERISTICS CODE (O) 40 ?	(0,20,40,200)	(OCTAL)
CMD/2 (D) 5 ?	(1-27)	(DECIMAL)
BRF COUNT (D) 4096 ?	(1-4K)	(DECIMAL)
# OF OPERATIONS (D) 10 ?	(1-65K)	(DECIMAL)
PATTERN (D) 7 ?	(0-8)	(DECIMAL)
CMD/3 (D) 5 ?	(1-27)	(DECIMAL)
BRF COUNT (D) 4096 ?	(1-4K)	(DECIMAL)
# OF OPERATIONS (D) 10 ?	(1-65K)	(DECIMAL)
PATTERN (D) 7 ?	(0-8)	(DECIMAL)
CMD/4 (D) 5 ?	(1-27)	(DECIMAL)
BRF COUNT (D) 4096 ?	(1-4K)	(DECIMAL)
# OF OPERATIONS (D) 10 ?	(1-65K)	(DECIMAL)
PATTERN (D) 7 ?	(0-8)	(DECIMAL)
CMD/5 (D) 5 ?	(1-27)	(DECIMAL)
BRF COUNT (D) 4096 ?	(1-4K)	(DECIMAL)
# OF OPERATIONS (D) 10 ?	(1-65K)	(DECIMAL)
PATTERN (D) 7 ?	(0-8)	(DECIMAL)

NOTE: THE PROGRAM AUTOMATICALLY INSERTS AN CHARACTERISTIC 40 AS THE FIRST COMMAND IN THE SEQUENCE TABLE. IF A DIFFERENT CHARACTERISTIC IS DESIRED, THE OPERATOR SHOULD ENTER THAT CHARACTERISTIC CODE. A TOTAL OF 4 COMMANDS MAY BE ENTERED IN ADDITION TO THE SET CHARACTERISTICS COMMAND. IF THE OPERATOR WISHES TO USE LESS THAN 4 COMMANDS, AN END COMMAND MUST BE ENTERED AND THEN A CONTROL Z (^Z) CAN BE ENTERED TO TERMINATE P-TABLE DIALOGUE.

2.3.14.1 COMMAND LIST FOR USE IN P-TABLE DIALOGUE.

CODE	COMMAND	DESCRIPTION
1 =	DRI	DRIVE INITIATE.
2 =	RDF	READ FORWARD.
3 =	RDR	READ REVERSE.
4 -	WRT	WRITE.
5	WTV	WRITE/VERIFY. IE. WRITE N RECORDS; READ REVERSE AND CHECK N RECORDS OF DATA; READ FORWARD AND CHECK N RECORDS.
6 -	SRF	SPACE RECORDS FORWARD.
7 =	SRR	SPACE RECORDS REVERSE.
8 =	RNR	READ NEXT REVERSE, IE. SPACE FWD, READ REV.
9 -	RNF	READ NEXT FORWARD, IE. READ FWD, SPACE REV.
10 =	RPF	READ PREVIOUS FWD, IE. SPACE REV, READ FWD.
11 =	RPR	READ PREVIOUS REV, IE. READ REV, SPACE FWD.
12 =	WRR	WRITE RETRY.
13 -	RWD	REWIND.
14 =	MBR	MESSAGE BUFFER RELEASE.
15 =	WTM	WRITE TAPE MARK.
16 =	WTR	WRITE TAPE MARK RETRY.
17 =	SFF	SPACE FILES FORWARD.
18 -	SFR	SPACE FILES REVERSE.
19 =	GES	GET EXTENDED STATUS.
20 -	ERS	ERASE 3 INCHES OF TAPE.
21 =	UNL	UNLOAD.
22 =	CLN	CLEAN TAPE
23 -	SCH	SET DEVICE CHARACTERISTIC. WHERE BRF=200, 40, 20, 0. 200 = ENABLE SKIP TAPE MARKS STOP (STOP AT LOGICAL EOT) 40 = ENABLE ATTENTION INTERRUPTS. 20 = ENABLE MESSAGE BUFFER RELEASE INTERRUPTS. SEE TS11/TS04 PROGRAMMING SPECIFICATION FOR DESCRIPTION.
24	DIA	DIAGNOSTICS. SEE TS11/TS04 PROGRAMMING SPECIFICATION FOR DESCRIPTION. ODT MUST BE USED TO LOAD DIAGNOSTIC DATA INTO THE WRITE BUFFER BEFORE THIS CMD IS ISSUED.
25 -	JMP	JUMP TO THE NTH COMMAND IN THE COMMAND SEQUENCE TABLE, WHERE N IS DEFINED IN THE BRF FIELD.
26 =	DLY	DELAY "N" MILISECONDS WHERE N IS DEFINED IN THE # OF OPERATIONS.
27 -	END	END OF COMMAND SEQUENCE.

2.3.14.2 DATA PATTERN LIST FOR USE IN P-TABLE DIALOGUE.

PATTERN #	DESCRIPTION.
0	INCREMENTING PATTERN. 0 - 377.
1	ALL "1"S PATTERN.
2	ALL "0"S PATTERN.
3	"1" BIT WALKING FROM R TO L IN A FIELD OF "0"S.
4	"0" BIT WALKING FROM R TO L IF A FIELD OF "1"S.
5	ALTERNATING "1" AND "0" BITS WITH ALTERNATE BYTES COMPLIMENTED. (125/252)
6	ALTERNATING BYTES OF 000 AND 377.
7	RANDOM DATA PATTERN.
8	NO PATTERN GENERATION.

2.3.15 EXTENDED DISCUSSION OF P-TABLE DIALOGUE

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

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

ON THE FIRST TRIP THRU THE QUESTIONS, ALL OF THE SLOTS IN ALL OF THE P-TABLES ARE FILLED. IF THE OPERATOR TYPES IN LESS THAN N EXPLICIT VALUES IN RESPONSE TO A PARTICULAR QUESTION, THESE VALUES ARE PLACED IN THE P-TABLES (ONE VALUE GOING INTO THE PROPER SLOT OF EACH P-TABLE BEGINNING WITH THE FIRST P-TABLE) UNTIL THE STRING OF VALUES IS EXHAUSTED. THE LAST VALUE IN THE STRING BECOMES THE NEW DEFAULT AND IS USED TO FILL THAT SLOT IN THE REMAINING P-TABLES.

ON SUBSEQUENT TRIPS THRU THE QUESTIONS, THE SAME PROCESS IS CARRIED OUT, EXCEPT THAT THE EARLIEST P-TABLE NOT TO HAVE RECEIVED AN EXPLICIT VALUE IN ANY OF ITS SLOTS NOW ASSUMES THE ROLE THAT TABLE NUMBER ONE PLAYED IN THE FIRST TRIP.

THE SERIES OF QUESTIONS IS REISSUED UNTIL AT LEAST ONE QUESTION HAS RECEIVED N EXPLICIT VALUES FROM THE OPERATOR.

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

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

NOW LET US SEE HOW WE COULD USE THESE CAPABILITIES TO CONSTRUCT A SET OF P-TABLES. ASSUME THAT WE HAVE 64 UNITS, AND THAT THERE ARE THREE HARDWARE PARAMETERS FOR EACH (THREE SLOTS IN THE P-TABLE, THREE HARDWARE QUESTIONS IN THE DIALOGUE). LET THE DESIRED VALUE FOR THE FIRST PARAMETER BE THE NUMBER 75 FOR ALL 64 TABLES. LET THE DESIRED VALUE FOR THE SECOND PARAMETER BE EQUAL TO THE UNIT NUMBER (1,2,3,...,64) EXCEPT FOR UNIT 50, WHICH SHOULD RECEIVE THE VALUE 49. LET THE DESIRED VALUE FOR THE THIRD PARAMETER BE THE NUMBER 76 FOR THE FIRST 20 UNITS AND THE NUMBER 77 FOR THE LAST 44 UNITS.

THE FOLLOWING DIALOGUE WOULD ACCOMPLISH THIS GOAL:

```
# UNITS (D)  ?  64

UNIT 1
<QUESTION 1> ? 75
<QUESTION 2> ? 1-20
<QUESTION 3> ? 76

UNIT 21
<QUESTION 1> ?
```

<QUESTION 2> ? 21-49,,51-64
<QUESTION 3> ? 77

THE FIRST TIME THE SERIES IS ASKED, SLOT ONE RECEIVES A 75 IN ALL 64 TABLES. SLOT TWO RECEIVES THE VALUES 1,2,3,...,20 IN TABLES 1 THRU 20 AND A CONSTANT 20 IN TABLES 21 THRU 64. SLOT THREE RECEIVES A CONSTANT 76 IN ALL 64 TABLES.

THE SECOND TIME THRU THE SERIES, TABLES 21 THRU THE END ARE GOING TO BE AFFECTED (NOTE THAT THIS PIECE OF INFORMATION IS PRINTED OUT FOR THE THE OPERATOR IN THE FORM 'UNIT XX'' AT THE BEGINNING OF EACH SERIES). QUESTION 1 IS RESPONDED TO BY A <CR>, SO SLOT ONE STAYS AT CONSTANT 75 IN TABLES 21 THRU 64, SINCE NO NEW EXLICIT VALUES ARE TYPED IN. SLOT TWO GETS THE VALUES 21,22,23,...,49 IN TABLES 21 THRU 49, AND GETS A 49 IN SLOT 50, AND GETS THE VALUES 51,52,53,...,64 IN TABLES 51 THRU 64. SLOT THREE GETS THE VALUE 77 IN TABLES 21 THRU 64.

THE DIALOGUE IS TERMINATED WHEN THE SOFTWARE RECOGNIZES THAT 64 EXPLICIT VALUES HAVE BEEN GIVEN FOR AT LEAST ONE QUESTION (NAMELY QUESTION 2).

2.3.16 EXAMPLES OF SOFTWARE P-TABLE DIALOGUE

2.3.16.1 BASIC FUNCTION AND DATA RELIABILITY WITH ALL ERROR REPORTING ENABLED

A) RECEIVE PROMPT (DS B>)
B) ENTER STA/TES:1-2<CR>
C) ANSWER HARDWARE QUESTIONS.
D) PROCEED WITH THE FOLLOWING DIALOGUE:

```
CHANGE SW (L) ?                          Y<CR>
CLEAR COUNTERS (L) N ?                   Y<CR>
RESET RANDOM VARIABLES (L) N ?           N<CR>
HALT AFTER EACH CMD (L) N ?              N<CR>
DISABLE INTERRUPTS (L) N ?               N<CR>
INHIBIT RECOVERY (L) N ?                 N<CR>
CHANGE CMD SEQUENCE (L) N ?              N<CR>
```

2.3.16.2 TO SET UP A SCOPE LOOP FOR A FAILURE IN BASIC FUNCTIONS.

A) RECEIVE PROMPT (DS B>)
B) ENTER STA/TES:1/FLA:LOE:IER:ISR:IDU<CR>
C) ANSWER HARDWARE QUESTIONS.
D) PROCEED WITH THE FOLLOWING DIALOGUE:

```
CHANGE SW (L) ?                          Y<CR>
CLEAR COUNTERS (L) N ?                   Y<CR>
RESET RANDOM VARIABLES (L) N ?           N<CR>
HALT AFTER EACH CMD (L) N ?              N<CR>
DISABLE INTERRUPTS (L) N ?               N<CR>
INHIBIT RECOVERY (L) N ?                 N<CR>
CHANGE CMD SEQUENCE (L) N ?              N<CR>
```

2.3.16.3 TO SET UP A SCOPE LOOP FOR A FAILURE IN DATA RELIABILITY

A) RECEIVE PROMPT (DS B>)
B) ENTER STA/TES:5/FLA:IER:ISR:IDU/EOP:1000<CR>
C) ANSWER HARDWARE QUESTIONS.
D) PROCEED WITH THE FOLLOWING DIALOGUE:

```
CHANGE SW (L) ?                          Y<CR>
CLEAR COUNTERS (L) N ?                   Y<CR>
RESET RANDOM VARIABLES (L) N ?           N<CR>
HALT AFTER EACH CMD (L) N ?              N<CR>
DISABLE INTERRUPTS (L) N ?               Y<CR>
INHIBIT RECOVERY (L) N ?                 Y<CR>
CHANGE CMD SEQUENCE (L) N ?              Y<CR>
INHIBIT RFC ERROR REPORTS (L) N ?        Y<CR>
CHARACTERISTICS CODE (O) 40 ?            40<CR>
CMD/2 (D) 5 ?                            13<CR>   (REWIND) (COULD BE ANY COMMAND)
BRF COUNT (D) 4096 ?                     1<CR>
# OF OPERATIONS (D) 10 ?                1<CR>
PATTERN (D) 7 ?                          1<CR>
CMD/3 (D) 5 ?                            4<CR>    (WRITE) (COULD BE ANY COMMAND)
BRF (D) 4096 ?                           1000<CR>
# OF OPERATIONS (D) 10 ?                10000<CR>
PATTERN (D) 7 ?                          1<CR>
CMD/4 (D) 5 ?                            27<CR>   (END)   (COULD BE ANY COMMAND)
BRF (D) 4096 ?                           <^Z>
```

2.4 EXECUTION TIMES

2.4.1 SYSTEM CONFIGURATION

PDP11/34
MOS MEMORY
A36
TS11/TS04

2.4.2 TEST EXECUTION TIMES

TEST 1 - BASIC FUNCTIONS - 30 SECONDS PER PASS.
TEST 2 - DATA RELIABILITY - 45 MINUTES PER PASS.
TEST 3 - WRITE COMPATABILITY - 16 MINUTES PER PASS.
TEST 4 - READ COMPATABILITY - 22 MINUTES PER PASS.
TEST 5 - OPERATOR SELECTED SEQUENCE - DEPENDS ON SEQUENCE SELECTED.

NOTE: ALL EXECUTION TIMES ARE SHOWN FOR ONE UNIT OEPRATION.
APPROXIMATELY 10% WILL BE ADDED TO ALL EXECUTION TIMES
FOR EACH ADDITIONAL UNIT.

3.0 ERROR INFORMATION

3.1 ERROR REPORTING

ALL ERROR REPORTS EXCEPT FOR ERRORS #1 AND #17 INCLUDE A DUMP OF THE FOLLOWING INFORMATION:

ERROR #, TEST #, SUBTEST #, PROGRAM COUNTER, UNIT #, COMMAND, PREVIOUS COMMAND, PASS COUNT, # OF RECORDS FROM BOT, THE COMMAND PACKET, TSSR, TCC, TSBA, RFC, AND THE EXTENDED STATUS REGISTERS (SEE 2.3.14.1 FOR LIST OF COMMANDS).

STANDARD ERROR REPORT FORMAT:

```
CZTSH SFT ERR  XXXX  TST XXX  SUB XXX  PC: XXXXXX
(ASCII ERROR MESSAGE)
XXX CMD FAILED - UNIT X  PASS: XXXXX  RECORD: XXXXX
PREVIOUS CMD WAS  XXX
CMDPKT  TSBA    RFC     TSSR   TCC
XXXXXX  XXXXXX  XXXXXX  XXXXXX  X
XXXXXX
XXXXXX
XXXXXX
XST0    XST1    XST2    XST3
XXXXXX  XXXXXX  XXXXXX  XXXXXX
```

EXAMPLE OF AN ERROR REPORT:

```
CZTSH SFT ERR 00009  TST 002  SUB 000  PC: 010606
RECOVERABLE ERROR
WRT CMD FAILED - UNIT 2  PASS:     2  RECORD:   254
PREVIOUS CMD WAS  WRT
CMDPKT  TSBA    RFC     TSSR   TCC
100005  002324  000000  100210  4
051766
000000
000371
XST0    XST1    XST2    XST3
000350  000002  100004  000000
```

3.1.1 ERROR #1 - COMMAND PACKET ADDRESS NOT ON A MODULO 4 BOUNDRY:

IF THIS ERROR IS REPORTED, THE PROGRAM DID NOT LOAD PROPERLY. THIS IS A SYSTEM FATAL ERROR AND THE PROGRAM MUST BE RELOADED TO CORRECT IT.

3.1.2 ERROR #2 - TS04 NOT READY:

BEFORE ANY COMMAND IS ISSUED TO THE TS04, THE SUBSYSTEM READY BIT IN THE TSS4 IS CHECKED. IF THE SSR IS NOT SET, THE PROGRAM

REPORTS THE NOT READY ERROR. THIS IS A FATAL DEVICE ERROR AND THE DEVICE WILL BE DROPPED FROM THE TEST SEQUENCE UNLESS THE IDU OPTION IS USED.

3.1.3 ERROR #3 - NO RESPONSE ERROR:

ONCE THE TSDB IS LOADED, THE TS04 HAS ONE MILLISECOND TO RESPOND OR THE PROGRAM REPORTS A NO RESPONSE ERROR. THIS IS A FATAL DEVICE ERROR AND THE DEVICE WILL BE DROPPED FROM THE TEST SEQUENCE UNLESS THE IDU OPTION IS USED.

3.1.4 ERROR #4 - NO INTERRUPT ERROR:

COMMAND WAS ISSUED AND NO INTERRUPT RECEIVED. THE PROGRAM REPORTS THAT NO INTERRUPT OCCURRED. THIS IS A FATAL DEVICE ERROR AND THE DEVICE WILL BE DROPPED FROM THE TEST CYCLE UNLESS THE IDU OPTION IS USED.

3.1.5 SPECIAL CONDITION ERRORS:

IF, DURING EXECUTION, AN INCIDENT OCCURS FORCING THE TSSR SPECIAL CONDITION BIT TO SET, THE PROGRAM WILL SELECT ONE OF 8 ERROR HANDLING ROUTINES, DEPENDING ON THE TERMINATION CLASS CODE.

THE TERMINATION CLASS CODES IN THE TSSR ARE PROCESSED AS FOLLOWS WHEN SPECIAL CONDITION IS SET:

3.1.5.1 ERROR #5 - TERMINATION CLASS CODE 0, UNDEFINED SPECIAL CONDITION

THE ERROR IS REPORTED, A HARD ERROR IS LOGGED AND THE PROGRAM PROCEEDS NORMALLY.

3.1.5.2 ERROR #6 - TERMINATION CLASS CODE 1, ATTENTION CONDITION

THIS TCC INDICATES THAT THE DRIVE HAS UNDERGONE A STATUS CHANGE SUCH AS GOING OFFLINE OR COMING ONLINE. THIS IS A FATAL DEVICE ERROR AND THE DEVICE WILL BE DROPPED FROM THE TEST CYCLE UNLESS THE IDU OPTION IS USED.

3.1.5.3 ERROR #7 - TERMINATION CLASS CODE 2, TAPE STATUS ALERT

A STATUS CONDITION HAS BEEN ENCOUNTERED THAT MAY HAVE SIGNIFICANCE TO THE PROGRAM. BITS OF INTEREST INCLUDE TMK, RLS, LET, RLL, EOT. ACTION TAKEN DEPENDS ON THE TEST BEING EXECUTED.
IF THE CONDITION IS UNEXPECTED, THE ERROR IS REPORTED AND A HARD ERROR IS LOGGED. THE PROGRAM PROCEEDS NORMALLY.

3.1.5.4 ERROR #8 - TERMINATION CLASS CODE 3, FUNCTION REJECT

THE SPECIFIED FUNCTION WAS NOT INITIATED. BITS OF INTEREST ARE RMR, OFL, VCK, BOT, ILC, WLE, ILA, AND NBA. THIS IS A FATAL DEVICE ERROR AND THE DEVICE WILL BE DROPPED FROM THE TEST CYCLE UNLESS THE IDU OPTION IS USED.

31.5.5 ERROR #9 - TERMINATION CLASS CODE 4, RECOVERABLE ERROR

TAPE POSITION IS ONE RECORD BEYOND WHAT ITS POSITION WAS WHEN THE FUNCTION WAS INITIATED. RECOVERY PROCEDURE IS TO LOG THE ERROR AND ISSUE THE APPROPRIATE RETRY COMMAND. IF RETRY LIMIT IS REACHED BEFORE THE ERROR IS RECOVERED, RETRY LIMIT EXCEEDED IS REPORTED AS DESCRIBED IN ERROR #14 BELOW.

3.1.5.6 ERROR #10 - TERMINATION CLASS CODE 5, RECOVERABLE ERROR

TAPE POSITION HAS NOT CHANGED. RECOVERY PROCEDURE IS TO LOG THE ERROR AND RE-ISSUE THE ORIGINAL COMMAND. IF RETRY LIMIT IS REACHED BEFORE THE ERROR IS RECOVERED, RETRY LIMIT EXCEEDED IS REPORTED AS DESCRIBED IN ERROR #14 BELOW.

3.1.5.7 ERROR #11 - TERMINATION CLASS CODE 6, UNRECOVERABLE ERROR

TAPE POSITION HAS BEEN LOST. THE ONLY VALID RECOVERY PROCEDURE IS TO REWIND AND START OVER AT BOT UNLESS THE TAPE HAS LABELS OR SEQUENCE NUMBERS. IF DENSITY CHECK IS SET THIS DIAGNOSTIC WILL REWIND AND RETRY THE COMMAND, OTHERWISE THIS IS A FATAL DEVICE ERROR AND THE DEVICE WILL BE DROPPED FROM THE TEST CYCLE UNLESS THE IDU OPTION IS USED.

3.1.5.8 ERROR #12 - TERMINATION CLASS CODE 7, FATAL SUBSYSTEM ERROR

THE SUBSYSTEM IS INCAPABLE OF PROPERLY PERFORMING COMMANDS OR AT LEAST ITS INTEGRITY IS SERIOUSLY QUESTIONABLE. REFER TO THE FATAL CLASS CODE FIELD IN THE TSSR REGISTER FOR ADDITIONAL INFORMATION ON THE TYPE OF FATAL ERROR. THE DEVICE WILL BE DROPPED FROM THE TEST CYCLE UNLESS THE IDU OPTION IS USED.

3.1.6 ERROR #13 - RFC NON-ZERO ERROR:

IF, AFTER EXECUTION, THE RESIDUAL FRAME COUNT IS NON-ZERO, THE ERROR IS REPORTED AND A HARD ERROR IS LOGGED. THE PROGRAM THEN PROCEEDS NORMALLY. THE REPORTING AND LOGGING OF THESE ERRORS IS OPTIONAL.

3.1.7 ERROR #14 - RETRY LIMIT EXCEEDED:

ON A WRITE COMMAND THIS IS A FATAL DEVICE ERROR AND THE DEVICE WILL BE DROPPED FROM THE TEST CYCLE UNLESS THE IDU OPTION IS USED.

ON A READ COMMAND THIS ERROR IS LOGGED AS A HARD ERROR AND

THF PROGRAM PROCEEDS NORMALLY.

3.1.8 ERROR #15 - TOO MANY INTERRUPTS:

IF MORE THAN ONE INTERRUPT OCCURS PER COMMAND, THIS ERROR IS REPORTED.
THIS IS A FATAL DEVICE ERROR AND THE DEVICE WILL BE DROPPED FROM
THE TEST CYCLE UNLESS THE IDU OPTION IS USED.

3.1.9 ERROR #16 - CAPSTAN RUNAWAY:

CAPSTAN DID NOT STOP WITHIN ACCEPTABLE WINDOW AFTER LAST
COMMAND. THE PROGRAM WILL ISSUE A GET STATUS COMMAND BEFORE REPORTING
THE ERROR SO THAT THE DEAD TRACK FIELD IN EXTENDED STATUS REGISTER 2
WILL CONTAIN THE TACH COUNT WHEN THE TAPE STOPPED.
THIS IS A FATAL DEVICE ERROR AND THE DEVICE WILL BE DROPPED FROM
THE TEST CYCLE UNLESS THE IDU OPTION IS USED.

3.1.10 ERROR #17 - DATA COMPARE ERROR:

IF A DATA VALIDATION ERROR OCCURS DURING A WRITE/VERIFY COMMAND,
THE PROGRAM PRINTS WHAT THE DATA SHOULD HAVE BEEN AND WHAT THE
DATA WAS, AND PRINTS THE BYTE AND RECORD NUMBER THE ERROR OCCURRED
ON. A HARD ERROR IS LOGGED AND THE PROGRAM PROCEEDS NORMALLY.

3.2 ERROR HALTS

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

4.0 PERFORMANCE REPORT

```
UNIT X   PASS:XXXXX  RECORD:XXXXX
BYTES WRITTEN  = XXX,XXX,XXX,XXX
BYTES READ REV = XXX,XXX,XXX,XXX
BYTES READ FWD = XXX,XXX,XXX,XXX
                          WRT      RDR      RDF
RECOVERABLE ERRORS    -  XXXXX    XXXXX    XXXXX
UNRECOVERABLE ERRORS  -  XXXXX    XXXXX    XXXXX

SPECIAL CONDITION    HARD/FATAL    DATA COMPARE
      XXXXX             XXXXX          XXXXX
```

5.0 TEST SUMMARIES

5.1 TEST 1 - BASIC FUNCTIONS.

EXECUTES AND VERIFIES CORRECT COMPLETION OF ALL TS04 FUNCTIONS.

SUBTEST 1 - SET CHAR, DRIVE INIT, GET STATUS.
+ SET CHARACTERISTIC 200.
+ DRIVE INITIATE.
+ SET CHARACTERISTIC 20.
+ GET STATUS
+ SET CHARACTERISTIC 40.
+ PRINT TS04 MICROCODE LEVEL (PASS 1 ONLY)

SUBTEST 2 - REWIND.
+ REWIND.
+ REWIND AT BOT.

SUBTEST 3 - WRITE/VERIFY.
+ WRITE/VERIFY PATTERN 1.
+ WRITE/VERIFY PATTERN 2.
+ WRITE/VERIFY PATTERN 3.
+ WRITE/VERIFY PATTERN 4.
+ WRITE/VERIFY PATTERN 5.
+ WRITE/VERIFY PATTERN 6.
+ WRITE/VERIFY PATTERN 0.

SUBTEST 4 - WRITE TAPE MARK, ERASE.
+ WRITE TAPE MARK.
+ WRITE 10 RECORDS
+ ERASE 10 TIMES
+ WRITE TAPE MARK.
+ WRITE TAPE MARK RETRY.

SUBTEST 5 - SPACE FILES.
+ SPACE 2 FILES REVERSE.
+ SPACE 2 FILES FORWARD.

```
                                + SPACE 2 FILES REVERSE.
                                + SPACE 2 FILES FORWARD.

                        SUBTEST 6  - SPACE RECORDS.
                                + REWIND.
                                + SPACE 7 RECORDS FORWARD.
                                + SPACE 7 RECORDS REVERSE.
                                + SPACE 7 RECORDS FORWARD.
                                + SPACE 7 RECORDS REVERSE.

                        SUBTEST 7  - WRITE RETRY.
                                + REWIND.
                                + WRITE DATA.
                                + WRITE RETRY.

                        SUBTEST 8  - READ REV RETRY.
                                + READ REVERSE.
                                + READ NEXT REVERSE.
                                + READ NEXT FORWARD.

                        SUBTEST 9  - READ FWD RETRY.
                                + READ FORWARD.
                                + READ PREVIOUS FORWARD.
                                + READ PREVIOUS REVERSE.

                        SUBTEST 10 - CLEAN.
                                + CLEAN.
                                + REWIND.

                        SUBTEST 11  - WRITE/VERIFY SWAPPED DATA BYTES.
                                + WRITE/VERIFY EVEN LENGTH (RECORD 1).
                                + WRITE/VERIFY ODD LENGTH (RECORD 2).
                                + SET DATA BYTE SWAP.
                                + WRITE/VERIFY EVEN LENGTH (RECORD 3).
                                + WRITE/VERIFY ODD LENGTH (RECORD 4).
                                + CLEAR DATA BYTE SWAP.

                        SUBTEST 12  - READ SWAPPED DATA BYTES.
                                + READ REV RECORD 4.
                                + READ REV RECORD 3.
                                + SET DATA BYTE SWAP.
                                + READ REV RECORD 2.
                                + READ REV RECORD 1.
                                + READ FWD RECORD 1.
                                + READ FWD RECORD 2.
                                + CLEAR DATA BYTE SWAP.
                                + READ FWD RECORD 3.
                                + READ FWD RECORD 4.
```

5.2 TEST 2 - DATA RELIABILITY.

1. THE TAPE IS INITIATED WITH THE FOLLOWING COMMANDS:
   SET CHARACTERISTIC 40
   REWIND
   WRITE/VERIFY 63 RECORDS OF RANDOM LENGTH AND DATA
2. WRITE AND READ COMMANDS ARE SELECTED AT RANDOM AND ARE EXECUTED A RANDOM NUMBER OF TIMES WITH RANDOM LENGTHS AND RANDOM PATTERN UNTIL END OF TAPE IS REACHED.
3. AT THE END OF EACH PASS, A REWIND COMMAND IS ISSUED AND A PERFORMANCE REPORT IS PRINTED.

NOTE: IF A RESTART COMMAND IS USED TO INITIATE TEST 1, THE INITIAL REWIND COMMAND IS NOT ISSUED.

5.3 TEST 3 - WRITE COMPATABILITY/WRITE UTILITY.

WRITES RECORDS OF RANDOM LENGTHS AND DATA FROM BOT TO EOT.

5.4 TEST 4 - READ COMPATABILITY/READ UTILITY.

READS ENTIRE TAPE, FORWARD AND REVERSE.

5.5 TEST 5 - EXECUTE OPERATOR SELECTED COMMAND SEQUENCE.

THE SEQUENCE OF COMMANDS ENTERED BY THE OPERATOR IS EXECUTED. IF NO COMMANDS WERE ENTERED, A DEFAULT SEQUENCE OF WRITE/VERIFY RANDOM DATA IS EXECUTED.

6.0 DEVICE INFORMATION TABLES

6.1 GENERAL

THE TS04 TAPE SUBSYSTEM CONSISTS OF A TS11 UNIBUS TO SERIAL BUS CONTROLLER CONNECTED TO A TS04 DRIVE. FROM A SOFTWARE VIEWPOINT THIS CONFIGURATION IS UNIQUE (FOR A UNIBUS DEVICE) IN A NUMBER OF WAYS:

A. ONLY ONE REGISTER MAY BE WRITTEN - TSDB (TAPE SYSTEM DATA BUFFER),

B. TWO REGISTERS MAY BE READ - TSSR AND TSBA (TAPE SYSTEM STATUS REGISTER AND TAPE SYSTEM BUS ADDRESS REGISTER),

C. COMMANDS ARE NOT WRITTEN TO THE DRIVE; RATHER, COMMAND POINTERS ARE WRITTEN WHICH POINT TO COMMAND PACKETS SOMEWHERE IN CPU MEMORY. THE COMMAND POINTER IS USED BY THE TS04 SUBSYSTEM TO FETCH THE WORD(S) WITHIN THE COMMAND PACKET. THE WORDS WITHIN THE COMMAND PACKET ARE:

1. COMMAND WORD
2. LOW ORDER BUFFER ADDRESS
3. HIGH ORDER BUFFER ADDRESS
4. BYTE COUNT

D. THE TSSR CONTAINS ALL THE INFORMATION WHICH WILL BE NECESSARY TO DETERMINE WHETHER:
1. THE DRIVE IS READY TO ACCEPT ANOTHER COMMAND,
2. THE PREVIOUS COMMAND WAS EXECUTED WITHOUT ERROR.
IF EITHER OF THE ABOVE CONDITIONS IS UNTRUE AT ''JOB DONE'' OR ''COMMAND INITIATION'' TIME,IT MAY BE NECESSARY TO GET THE EXTENDED STATUS REGISTERS TO DETERMINE WHAT ACTION IS TO BE TAKEN AND/OR LOG THE ERROR INFORMATION.

E. EXTENDED STATUS REGISTERS ARE NOT READ DIRECTLY FROM DRIVE REGISTERS; RATHER, A ''GET STATUS'' COMMAND IS ISSUED WHICH WILL CAUSE THE TS04 TO TRANSFER EXTENDED STATUS INFORMATION TO THE MEMORY AREA POINTED TO BY THE BUFFER ADDRESS OF THE ''GET STATUS'' COMMAND. THERE ARE FOUR EXTENDED STATUS REGISTERS. SEE 6.3.

F. THE TSDB MUST BE WRITTEN WITH A DATO INSTRUCTION TO PROPERLY WRITE THE COMMAND POINTER. A DATOB WILL CAUSE A MAINTENANCE FUNCTION. A DATO TO THE TSSR WILL CAUSE SUBSYSTEM INIT.

G. COMMAND PACKETS MUST RESIDE ON DIVIDE BY FOUR MEMORY BOUNDARIES (AS OPPOSED TO DIVIDE BY 2 OR WORD BOUNDARIES) .

6.2 UNIBUS INTERFACE SPECIFICATIONS

TS11/ TS04	INT. VECTOR	UNIBUS ADDRESS	REGISTER
FIRST	150	772520	TSBA/TSDB
		772522	TSSR
SECOND	154	772524	TSBA/TSDB
		772526	TSSR
THIRD	160	772530	TSBA/TSDB
		772532	TSSR
FOURTH	164	772534	TSBA/TSDB
		772536	TSSR

6.3 BIT DEFINITIONS FOR TS11/TS04 REGISTERS

6.3.1 TS11/TS04 REGISTER SUMMARY

	15	14	13	12	11	10	09	08	07	06	05	04	03	02	01	00
TSBA	A15	A14	A13	A12	A11	A10	A09	A08	A07	A06	A05	A04	A03	A02	A01	A00
TSDB	P15	P14	P13	P12	P11	P10	P09	P08	P07	P06	P05	P04	P03	P02	P17	P16
TSSR	SC	UPE	SPE	RMR	NXM	NBA	A17	A16	SSR	OFL	FC1	FC0	TC2	TC1	TC0	
XST0	TMK	RLS	LET	RLL	WLE	NEF	ILC	ILA	MOT	ONL	IE	VCK	PED	WLK	BOT	EOT
XST1	DLT		COR	CRS	TIG	DBF NZO	SCK		IPR	SYN DRP	IPO ITM	IED LCO	POS NZN	POL LRC	UNC CRC	MTE VPE
XST2	OPM	SIP	BPE	CAF		WCF		DTP	DT7	DT6	DT5	DT4	DT3	DT2	DT1	DT0
XST3	MICRO DIAGNOSTIC ERROR CODE								MX	OPI	REV	CRF	DCK	NOI		RIB

TERMINATION CLASS CODES (TSSR TC0-TC2):

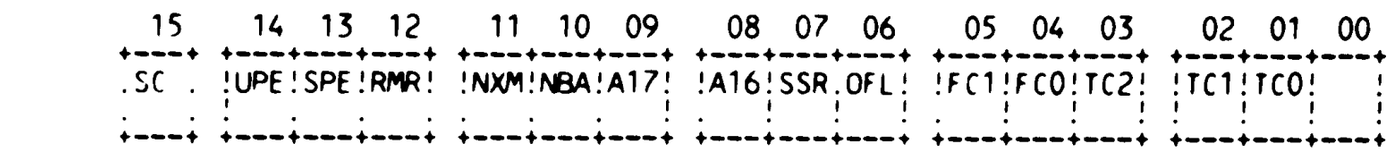
0 = NORMAL TERMINATION
1 - ATTENTION CONDITION
2 - TAPE STATUS ALERT
3 FUNCTION REJECT
4 - RECOVERABLE ERROR - TAPE POSITION = ONE RECORD
DOWN TAPE FROM START OF FUNCTION
5 = RECOVERABLE ERROR - TAPE NOT MOVED
6 = UNRECOVERABLE ERROR - TAPE POSITION LOST
7 - FATAL CONTROLLER ERROR

FATAL CLASS CODES (TSSR FC0-FC1):

0 = MICRO DIAGNOSTIC FAILURE (DISPLAYED IN TS04 OPERATOR PANEL AND XST3).
1 - I/O SEQUENCER CROM PARITY ERROR.
2 = MICROPROCESSOR CROM PARITY ERROR.
SILO PARITY ERROR.
SERIAL BUS PARITY ERROR DETECTED AT TS11 (SPE).
SERIAL BUS PARITY ERROR DETECTED AT TS04 (BPE).
FATAL ERROR HALTS 1750-1777 IN TS04 PROGRAM COUNTER DISPLAY.
3 LOSS OF AC POWER HAS BEEN DETECTED.

6.3.2 TS11 STATUS REGISTER (TSSR)

UNIBUS ADDRESS + 2 - READ ONLY



BIT	NAME	TCC	DEFINITION
15	SC	S	SPECIAL CONDITION. WHEN SET, INDICATES THAT THE LAST COMMAND DID NOT COMPLETE WITHOUT INCIDENT. SPECIFICALLY, EITHER AN ERROR WAS DETECTED OR AN EXCEPTION CONDITION OCCURRED. EXCEPTION CONDITIONS CAN BE TAPE MARKS ON READ COMMANDS, REVERSE MOTION AND AT BOT, EOT WHILE WRITING, ETC. MAY ALSO BE SET BY THE ERROR BITS CONTAINED IN THE TSSR REGISTER: UPE, SPE, RMR, AND NXM. THE TERMINATION CLASS BITS ARE SOMETHING OTHER THAN 0 (UNLESS RMR IS THE ONLY ERROR - SEE RMR).
14	UPE	4/5	UNIBUS PARITY ERROR. SET BY THE TS11 WHEN IT DETECTS A PARITY ERROR ON THE UNIBUS DATA WHEN TRANSFERRING TO OR FROM THE CPU'S MEMORY.
13	SPE	7	SERIAL BUS PARITY ERROR. THIS BIT IS SET BY THE TS11 WHEN IT DETECTS A SERIAL BUS PARITY ERROR ON DATA RECEIVED FROM THE TS04.
12	RMR	S	REGISTER MODIFICATION REFUSED. SET BY THE TS11 WHEN A COMMAND POINTER IS LOADED INTO TSDB AND SUB-SYSTEM READY (SSR) IS NOT SET. NOTE THAT THIS BIT CAUSES SPECIAL CONDITION BUT NO TERMINATION CLASS (IN FACT, THE TS04 NEVER SEES THIS ERROR) BECAUSE ON A SYSTEM WITH NO BUGS, THIS BIT MAY COME UP ON AN ATTENTION MESSAGE. IF ATTNS ARE NOT ENABLED, THIS BIT COMING UP IS AN INDICATION OF EITHER A FATAL CONTROLLER ERROR OR A SOFTWARE BUG.
11	NXM	4/5	NON-EXISTENT MEMORY. SET BY THE TS11 WHEN TRYING TO TRANSFER TO OR FROM A MEMORY LOCATION WHICH DOES NOT EXIST. MAY OCCUR WHEN FETCHING THE COMMAND PACKET, FETCHING OR STORING DATA, OR STORING THE MESSAGE PACKET.
10	NBA	S	NEED BUFFER ADDRESS. WHEN SET, INDICATES THAT THE TS04 NEEDS A MESSAGE BUFFER ADDRESS. THIS

			BIT IS CLEARED DURING THE SET CHARACTERISTICS COMMAND (IF A GOOD ADDRESS WAS GIVEN).
09	A17	S	BUS ADDRESS BIT 17. A17 AND A16 (BIT 08) TRACK THE VALUES OF BITS 17 AND 16 OF THE TSBA REGISTER.
08	A16	S	BUS ADDRESS BIT 16. SEE A17 (BIT 09).
07	SSR	S	SUB-SYSTEM READY. WHEN SET, INDICATES THAT THE TS11/TS04 SUBSYSTEM IS NOT BUSY AND IS READY TO ACCEPT A NEW COMMAND POINTER.
06	OFL	S,1,3	OFF-LINE. WHEN SET, INDICATES THAT THE TS04 IS OFF-LINE AND UNAVAILABLE FOR ANY TAPE MOTION COMMANDS. THIS BIT CAN CAUSE A TERMINATION CLASS OF 1 (ON ATTN INTERRUPT) OR 3 (RESULTS IN NEF).
05	FC1	7	FATAL TERMINATION CLASS 01. FC1 AND FC0 (BIT 04) ARE USED TO INDICATE THE TYPE OF FATAL ERROR WHICH HAS OCCURRED ON THE TS04. THESE BITS ARE VALID ONLY WHEN SC IS SET AND THE TERMINATION CLASS CODE BITS ARE ALL SET (111).
04	FC0	7	FATAL TERMINATION CLASS 00. SEE FC1 (BIT 05).
03	TC2	S	TERMINATION CLASS BIT 02. THIS BIT, ALONG WITH THE TC1 AND TC0 BITS, ACT AS AN OFFSET VALUE WHENEVFR AN ERROR OR EXCEPTION CONDITION OCCURS ON A COMMAND. EACH OF THE EIGHT POSSIBLE VALUES OF THIS FIELD REPRESENT A PARTICULAR CLASS OF ERRORS OR EXCEPTIONS. THE CONDITIONS IN EACH CLASS HAVE SIMILAR SIGNIFICANCE AND, AS APPLICABLE, RECOVERY PROCEDURES. THE CODE PROVIDED IN THIS FIELD IS EXPECTED TO BE UTILIZED AS AN OFFSET INTO A DISPATCH TABLE FOR HANDLING OF THE CONDITION.
02	TC1	S	TERMINATION CLASS BIT 01. SEE TC2 (BIT 03).
01	TC0	S	TERMINATION CLASS BIT 00. SEE TC2 (BIT 03).
00	-	-	NOT USED.

UNIBUS ADDRESS + 2 - WRITE ONLY

SUBSYSTEM INITIALIZE

6.3.3 EXTENDED STATUS REGISTER 0 (XSTAT0)

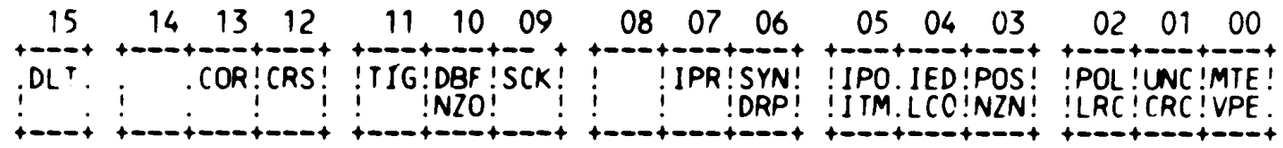
15	14	13	12	11	10	09	08	07	06	05	04	03	02	01	00
TMK	RLS	LET	RLL	WLE	NEF	ILC	ILA	MOT	ONL	IE	VCK	PED	WLK	BOT	EOT

BIT	NAME	TCC	DEFINITION
15	TMK	S,2	TAPE MARK DETECTED. SET WHENEVER A TAPE MARK WAS DETECTED DURING A READ, SPACE, OR SKIP COMMAND AND AS A RESULT OF THE WRITE TAPE MARK OR WITE TAPE MARK RETRY COMMANDS.
14	RLS	2	RECORD LENGTH SHORT. THIS BIT INDICATES THAT EITHER THE RECORD'S LENGTH WAS SHORTER THAN THE BYTE COUNT ON READ OPERATIONS, A SPACE RECORD OPERATION ENCOUNTERED A TAPE MARK OR BOT BEFORE THE POSITION COUNT WAS EXHAUSTED, OR A SKIP TAPE MARKS COMMAND WAS TERMINATED BY ENCOUNTERING BOT OR A DOUBLE TAPE MARK (IF THAT OPERATIONAL MODE IS ENABLED, SEE LET) PRIOR TO EXHAUSTING THE POSITION COUNTER.
13	LET	2	LOGICAL END OF TAPE. SET ONLY ON THE SKIP TAPE MARKS COMMAND WHEN EITHER TWO CONTIGUOUS TAPE MARKS ARE DETECTED OR WHEN MOVING OFF OF BOT AND THE FIRST RECORD ENCOUNTERED IS A TAPE MARK. THE SETTING OF THIS BIT WILL NOT OCCUR UNLESS THIS MODE OF TERMINATION IS ENABLED THROUGH USE OF THE SET CHARACTERISTICS COMMAND.
12	RLL	2	RECORD LENGTH LONG. WHEN SET, THIS BIT INDICATES THAT THE RECORD READ WAS LONGER THAN THE BYTE COUNT SPECIFIED.
11	WLE	3,6	WRITE LOCK ERROR. WHEN SET, INDICATES THAT A WRITE OPERATION WAS ISSUED BUT THE MOUNTED TAPE DID NOT CONTAIN A WRITE ENABLE RING OR THE WRT LOCK SWITCH ACTIVATED DURING THE OPERATION.
10	NEF	3	NON-EXECUTABLE FUNCTION. WHEN SET, INDICATES THAT THE COMMAND COULD NOT BE EXECUTED DUE TO ONE OF THE FOLLOWING CONDITIONS: - THE COMMAND SPECIFIED REVERSE TAPE DIRECTION BUT THE TAPE WAS ALREADY POSITIONED AT BOT. - THE ISSUING OF ANY COMMAND, EXCEPT REWIND,

UNLOAD, OR A COMMAND WITH THE CLEAR VOLUME CHECK (CVC) BIT SET, WHEN THE VOLUME CHECK BIT IS SET.
- ANY COMMAND, EXCEPT GET STATUS OR DRIVE INITIALIZE, WHEN THE TS04 IS OFF-LINE.
- ANY WRITE COMMAND WHEN THE TAPE DOES NOT CONTAIN A WRITE ENABLE RING (WRITE LOCK STATUS - WLS).

09	ILC	3	ILLEGAL COMMAND. SET WHEN A COMMAND IS ISSUED AND EITHER ITS COMMAND FIELD OR ITS COMMAND MODE FIELD CONTAINS CODES WHICH ARE NOT SUPPORTED BY THE TS04.
08	ILA	3	ILLEGAL ADDRESS. (MORE THAN 18 BITS OR ODD WHEN AN EVEN ADDRESS IS REQUIRED.)
07	MOT	S	TAPE IS MOVING.
06	ONL	S	ON LINE. WHEN SET, INDICATES THAT THE TS04 IS ON-LINE AND OPERABLE.
05	IE	S	INTERRUPT ENABLE. REFLECTS THE STATE OF THE INTERRUPT ENABLE BIT SUPPLIED ON THE LAST COMMAND.
04	VCK	S	VOLUME CHECK. WHEN SET, INDICATES THAT THE DRIVE HAS BEEN EITHER POWERED DOWN OR TURNED OFF-LINE. CLEARED BY THE CLEAR VOLUME CHECK (CVC) BIT IN THE COMMAND HEADER WORD. THIS BIT CAN CAUSE A TERMINATION CLASS OF 3.
03	PED	S	PHASE ENCODED DRIVE. WHEN SET, INDICATES THAT THE TS04 IS CAPABLE OF READING AND WRITING ONLY 1600 BPI PHASE ENCODED DATA. WHEN RESET, INDICATES THAT THE TS04 HAS ONLY 800 BPI NRZI DATA CAPABILITIES.
02	WLK	S,3	WRITE LOCKED. WHEN SET, INDICATES THAT THE MOUNTED REEL OF TAPE DOES NOT HAVE A WRITE-ENABLE RING INSTALLED. THE TAPE IS, THEREFORE, WRITE PROTECTED.
01	BOT	S,3	BEGINNING OF TAPE. WHEN SET, INDICATES THAT THE TAPE IS POSITIONED AT THE LOAD POINT AS DENOTED BY THE BOT REFLECTIVE STRIP ON THE TAPE.
00	EOT	S,2	END OF TAPE. THIS BIT IS SET WHENEVER THE TAPE IS POSITIONED AT OR BEYOND THE END OF TAPE REFLECTIVE STRIP. DOES NOT RESET UNTIL THE TAPE PASSES OVER THE REFLECTIVE STRIP IN THE REVERSE DIRECTION UNDER PROGRAM CONTROL.

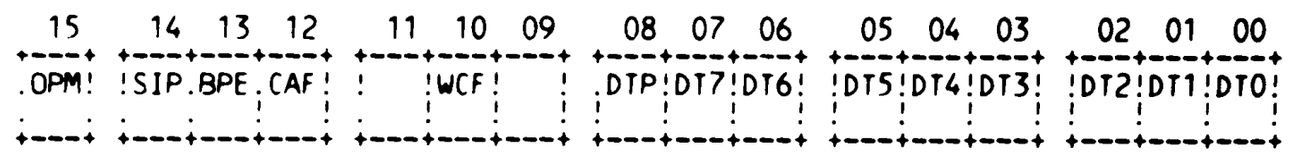
6.3.4 EXTENDED STATUS REGISTER 1 (XSTAT1)



BIT	NAME	TCC	DEFINITION
15	DLT	4	DATA LATE. SET WHEN THE I/O SILO IS FULL ON A READ OR EMPTY ON A WRITE. THESE CONDITIONS OCCUR WHENEVER THE UNIBUS LATENCY EXCEEDS THE DATA TRANSFER RATE OF THE TS04.
14	-	-	NOT USED.
13	COR	S	CORRECTABLE DATA. IN PHASE ENCODED MODE, A CORRECTABLE DATA ERROR HAS BEEN ENCOUNTERED.
12	CRS	4	CREASE DETECTED. FOR NRZI, ALL DATA TRACKS DROPPED OUT FOR MORE THAN THREE CHARACTER TIMES BUT FOR LESS THAN .1 INCHES OF TAPE. FOR PE, EIGHT OUT OF NINE DATA TRACKS WENT DEAD FOR LESS THAN .1 INCHES BEFORE A VALID POSTAMBLE WAS DETECTED.
11	TIG	4	TRASH IN THE GAP. NON-ERASED DATA WAS DETECTED IN A GAP DURING A READ, WRITE, WRITE TAPE MARK, OR ERASE COMMAND.
10	DBF	4	EXCESSIVE SKEW. FOR NRZI, DATA OCCURRED BETWEEN THE 50% MARK AND THE 100% MARK OF THE NRZI DATA WINDOW. FOR PE, IT TOOK MORE THAN FIVE CHARACTERS IN READ-AFTER-WRITE OR TEN CHARACTERS IN READ TO PROPERLY CENTER THE WINDOWS OF THE FORMAT CHANNEL LOGIC.
	NZO	4	NRZ FIFO OVERRUN.
09	SCK	4	SPEED CHECK. TAPE SPEED WAS OFF BY MORE THAN 5% DURING A WRITE DATA OPERATION. NOTE THAT SPEED AVERAGED OVER 8 TICKS AND THE AVERAGE MUST BE OFF 5% TO CAUSE THIS ERROR.
08	-	-	NOT USED.
07	IPR	S,4	INVALID PREAMBLE. SET ON A PE DRIVE IF THE PREAMBLE APPEARS TO BE SHORTER THAN 36 CHARACTERS OR LONGER THAN 44 CHARACTERS. ALSO

			SET IF THE PREAMBLE IS INCORRECTLY ENCODED BEYOND THE FIFTEENTH CHARACTER IN READ OR THE TENTH CHARCTER IN READ-AFTER-WRITE.
06	SYN	4	SYNCH FAILURE. SET ON A PE DRIVE IF THE FORMATTER WAS UNABLE TO ACHIEVE SYNCHRONIZATION IN THE PREAMBLE.
	DRP	4	NRZ RECORD DROPPED A CHARACTER (THE NEXT CHARACTER WAS TO BE CONSIDERED CRC).
05	IPO	S,4	INVALID POSTAMBLE. SET ON A PE DRIVE DURING READ OR WRITE IF ANY OF THE FIRST 39 CHARACTERS OF THE POSTAMBLE ARE NOT READ CORRECTLY.
	ITM	S,4	ILLEGAL TAPE MARK FOR NRZ.
04	IED	4	INVALID END DATA. FOR PE, EIGHT OUT OF NINE TRACKS WENT DEAD BEFORE THE POSTAMBLE WAS DETECTED.
	LRO	4	FOR NRZI, DATA WAS NOT DETECTED IN EITHER THE LRCC OR CRCC WINDOWS. (LRC WAS ZERO)
03	POS	S,4	POSTAMBLE SHORT. SET ON PE DRIVES DURING A READ OR WRITE WHEN LESS THAN 38 ALL-ZEROES CHARACTERS ARE READ FOLLOWING THE ALL-ONES CHARACTER.
	NZN	S,4	NRZ NOISE RECORD (FEWER THAN 13(10) FRAMES).
02	POL	4	POSTAMBLE LONG. SET ON PE DRIVES DURING READ OR WRITE OPERATIONS WHEN THE POSTAMBLE EXCEEDS 42 CHARACTERS.
	LRC	4	LRC ERROR. SET ON NRZI DRIVES WHEN THE LRCC CHARACTER WAS FOUND IN ERROR.
01	UNC	4	UNCORRECTABLE DATA. SET ON PE DRIVES WHEN A PARITY ERROR OCCURRED WITHOUT A CORRESPONDING DEAD TRACK INDICATION.
	CRC	4	CRC ERROR. SET ON NRZI DRIVES WHEN THE CRC CHARACTER WAS FOUND TO BE IN ERROR.
00	MTE	4	MULTI-TRACK ERROR. SET ON PE DRIVES WHEN MORE THAN ONE DEAD TRACK OCCURRED IN THE PREAMBLE OR IN THE DATA FIELD.
	VPE	4	VERTICAL PARITY ERROR. SET ON NRZI DRIVES WHEN A CHARACTER DID NOT CONTAIN AN ODD NUMBER OF ONE BITS.

6.3.5 EXTENDED STATUS REGISTER 2 (XSTAT2)

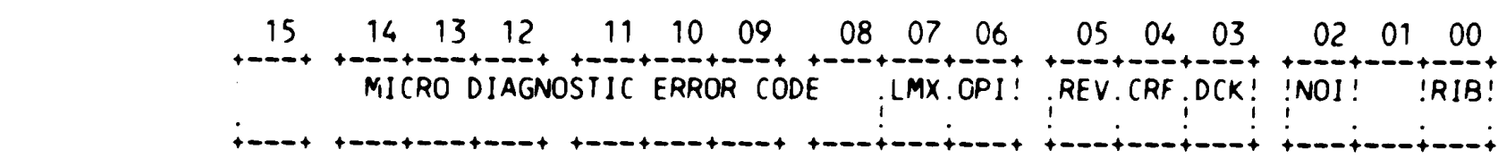


BIT	NAME	TCC	DEFINITION
15	OPM	S	OPERATION IN PROGRESS. (TAPE MOVING)
14	SIP	7	SILO PARITY ERROR. CAUSES FATAL CLASS 2 BECAUSE THE ERROR MIGHT HAVE OCCURRED DURING THE TRANSMISSION OF THE MESSAGE PACKET.
13	BPE	7	SERIAL BUS PARITY ERROR AT DRIVE. SET BY THE TS04 WHEN A PARITY ERROR IS DETECTED ON DATA TRANSMITTED FROM THE TS11 TO THE TS04. CAUSES FATAL CLASS 2 BECAUSE THE ERROR MIGHT HAVE OCCURRED DURING THE TRANSMISSION OF THE MESSAGE PACKET.
12	CAF	7	CAPSTAN ACCELERATION FAIL. AFTER ACCELERATING TAPE FOR .2 INCHES, THE TAPE SPEED WAS CHECKED AND FOUND TO BE OUT OF TOLERANCE BY MORE THAN 10%.
11	-	-	NOT USED.
10	WCF	7	DESKEW BUFFER FAIL. ONE OF THE DESKEW BUFFERS FAILED TO ASSERT 'OUTPUT READY'' WITHIN 20 MICROSECONDS AFTER BEING ENABLED. THE DEAD TRACK BITS WILL INDICATE ON WHICH TRACKS THIS FAILURE OCCURRED.
09	-	-	NOT USED.
08	DTP	S	DEAD TRACK PARITY. THE BITS DTP THROUGH DT0 INDICATE WHICH TRACK(S) WENT DEAD, IF ANY, DURING THE LAST DATA TRANSFER OPERATION. IF DESKEW BUFFER FAIL (DBF) IS SET, THESE BITS INDICATE WHICH CHANNEL FAILED.
07	DT7	S	DEAD TRACK 7. SEE DTP.
06	DT6	S	DEAD TRACK 6. SEE DTP.
05	DT5	S	DEAD TRACK 5. SEE DTP.
04	DT4	S	DEAD TRACK 4. SEE DTP.
03	DT3	S	DEAD TRACK 3. SEE DTP.

02	DT2	S	DEAD TRACK 2. SEE DTP.
01	DT1	S	DEAD TRACK 1. SEE DTP.
00	DT0	S	DEAD TRACK 0. SEE DTP.

NOTE: ON A SET CHARACTERISTICS COMMAND, THE UCODE LEVEL IS RETURNED IN DT7 THRU DT0. ON A GET STATUS COMMAND, THE RESIDUAL CAPSTAN TICK COUNT (INTERNALLY R7) IS RETURNED IN DT7 THRU DT0.

6.3.6 EXTENDED STATUS REGISTER 3 (XSTAT3)



BIT	NAME	TCC	DEFINITION
15 TO 08			MICRO DIAGNOSTIC ERROR CODE. (SEE LIST OF CODES BELOW). ALL ERROR CODES IN THE TABLE WILL BE DISPLAYED ON THE TS04 CONTROL PANEL BUT ONLY CODES HIGHER THAN 110 WILL BE AVAILABLE TO CPU DIAGNOSTICS FOR PRINTOUT IN THE MICRO DIAGNOSTIC ERROR CODE FIELD OF XSTAT3. THIS ERROR CODE FIELD IS VALID ONLY WHEN THE TERMINATION CLASS CODE IN THE TSSR EQUALS 7 AND THE FATAL CLASS CODE IN THE TSSR EQUALS 0, INDICATING AN INTERNAL DIAGNOSTIC FAILURE.
07	NTL	6	LIMIT EXCEEDED. SET WHEN THE TAPE TENSION ARMS HAVE EXCEEDED THEIR ALLOWABLE TRAVEL AND HAVE CAUSED THE ACTIVITATION OF THE LIMIT SWITCHES. NO TENSION EXISTS ON THE MOUNTED TAPE.
06	OPI	6	OPERATION INCOMPLETE. SET WHEN A READ, SPACE, OR SKIP OPERATION HAS MOVED 25 FEET OF TAPE WITHOUT DETECTING ANY DATA ON THE TAPE.
05	REV	S	DIRECTION OF CURRENT OPERATION WAS REVERSE (BUT IS 0 IF REWIND OR FORWARD)
04	CRF	7	CAPSTAN RESPONSE FAILURE. A MOTION COMMAND WAS GIVEN TO THE CAPSTAN BUT WE DID NOT GET A TICK BACK WITHIN A REASONABLE AMOUNT OF TIME.
03	DCK	S,6	DENSITY CHECK. SET ON PE DRIVES WHEN A PE IDENTIFICATION BURST WAS NOT DETECTED WHEN MOVING OFF OF BOT. SET ON NRZI DRIVES WHEN A NON-NRZI IDENTIFICATION BURST WAS FOUND WHEN MOVING OFF OF BOT.
02	NOI	6	NOISE RECORD. SET DURING A READ OR SPACE OPERATION WHEN A BURST OF FLUX CHANGES, WHICH DO NOT QUALIFY AS A RECORD (BUT TOO MANY TO IGNORE), ARE DETECTED: NRZI: AT LEAST TWO CHARACTERS IN A ROW BUT LESS THAN TWELVE, FOLLOWED BY A CHARACTER IN EITHER THE CRCC OR LRCC WINDOWS.

PE: AT LEAST 24 CHARACTERS IN A ROW THAT DO NOT QUALIFY AS A TAPE MARK OR A DATA PREAMBLE.

01 - - NOT USED.

00 RIB 2 REVERSE INTO BOT. A READ, SPACE, OR SKIP COMMAND ALREADY IN PROGRESS HAS ENCOUNTERED THE BOT MARKER WHEN MOVING TAPE IN THE REVERSE DIRECTION. TAPE MOTION WILL BE HALTED AT BOT.

MICRO DIAGNOSTIC ERROR CODES

FOLLOWING IS A LIST OF THE ERRORS WHICH ARE DISPLAYED IN THE MICRO DIAGNOSTIC ERROR CODE (XSTAT3 BITS 15 - 08) AND ALSO IN THE LIGHTS ON THE TS04 CONTROL PANEL, DUE TO FAILURES ON THE CAPSTAN BOARD, I/O BOARDS, WRITE BOARD, READ BOARD, OR FORMATTER BOARD. THE MICRO WILL BE IN A TIGHT LOOP IN THE DISPM PROGRAM, WAITING FOR OPERATOR OR CPU INTERVENTION WHILE THE ERROR IS BEING DISPLAYED IN THE CONSOLE LIGHTS. IT IS APPARENT THAT AN ERROR IS BEING DISPLAYED IF THE 'UOK'' LIGHT IS NOT LIGHTED, THE PROCESSOR IS NOT STOPPED, AND AN OCTAL NUMBER (100-377) IS BEING DISPLAYED IN THE LIGHTS. TO SCOPE LOOP THESE TESTS, ENTER MAINTENANCE MODE (ON-LINE SWITCH TO 'OFF'' POSITION, MAINTENANCE SWITCH UP, PRESS RESET), ENTER THE OFF-LINE TEST NUMBER (SEE SCOPE LOOP COLUMN BELOW) IN THE OPERATOR CONSOLE LIGHTS (ENTER ONES WITH LEFT-MOST SWITCH, ENTER ZEROES WITH RIGHT-MOST SWITCH), AND PRESS ON-LINE BUTTON. TEST WILL LOOP UNTIL ON-LINE SWITCH IS RETURNED TO OFF-LINE POSITION, ERRORS WILL BE DISPLAYED CONTINUOUSLY.

ERROR (DISPLAY)	PROGRAM	ERROR DESCRIPTION	LIKELY MODULE	SCOPE LOOP
337	OPERATIONAL CODE	CAPSTAN RUNAWAY ERROR (H3.RNY). CAPSTAN DIDN'T STOP WITHIN ACCEPTABLE WINDOW AFTER LAST COMMAND.		
100	IOTSM	BASIC I/O MICRO FAILURE (PARITY ERROR, IOATN, HANDSHAKING, AND DATA WINDOW TEST BETWEEN THE I/O AND MAIN MICROS. NOTE: CAN ALSO BE CAUSED BY THE SERIAL BUS .SHIN (SHIFT IN) STUCK ASSERTED.	M8967	14
101	IOTSM	ERROR IN I/O CONTROL REGISTER TEST	M8966 M8967	15
102	IOTSM	FAILURE OF FRAME COUNTER TEST	M8966	15

103	IOTSM	FAILURE OF I/O SILO NON-PARITY ERROR DATA TEST OR THE WRITE FLAG.	M8966 M8963	16
104	IOTSM	FAILURE OF I/O SILO PARITY ERROR TEST OR DATA LATE TEST.	M8966	17
105	IOTSM	FAILURE OF SHIFT LOOP WITH ZEROES.	M8965	20
106	IOTSM	FAILURE OF SHIFT LOOP WITH ONES.	M8965	21
107	IOTSM	FAILURE OF SHIFT LENGTH MUX.	M8965	22
110	IOTSM	FAILURE TO RECEIVE CORRECT OP-CODE FROM TS11 WHEN WE SENT DATA OVER THE SERIAL BUS.	M8965 TS11 MOTHER BD SBUS CABLE	47
111	CATSM	FAILURE OF 1 KHZ CLOCK TEST. TSTS TAC SYNC FLOP AND ATTN, TOO.	G159 CBUS CABLE M8963	2
112	CATSM	LIGHT REGISTER CHANGED WHEN MOTION REGISTER WAS CLEARED.	G159	3,4
113	CATSM	FWD OR MVG BITS WRONG AFTER 1 TICK OF SIMULATED COMMAND AND TACH PULSES.	G159	3,4
114	CATSM	FAILURE OF SIMULATED CAPSTAN SPEED TEST. THE CAPSTAN SPEED COUNTER WAS OUT OF RANGE WHEN TAPE MOTION AT SPEED WAS SIMULATED.	G159	3,4
115	CATSM	FAILURE OF SIMULATED SLOW CAPSTAN TEST. SPEED COUNTER DID NOT LATCH UP WITH MAX COUNT WHEN SLOW TACH TICKS WERE SIMULATED.	G159	3,4
116	CATSM	FAILURE OF SIMULATED CAPSTAN DECEL TEST. COUNTER NOT ZERO FOR FORWAPD OR 377 FOR REVERSE WHILE DECELERATING, OR MVG BIT NOT 1.	G159	3,4
117	CATSM	FAILURE OF MOVING FLOP TO GO TO ZERO AFTER STOPPING (DIRECTION REVERSAL FOR ONE TACH TICK).	G159	3,4
120	PETSM	FAILURE OF WRITE BOARD TO TURN ON AND EMPTY THE SILO, OR DATA LATE BIT DOESN'T WORK.	M8929 M8966	23
121	PETSM	FAILURE OF WRITE BOARD TO EMPTY SILO AT CORRECT SPEED.	M8929	23
124	PETSM	FORMATTER FLAG DOESN'T WORK ON THE	M8922	24

M8922.

125	PETSM	FORMATTER SILO FILLING AND DATA ERROR	M8922 M8923 M8924	24
126	PETSM	PEAK SHIFT TEST ERROR	M8922 M8923 M8924	25
127	PETSM	FORMATTER TABLE LOOKUP ROM CHECKSUM TEST ERROR	M8922 M8923 M8924	26

&

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                                .TITLE PROGRAM HEADER AND TABLES
                                .SBTTL  PROGRAM HEADER

                                        .ENABL  ABS,AMA
002000                          .       =       2000
002000                                  BGNMOD

                                ;++
                                ; THE PROGRAM HEADER IS THE INTERFACE BETWEEN
                                ; THE DIAGNOSTIC PROGRAM AND THE SUPERVISOR.
                                ;--

002000                                  POINTER ALL


002000                                  HEADER  CZTSH,A,0,5000,5000,2700,,E,DESCM
002000                          L$NAME::
002010                          L$REV::
002011                          L$DEPO::
002012                          L$UNIT::
002014                          L$TIML::
002016                          L$HPCP::
002020                          L$SPCP::
002022                          L$HPTP::
002024                          L$SPTP::
002026                          L$LADP::
002030                          L$STA::
002032                          L$CO::
002034                          L$EFLG::
002036                          L$APT::
002040                          L$DTP::
002042                          L$EXP1::
002044                          L$EXP2::
002046                          L$EXP3::
002050                          L$MREV::
002052                          L$TIM1::
002054                          L$TIMU::
002056                          L$EF::
002062                          L$SPC::
002064                          L$DEVP::
002066                          L$REPP::
002070                          L$DRCT::
002072                          L$DRS::
002074                          L$AUT::
002076                          L$DUT::
002100                          L$TSTID::
002102                          L$DESC::
002104                          L$ICP::
002106                          L$CCP::

```

```
                                .SBTTL  DISPATCH TABLE

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

002110                                  DISPATCH 5
002112                          L$DISPATCH::
```

```
                                .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 RUN-TIME P-TABLE.
                                ;--

002124                                  BGNHW   DFPTBL
002126                          L$HW::
002126                          DFPTBL::

002126  172520                  172520          ;TSDB ADDRESS.
002130  000150                  150             ;VECTOR ADDRESS.

002132                                  ENDHW
002132                          L10000:
```

```
                                .SBTTL  SOFTWARE P-TABLE

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

                                        BGNSW   SFPTBL
                                L$SW::
                                SFPTBL::

002134  001                     CLRFLG:: .BYTE  1               ;CLEAR COUNTERS FLAG.
002135  000                     RRANV::  .BYTE  0               ;RESET RANDOM VARIABLES EACH PASS FLAG.
002136  000                     HAE::    .BYTE  0               ;HALT AFTER EACH COMMAND FLAG.
002137  000                              .BYTE  0               ;SPARE.
002140  000                              .BYTE  0               ;SPARE.
002141  000                              .BYTE  0               ;SPARE
002142  000                     DINT::   .BYTE  0               ;DISABLE INTERRUPTS FLAG.
002143  000                     IREC::   .BYTE  0               ;INHIBIT ERROR RECOVERY FLAG.
002144  000                     CHGFLG:: .BYTE  0               ;CHANGE CMD SEQ TABLE FLAG.
002145  000                              .BYTE  0               ;SPARE.
002146  000                     PIRE::   .BYTE  0               ;INHIBIT RESIDUAL FRAMECOUNT ERROR REPORT FLAG.
002147  000                              .BYTE  0               ;SPARE.
002150  000040                CHAR::   CH.EAI                 ;CHARACTERISTICS CODE (DEFAULT = 40).
002152  000005                CMDD::   .WORD  5               ;COMMAND 2 (DEFAULT = WRITE/VERIFY).
002154  010000                         .WORD  DATCNT          ;BYTE COUNT (DEFAULT = MAX BUFFER SIZE)
002156  000012                         .WORD  12              ;NUMBER OF OPERATIONS (DEFAULT = 10).
002160  000007                         .WORD  RANP            ;PATTERN (DEFAULT = RANDOM).
002162  000005                         .WORD  5               ;COMMAND 3 (DEFAULT = WRITE/VERIFY).
002164  010000                         .WORD  DATCNT          ;BYTE COUNT (DEFAULT = MAX BUFFER SIZE).
002166  000012                         .WORD  12              ;NUMBER OF OPERATIONS (DEFAULT - 10).
002170  000007                         .WORD  RANP            ;PATTERN (DEFAULT = RANDOM).
002172  000005                         .WORD  5               ;COMMAND 4 (DEFAULT = WRITE/VERIFY).
002174  010000                         .WORD  DATCNT          ;BYTE COUNT (DEFAULT = MAX BUFFER SIZE).
002176  000012                         .WORD  12              ;NUMBER OF OPERATIONS (DEFAULT = 10).
002200  000007                         .WORD  RANP            ;PATTERN (DEFAULT = RANDOM).
002202  000005                         .WORD  5               ;COMMAND 5 (DEFAULT = WRITE/VERIFY).
002204  010000                         .WORD  DATCNT          ;BYTE COUNT (DEFAULT = MAX BUFFER SIZE).
002206  000012                         .WORD  12              ;NUMBER OF OPERATIONS (DEFAULT - 10).
002210  000007                         .WORD  RANP            ;PATTERN (DEFAULT = RANDOM).
002212  000033                         .WORD  33              ;END OF CMD SEQ TABLE CODE.

002214                                  ENDSW
002214                          L10001:

002214                                  ENDMOD
```

```
                                .TITLE GLOBAL AREAS
                                .SBTTL  GLOBAL EQUATES SECTION

002214                                  BGNMOD

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

002214                                  EQUALS
                                ;
                                ; BIT DIFINITIONS
                                ;
100000                          BIT15== 100000
040000                          BIT14== 40000
020000                          BIT13== 20000
010000                          BIT12== 10000
004000                          BIT11== 4000
002000                          BIT10== 2000
001000                          BIT09== 1000
000400                          BIT08== 400
000200                          BIT07== 200
000100                          BIT06== 100
000040                          BIT05== 40
000020                          BIT04== 20
000010                          BIT03== 10
000004                          BIT02== 4
000002                          BIT01== 2
000001                          BIT00== 1
                                ;
001000                          BIT9==  BIT09
000400                          BIT8==  BIT08
000200                          BIT7==  BIT07
000100                          BIT6==  BIT06
000040                          BIT5==  BIT05
000020                          BIT4==  BIT04
000010                          BIT3==  BIT03
000004                          BIT2==  BIT02
000002                          BIT1==  BIT01
000001                          BIT0==  BIT00
                                ;
                                ; EVENT FLAG DEFINITIONS
                                ;   EF32:EF17 RESERVED FOR SUPERVISOR TO PROGRAM COMMUNICATION
                                ;   EF16:EF01 AVAILABLE FOR PROGRAM USE
                                ;
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
                                ;
000020                          EF16==  16.
000017                          EF15==  15.
000016                          EF14==  14.
```

```
2458    000015          EF13==  13.
2459    000014          EF12==  12.
2460    000013          EF11==  11.
2461    000012          EF10==  10.
2462    000011          EF09==  9.
2463    000010          EF08==  8.
2464    000007          EF07==  7
2465    000006          EF06==  6
2466    000005          EF05==  5
2467    000004          EF04==  4
2468    000003          EF03==  3
2469    000002          EF02==  2
2470    000001          EF01==  1
2471                    ;
2472                    ; PRIORITY LEVEL DEFINITIONS
2473                    ;
2474    000340          PRI07== 340
2475    000300          PRI06== 300
2476    000240          PRI05== 240
2477    000200          PRI04== 200
2478    000140          PRI03== 140
2479    000100          PRI02== 100
2480    000040          PRI01== 40
2481    000000          PRI00== 0
2482
2483
2484                    ; REGISTER USAGE.
2485                    ;
2486                    ;       R0 - PASSES PARAMETERS TO/FROM DIAGNOSTIC SUPERVISOR.
2487                    ;       R1 - COMMAND SEQUENCE TABLE POINTER.
2488                    ;       R2 - GENERAL PURPOSE REGISTER.
2489                    ;       R3 - GENERAL PURPOSE REGISTER.
2490                    ;       R4 - GENERAL PURPOSE REGISTER.
2491                    ;       R5 - CURRENT LOGICAL DEVICE NUMBER X 2.
2492                    ;       R6 - STACK POINTER.
2493                    ;       R7 - PROGRAM COUNTER.
2494
2495                    ;THE FOLLOWING ARE BIT DEFINITIONS FOR THE TSSR REGISTERS.
2496
2497    100000          TS.SC==100000           ;SPECIAL CONDITION BIT.
2498    040000          TS.UPE==40000           ;UNIBUS PARITY ERROR
2499    020000          TS.SPE==20000           ;SERIAL BUS PARITY ERROR.
2500    010000          TS.RMR==10000           ;REGISTER MODIFICATION REFUSED.
2501    004000          TS.NXM==4000            ;NON-EXISTENT MEMORY.
2502    002000          TS.NBA==2000            ;NEED BUFFER ADDRESS.
2503    001000          TS.A17==1000            ;BUS ADDRESS BIT 17.
2504    000400          TS.A16==400             ;BUS ADDRESS BIT 16.
2505    000200          TS.SSR=-200             ;UNIT READY BIT.
2506    000100          TS.OFL==100             ;OFF LINE.
2507    177717          TSC.FCC==177717         ;FATAL CLASS CODE MASK.
2508    177761          TSC.TCC--177761         ;TERMINATION CLASS CODE MASK.
```

```
2509                            ;THE FOLLOWING ARE BIT DEFINITIONS FOR THE COMMAND WORD
2510
2511    100000                  ACK.C==100000                   ;ACKNOWLEDGE BIT
2512    040000                  CVC.C==40000                    ;CLEAR VOLUME CHECK.
2513    020000                  OPP.C==20000                    ;OPPOSITE BIT
2514    010000                  SWB.C==10000                    ;SWAP BYTE BIT
2515    004000                  MOD.C3==4000                    ;MODE BIT 3
2516    004000                  BRF.C==4000                     ;BYTE/RECORD/FILE COUNT FLAG BIT.  NOT USED
2517                                                            ;BY TS04 BUT USED INTERNALLY BY THIS PROGRAM ONLY.
2518    002000                  MOD.C2==2000                    ;MODE BIT 2
2519    001000                  MOD.C1==1000                    ;MODE BIT 1
2520    000400                  MOD.C0==400                     ;MODE BIT 0
2521    000200                  IE.C==200                       ;INTERRUPT ENABLE       ;
2522    000100                  FMT.C1==100                     ;FORMAT BIT 1
2523    000100                  VFY.C==100                      ;WRITE VERIFY FLAG BIT.  INTERNAL USE ONLY.
2524                                                            ;NOT USED BY TS04.
2525    000040                  FMT.C0==40                      ;FORMAT BIT 0.
2526    000040                  JMP.C==40                       ;JUMP BIT-TO DIRECT THIS PROGRAM TO JUMP TO
2527                                                            ;A CERTAIN LOCATION IN THE COMMAND SEQUENCE
2528                                                            ;TABLE.  INTERNAL USE ONLY.
2529    000020                  CMD.C4==20                      ;COMMAND BIT 4
2530    000020                  DLY.C==20                       ;INSERT DELAY. INTERNAL USE ONLY.
2531    000010                  CMD.C3==10                      ;COMMAND BIT 3
2532    000004                  CMD.C2==4                       ;COMMAND BIT 2
2533    000002                  CMD.C1=-2                       ;COMMAND BIT 1
2534    000001                  CMD.C0==1                       ;COMMAND BIT 0
2535
2536                            ;       BIT DEFINITIONS FOR DEVICE CHARACTERISTICS.
2537
2538    000200                  CH.ESS==200                     ;ENABLE SKIP TAPE MARKS STOP (STOP AT LOGICAL EOT).
2539    000040                  CH.EAI==40                      ;ENABLE ATTENTION INTERRUPTS.
2540    000020                  CH.ERI==20                      ;ENABLE MESSAGE BUFFER RELEASE INTERRUPTS.
2541    000040                  DFTSCH==CH.EAI                  ;DEFAULT CHARACTERISTICS CODE.
2542
2543                            ;THE FOLLOWING INDICATES THE RELATIVE POSITIONS OF THE STATUS WORDS
2544                            ;IN THE MESSAGE BUFFER.
2545
2546    000004                  MS.RFC==4                       ;RESIDUAL FRAME COUNT.
2547    000006                  MS.XS0==6                       ;EXT STATUS REG 0
2548    000010                  MS.XS1==10                      ;EXT STATUS REG 1
2549    000012                  MS.XS2==12                      ;EXT STATUS REG 2
2550    000014                  MS.XS3==14                      ;EXT STATUS REG 3
2551
2552                            ;THE FOLLOWING ARE BIT DEFINITIONS FOR EXTENDED STATUS REGISTER 0.
2553
2554    100000                  X0.TMK==100000                  ;TAPE MARK.
2555    040000                  X0.RLS==40000                   ;RECORD LENGTH SHORT.
2556    020000                  X0.LET=-20000                   ;LOGICAL EOT.
2557    010000                  X0.RLL==10000                   ;RECORD LENGTH LONG.
2558    000100                  X0.ONL==100                     ;ON LINE BIT.
2559    000002                  X0.BOT==2                       ;BOT BIT.
2560    000001                  X0.EOT==1                       ;EOT BIT.
2561
2562                            ;THE FOLLOWING ARE BIT DEFINITIONS FOR EXTENDED STATUS REGISTER 3.
2563
2564    000010                  X3.DCK==10                      ;DENSITY CHECK.
```

```
                        X3.RNY==337                     ;CAPSTAN RUNAWAY UDIAG ERROR CODE.

                        ;THE FOLLOWING DEFINITIONS SHOW THE RELATIVE POSITIONS OF THE COMMAND
                        ;PACKET ENTRIES.

000000                  CP.CMD==0                       ;CMDPKT+0==TS04 COMMAND.
000002                  CP.ADL==2                       ;CMDPKT+2==BUFFER ADDRESS LOW.
000004                  CP.ADH==4                       ;CMDPKT+4==BUFFER ADDRESS HIGH.
000006                  CP.CNT==6                       ;CKDPKT+6==BYTE/FILE/RECORD COUNT

                        ;       MISCELLANEOUS DEFINITIONS.

000340                  INTPRI==PRI07                   ;PRIORITY TO BE USED IN INTERRUPT STATE.
002366                  TSBA==TSDB                      ;DATA BUFFER ADDRESS REGISTER.
000010                  SCHCNT==10                      ;ARBITRARY BYTE LENGTH FOR CHARACTERISTIC
                                                        ;BUFFER LENGTH. (EVEN #)
000016                  MSGCNT=-16                      ;MESSAGE BUFFER LENGTH IN BYTES. (EVEN #)
002750                  DIABLK==DATAWT                  ;WRITE BUFFER ALSO USED FOR DIAG CMD.
000020                  DIACNT==20                      ;DIAGNOSTIC COMMAND BUFFER EXTENT.
010000                  DATCNT==4096.                   ;MAXIMUM RECORD LENGTH IN BYTES.
                                                        ;THIS COUNT SHOULD BE A MULTIPLE OF 256 TO INSURE
                                                        ;PROPER READ/WRITE BUFFER ALLOCATION BY THE SUPER.
000260                  CNTLEN==CNTEND-CNTBGN           ;LENGTH OF STATISTICAL COUNTER AREA.
177700                  RNOPSC==177700                  ;RANDOM # OF OPERATIONS MASK.
000007                  RANP==7                         ;CODE TO SELECT RANDOM PATTERN.
000020                  RRECL==16.                      ;READ RECOVERY ATTEMPT LIMIT.
000020                  WRECL==16.                      ;WRITE RECOVERY ATTEMPT LIMIT.
153624                  RANBC==153624                   ;CONSTANT USED TO RESET RANDOM # GENERATOR BASE.
032561                  RANSC==32561                    ;CONSTANT USED TO RESET RANDOM # SAVE LOCATION.
177774                  NINUSE==177774                  ;NOT IN USE CODE FOR DEVICE STATE TABLE.
177740                  NCMD.C==ACK.C!CVC.C!OPP.C.SWB.C!MOD.C3!MOD.C2!MOD.C1!MOD.C0!IE.C!FMT.C1.FMT.C0
                                                        ;NOT ''COMMAND'' BITS.

                        ;THE FOLLOWING DEFINES THE COMMAND WORD FOR EACH TS04 COMMAND.

100013                  DRI==   ACK.C.CMD.C3!CMD.C1!CMD.C0
                                                        ;DRIVE INIT.

104001                  RDF-=   ACK.C.BRF.C!CMD.C0
                                                        ;READ FORWARD

104401                  RDR=-   ACK.C!BRF.C!MOD.C0.CMD.C0
                                                        ;READ REVERSE

104005                  WRT-=   ACK.C!BRF.C!CMD.C0!CMD.C2
                                                        ;WRITE COMMAND

104105                  WTV-=   ACK.C!BRF.C!VFY.C!CMD.C0!CMD.C2
                                                        ;WRITE VERIFY

104010                  SRF==   ACK.C!BRF.C!CMD.C3
                                                        ;SPACE RECORD FORWARD

104410                  SRR==   ACK.C!BRF.C!MOD.C0!CMD.C3
                                                        ;SPACE RECORD REVERSE
```

```
2621            105401          RNR==   ACK.C!BRF.C.MOD.C1!MOD.C0!CMD.C0
2622                                            ;READ REV RETRY1 - REREAD NEXT REVERSE, IE. SPACE FWD, READ REVERSE
2623
2624            125401          RNF==   ACK.C!BRF.C!OPP.C!MOD.C1!MOD.C0.CMD.C0
2625                                            ;READ REV RETRY2 - REREAD NEXT FORWARD, IE.READ FORWARD, SPACE REVERSE
2626
2627            105001          RPF==   ACK.C!BRF.C!MOD.C1!CMD.C0
2628                                            ;READ FWD RETRY1 - REREAD PREVIOUS FORWARD, IE. SPACE REVERSE, READ FORW
2629
2630            125001          RPR==   ACK.C!BRF.C!OPP.C!MOD.C1!CMD.C0
2631                                            ;READ FWD RETRY2 - REREAD PREVIOUS REVERSE, IE. READ REVERSE, SPACE FORW
2632
2633            105005          WRR==   ACK.C!MOD.C1!BRF.C!CMD.C2!CMD.C0
2634                                                    ;WRITE RETRY
2635
2636            102010          RWD==   ACK.C!MOD.C2!CMD.C3
2637                                                    ;REWIND COMMAND
2638
2639            100012          MBR==   ACK.C!CMD.C3!CMD.C1
2640                                                    ;MESSAGE BUFFER RELEASE
2641
2642            100011          WTM==   ACK.C!CMD.C3!CMD.C0
2643                                                    ;WRITE TAPE MARK.
2644
2645            101011          WTR==   ACK.C!MOD.C1!CMD.C3.CMD.C0
2646                                                    ;WRITE TAPE MARK RETRY.
2647
2648            105010          SFF==   ACK.C!BRF.C!MOD.C1!CMD.C3
2649                                                    ;SPACE FILE FORWARD
2650
2651            105410          SFR==   ACK.C!BRF.C!MOD.C0!MOD.C1!CMD.C3
2652                                                    ;SPACE FILE REVERSE
2653
2654            100017          GES==   ACK.C!CMD.C0!CMD.C1!CMD.C2!CMD.C3
2655                                                    ;GET EXTENDED STATUS
2656
2657            100411          ERS==   ACK.C!MOD.C0!CMD.C3!CMD.C0
2658                                                    ;ERASE 3 INCHES OF TAPE
2659
2660            100412          UNL==   ACK.C!MOD.C0!CMD.C3!CMD.C1
2661                                                    ;UNLOAD COMMAND
2662
2663            101012          CLN==   ACK.C.MOD.C1!CMD.C3.CMD.C1
2664                                                    ;ERASE TAPE.
2665
2666            140004          SCH==   ACK.C.CVC.C!CMD.C2      ;SET DEVICE CHARACTERISTICS.
2667
2668            100006          DIA==   ACK.C!CMD.C2!CMD.C1     ;DIAGNOSTICS.
2669
2670            000040          JMP==   JMP.C                   ;JUMP TO 'N'TH COMMAND
2671
2672            000020          DLY==   DLY.C                   ;DELAY 'N'' MS.
2673
2674            177777          END==   177777                  ;END OF COMMAND SEQUENCES
```

```
                                .SBTTL  GLOBAL DATA SECTION

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

                                ;
                                ; STORAGE FOR DEVICE REGISTERS
                                ;
                                        DEVREG  0,0
002214                          L$DR::
002216                          L$DRST::
002222


                                ;       COMMAND PACKET.

                                .       =       .+3&177774      ;MUST BE ON MOD 4 BOUNDRY.
002224  000000                  CMDPKT:: 0                      ;1ST WORD IS TS04 COMMAND.
002226  000000                          0                       ;2ND WORD IS THE BUFFER LOW ADDRESS.
002230  000000                          0                       ;3RD WORD IS THE BUFFER HIGH ADDRESS.
002232  000000                          0                       ;4TH WORD IS THE BYTE/RECORD/FILE COUNT.


                                ;       GET STATUS COMMAND PACKET.

                                .       =       .+3&177774      ;MUST BE ON MOD 4 BOUNDRY.
002234  100017                  GSCPK:: .WORD   GES


                                ;       MESSAGE BUFFER RELEASE COMMAND PACKET.

                                .       =       .+3&177774      ;MUST BE ON MOD 4 BOUNDRY.
002240  100012                  BRCPK:: .WORD   MBR


                                ;       REWIND COMMAND PACKET (USED IN ERROR RECOVERY ONLY)

                                .       =       .+3&177774      ;MUST BE ON A MODULE 4 BOUNDARY.
002244  102010                  RWCPK:: .WORD   RWD
002246  000001                          .WORD   1


                                ;       WORK AREA FOR ANALYSIS OF MESSAGE PACKET CONTENTS.

002250  000007                  MSGPKT:: .BLKW  7               ;1ST WORD:: MESSAGE TYPE.
                                                                ;2ND WORD:: DATA FIELD LENGTH.
                                                                ;3RD WORD:: RESIDUAL FRAME COUNT.
                                                                ;4TH WORD:: XSTAT0
                                                                ;5TH WORD:: XSTAT1
                                                                ;6TH WORD:: XSTAT2
                                                                ;7TH WORD:: XSTAT3
```

```
                                ;       MESSAGE PACKETS.
                                ;
002266  000007                 MSGPK0:: .BLKW  7              ;MESSAGE PACKET FOR DEVICE #0
002304  000007                 MSGPK1:: .BLKW  7              ;MESSAGE PACKET FOR DEVICE #1
002322  000007                 MSGPK2:: .BLKW  7              ;MESSAGE PACKET FOR DEVICE #2
002340  000007                 MSGPK3:: .BLKW  7              ;MESSAGE PACKET FOR DEVICE #3
                                ;
                                ;       SET CHARACTERISTIC BLOCK.
                                ;
002356  002266                 SCHBK:: MSGPK0                 ;1ST WORD:: MSGPKT ADDR LO(SET UP BY EXCUTE ROUTINE).
002360  000000                         0                      ;2ND WORD:: MSGPKT ADDR HI.
002362  000016                         MSGCNT                 ;3RD WORD:: MSG BUFFER LENGTH (BYTES)
002364  000040                         CH.EAI                 ;4TH WORD:: CHARACTERISTICS WORD(SET BY SETUP ROUTINE).
                                ;
                                ;       TS04 REGISTER ADDRESSES.
                                ;
002366  000004                 TSDB:: .BLKW    4              ;TS04 DATA BUFFER ADDRESSES.
002376  000004                 TSSR:: .BLKW    4              ;TS04 STATUS REGISTER ADDRESSES.
002406  000004                 TSVCT:: .BLKW   4              ;TS04 VECTOR ADDRESSES.
                                ;
                                ;       ADDRESSES OF MESSAGE PACKETS.
                                ;
002416  002266                 MSGPKA:: MSGPK0                ;DEVICE 0.
002420  002304                         MSGPK1                 ;DEVICE 1.
002422  002322                         MSGPK2                 ;DEVICE 2.
002424  002340                         MSGPK3                 ;DEVICE 3.
                                ;
                                ;       ADDRESSES OF INTERRUPT HANDLING ROUTINES.
                                ;
002426  005674                 TS4INT:: TS4IN0                ;DEVICE 0.
002430  005710                         TS4IN1                 ;DEVICE 1.
002432  005724                         TS4IN2                 ;DEVICE 2.
002434  005740                         TS4IN3                 ;DEVICE 3.
                                ;
                                ;       TS04 CODE LEVELS, WILL BE STORED AFTER SCH CMD IN BASIC FUNCTION TEST
                                ;
002436  000000                 TS4CL:: 0                      ;DEVICE 0
002440  000000                         0                      ;DEVICE 1
002442  000000                         0                      ;DEVICE 2
002444  000000                         0                      ;DEVICE 3
                                ;
                                ;       UNIT NUMBERS OF ALL DEVICES BEING TESTED(1-4).
                                ;       WHEN DEVICE IS NOT IN USE, IT,S LOCATION WILL = -3.
                                ;       R5 WILL ALWAYS CONTAIN THE PRESENT LOGICAL UNIT NUMBER X 2.
                                ;
002446  177774                 DEVTBL:: .WORD  NINUSE
002450  177774                         .WORD   NINUSE
002452  177774                         .WORD   NINUSE
002454  177774                         .WORD   NINUSE
002456  177777                         .WORD   END
```

```
                                ;       COUNTER AREA.
                                ;
                        002460  CNTBGN=.
002460  000020          WRBC::  .BLKW   20              ;BYTES WRITTEN.
002520  000020          RRBC::  .BLKW   20              ;BYTES READ REV.
002560  000020          RFBC::  .BLKW   20              ;BYTES READ FWD.
002620  000004          WRREC:: .BLKW   4               ;RECOVERABLE WRITE ERRORS.
002630  000004          WRUNR:: .BLKW   4               ;UNRECOVERABLE WRITE ERRORS.
002640  000004          RRREC:: .BLKW   4               ;RECOVERABLE READ REV ERRORS.
002650  000004          RRUNR:: .BLKW   4               ;UNRECOVERABLE READ REV ERRORS.
002660  000004          RFREC:: .BLKW   4               ;RECOVERABLE READ FWDERRORS.
002670  000004          RFUNR:: .BLKW   4               ;UNRECOVERABLE READ FWD ERRORS.
002700  000004          PASCNT:: .BLKW  4               ;PASS COUNT.
002710  000004          SCCNT:: .BLKW   4               ;SPECIAL CONDITION COUNT.
002720  000004          VFYCNT:: .BLKW  4               ;COUNT OF TS04 WRITE VERIFY ERRORS.
002730  000004          HRDCNT:: .BLKW  4               ;COUNT OF # OF TIMES WE SAW HARD ERRORS.
        002740          CNTEND=.                        ;END OF STATICTICAL COUNTERS.
002740  000004          RECCNT:: .BLKW  4               ;NUMBER OF RECORDS FROM BOT(CLEARED ONLY ON REWIND).


                                ;       THE FOLLOWING ARE THE DEFINITIONS OF VARIABLES
                                ;       USED BY THE PROGRAM.

002750  000000          DATAWT:: .WORD  0               ;WRITE BUFFER ADDRESS.
002752  000000          DATARD:: .WORD  0               ;READ BUFFER ADDRESS.
002754  000000          NCNT::  .WORD   0               ;STORAGE FOR VALUE OF N.
002756  000000          NCNT1:: .WORD   0               ;TEMP STORAGE FOR VALUE OF N.
002760  000000          BRFCNT:: .WORD  0               ;STORAGE FOR BPCR VALUE.
002762  177777          CMDWRD:: .WORD  END             ;CONTAINS COMMAND WORD BEING EXECUTED PRESENTLY.
002764  177777          CMDSAV:: .WORD  END             ;SAVE LOCATION FOR CMD WORD DURING ERROR RECOVERY
002766  177777          PCMDWD:: .WORD  END             ;CONTAINS PREVOUS COMMAND WORD.
002770  000000          CMDLG:: .WORD   0               ;CURRENT COMMAND LOGGING CODE.
002772  000000          LENMSK:: .WORD  0               ;RANDOM WRITE LENGTH MASK, TO BE SET UP BY TESTS
002774  153624          RANB::  .WORD   153624          ;RANDOM # GENERATOR BASE.
002776  032561          RANS::  .WORD   32561           ;RANDOM # SAVE LOCATION.
003000  000000          TIME1:: .WORD   0               ;TIME COUNT 1.
003002  000000          TIME2:: .WORD   0               ;TIME COUNT 2.
003004  000000          JLOOP:: .WORD   0               ;JMP COMMAND LOOP COUNT.
003006  000000          JLOC::  .WORD   0               ;JMP COMMAND LOCATION COUNT.
003010  000000          PATERN:: .WORD  0               ;PATTERN SELECT CODE.
003012  000000          CTCC::  .WORD   0               ;CURRENT TERMINATION CLASS CODE.
003014  000000          R5SAVE:: .WORD  0               ;LOCATION FOR SAVING CURRENT DEVICE POINTER.
```

```
                                ;       ERROR FLAG AREA, THESE FLAGS ARE CLEARED DURING INITIALIZATION AND
                                ;       AFTER EACH COMMAND IS COMPLETED.

                    003016      BGNFLG=.
003016  000000      RETRYC:: .WORD  0               ;# OF RECOVERY ATTEMPTS EXECUTED.
003020     000      RECLOG:: .BYTE  0               ;RECORD COUNT HAS BEEN UPDATED FOR THIS RECORD.
003021     000      ERLOG:: .BYTE   0               ;DATA BYTES AND ERRORS HAVE BEEN LOGGED FOR THIS RECORD.
003022     000      RWERR:: .BYTE   0               ;READ/WRITE ERROR HAS OCCURED.
003023     000      UNREC:: .BYTE   0               ;UNRECOVERABLE ERROR HAS OCCURED.
003024     000      ERRREC:: .BYTE  0               ;ERROR RECOVERY MODE.
003025     000      DROPED:: .BYTE  0               ;CURRENT UNIT HAS BEEN DROPPED
                                .EVEN
                    003026      ENDERF=.

                                ;       ADDITIONAL FLAGS, THESE FLAGS ARE CLEARED DURING INITIALIZATION.

003026  000004      .NTFLG:: .BLKW  4               ;INTERRUPT OCCURRED FLAGS FOR EACH DEVICE.
003036     000      RANDOM:: .BYTE  0               ;RANDOM EVERYTHING FLAG.
003037     000      VFYFLG:: .BYTE  0               ;SET DURING WRITE/VERIFY COMMAND.
003040     000      EOTFLG:: .BYTE  0               ;EOT HAS BEEN REACHED ON THIS PASS
003041     000      RPTFLG:: .BYTE  0               ;PERFORMANCE REPORT HAS BEEN REQUESTED.
003042     000      SWBFLG:: .BYTE  0               ;ENABLES SWAP BYTE FUNCTION WHEN NOT EQUAL TO ZERO.
003043     000      IRE::   .BYTE   0               ;INHIBIT RESIDUAL FRAME COUNT ERROR REPORT.
                                .EVEN
                    003044      ENDFLG=.

                                ;       ADDITIONAL FLAGS, THESE FLAGS ARE CLEARED ONLY AFTER BEING CHECKED.

003044     000      STAFLG:: .BYTE  0               ;START FLAG - SET BY INIT CODE IF STARTING.
003045     000      PWRFLG:: .BYTE  0               ;POWER FAILURE FLAG - SET ONLY DURING INIT.
                                .EVEN
```

```
                                        ;THE FOLLOWING IS THE COMMAND SEQUENCE TABLE.  THE TABLE
                                        ;HAS DEFAULT VALUES AT PROGRAM LOAD AS SHOWN.  THESE VALUES
                                        ;CAN BE UPDATED BY A TEST OR BY OPERATOR INPUT.

003046  140004          CMDSEQ:: .WORD  SCH             ;SET CHARACTERISTICS.
003050  000040                   .WORD  CH.EAI
003052  000001                   .WORD  1
003054  000000                   .WORD  0
003056  104105          CMDSE2:: .WORD  WTV             ;WRITE VERIFY
003060  010000                   .WORD  DATCNT          ;MAX BUFFER LENGTH.
003062  000012                   .WORD  00012           ;;TEN TIMES.
003064  000007                   .WORD  RANP            ;RANDOM PATTERN.
003066  104105                   .WORD  WTV             ;WRITE VERIFY..
003070  010000                   .WORD  DATCNT          ;MAX BUFFER LENGTH.
003072  000012                   .WORD  00012           ;TEN TIMES;
003074  000007                   .WORD  RANP            ;RANDOM PATTERN.
003076  104105                   .WORD  WTV             ;WRITE VERIFY.
003100  010000                   .WORD  DATCNT          ;MAX BUFFER LENGTH.
003102  000012                   .WORD  00012           ;TEN TIMES.
003104  000007                   .WORD  RANP            ;RANDOM PATTERN.
003106  104105                   .WORD  WTV             ;WRITE VERIFY.
003110  010000                   .WORD  DATCNT          ;MAX BUFFER LENGTH.
003112  000012                   .WORD  00012           ;TEN TIMES.
003114  000007                   .WORD  RANP            ;RANDOM PATTERN.
003116  000004                   .BLKW  4               ;EXTENSTION TO HOLD 1 MORE CMD.
003126  177777          SEQEND:: .WORD  END             ;SOFT END OF SEQUENCE TABLE.
003130  177777                   .WORD  END
003132  177777                   .WORD  END
003134  177777                   .WORD  END
003136  177777                   .WORD  END             ;HARD END OF SEQUENCE TABLE.
```

```
2882                                    ;THE FOLLOWING IS THE TS04 COMMAND TABLE
2883
2884  003140  100013          CMDTBL:: .WORD  DRI             ;DRIVE INIT.
2885  003142  104001                   .WORD  RDF             ;READ FORWARD.
2886  003144  104401                   .WORD  RDR             ;READ REVERSE.
2887  003146  104005                   .WORD  WRT             ;WRITE
2888  003150  104105                   .WORD  WTV             ;WRITE/VERIFY.  (WRITE ALL RECORDS, RDR AND
2889                                                           ;CHECK DATA ON ALL RECORDS, RDF AND
2890                                                           ;CHECK DATA ON ALL RECORDS.)
2891  003152  104010                   .WORD  SRF             ;SPACE 'N'' RECORDS FORWARD.
2892  003154  104410                   .WORD  SRR             ;SPACE 'N'' RECORDS REVERSE.
2893  003156  105401                   .WORD  RNR             ;READ NEXT REVERSE. I.E., SPACE FWD, READ REVERSE.
2894  003160  125401                   .WORD  RNF             ;READ NEXT FORWARD, I.E., READ FORWARD, SPACE REVERSE.
2895  003162  105001                   .WORD  RPF             ;READ PREVIOUS FORWARD. I.E., SPACE REVERSE, READ FORWAR
2896  003164  125001                   .WORD  RPR             ;READ PREVIOUS REVERSE. I.E., READ REVERSE, SPACE FORWAR
2897  003166  105005                   .WORD  WRR             ;WRITE RETRY.
2898  003170  102010                   .WORD  RWD             ;REWIND.
2899  003172  100012                   .WORD  MBR             ;MESSAGE BUFFER RELEASE
2900  003174  100011                   .WORD  WTM             ;WRITE TAPE MARK
2901  003176  101011                   .WORD  WTR             ;WRITE TAPE MARK RETRY.
2902  003200  105010                   .WORD  SFF             ;SPACE 'N'' FILES FORWARD.
2903  003202  105410                   .WORD  SFR             ;SPACE 'N'' FILES REVERSE.
2904  003204  100017                   .WORD  GES             ;GET EXTENDED STATUS.
2905  003206  100411                   .WORD  ERS             ;ERASE 3 INCHES OF TAPE.
2906  003210  100412                   .WORD  UNL             ;REWIND AND UNLOAD.
2907  003212  101012                   .WORD  CLN             ;CLEAR TAPE.
2908  003214  140004                   .WORD  SCH             ;SET CHARACTERISTICS.
2909  003216  100006                   .WORD  DIA             ;DIAGNOSTIC COMMAND.
2910  003220  000040                   .WORD  JMP             ;JUMP TO THE NTH COMMAND IN THE SEQUENCE.
2911  003222  000020                   .WORD  DLY             ;DELAY 'N'' MS.
2912  00322?  177777                   .WORD  END             ;END OF COMMAND TABLE
2913
```

```
2914                                    ;       THE FOLLOWING TABLE CONTAINS THE ASCII FOR EACH COMMAND.
2915
2916  003226  051104      111           CMDASC:: .ASCII /DRI/          ;DRIVE INIT.
2917          003232                            .EVEN
2918  003232  042122      106                   .ASCII  /RDF/          ;READ FORWARD.
2919          003236                            .EVEN
2920  003236  042122      122                   .ASCII  /RDR/          ;READ REVERSE.
2921          003242                            .EVEN
2922  003242  051127      124                   .ASCII  /WRT/          ;WRITE
2923          003246                            .EVEN
2924  003246  052127      126                   .ASCII  /WTV/          ;WRITE/VERIFY.  (WRITE ALL RECORDS, RDR AND CHECK DATA
2925                                                                    ;ON ALL RECORDS, RDF AND CHECK DATA ON ALL RECORDS.)
2926          003252                            .EVEN
2927  003252  051123      106                   .ASCII  /SRF/          ;SPACE 'N'' RECORDS FORWARD.
2928          003256                            .EVEN
2929  003256  051123      122                   .ASCII  /SRR/          ;SPACE 'N''  RECORDS REVERSE.
2930          003262                            .EVEN
2931  003262  047122      122                   .ASCII  /RNR/          ;READ NEXT REVERSE. I.E., SPACE FWD READ REVERSE.
2932          003266                            .EVEN
2933  003266  047122      106                   .ASCII  /RNF/          ;READ NEXT FORWARD, I.E., READ FORWARD, SPACE REVERSE.
2934          003272                            .EVEN
2935  003272  050122      106                   .ASCII  /RPF/          ;READ PREVIOUS FORWARD. IE., SPACE REVERSE, READ FORWARD
2936          003276                            .EVEN
2937  003276  050122      122                   .ASCII  /RPR/          ;READ PREVIOUS REVERSE. IE., READ REVERSE, SPACE FORWARD
2938          003302                            .EVEN
2939  003302  051127      122                   .ASCII  /WRR/          ;WRITE RETRY.
2940          003306                            .EVEN
2941  003306  053522      104                   .ASCII  /RWD/          ;REWIND.
2942          003312                            .EVEN
2943  003312  041115      122                   .ASCII  /MBR/          ;MESSAGE BUFFER RELEASE
2944          003316                            .EVEN
2945  003316  052127      115                   .ASCII  /WTM/          ;WRITE TAPE MARK
2946          003322                            .EVEN
2947  003322  052127      122                   .ASCII  /WTR/          ;WRITE TAPE MARK RETRY.
2948          003326                            .EVEN
2949  003326  043123      106                   .ASCII  /SFF/          ;SPACE 'N'' FILES FORWARD.
2950          003332                            .EVEN
2951  003332  043123      122                   .ASCII  /SFR/          ;SPACE 'N'' FILES REVERSE.
2952          003336                            .EVEN
2953  003336  042507      123                   .ASCII  /GES/          ;GET EXTENDED STATUS.
2954          003342                            .EVEN
2955  003342  051105      123                   .ASCII  /ERS/          ;ERASE 3 INCHES OF TAPE.
2956          003346                            .EVEN
2957  003346  047125      114                   .ASCII  /UNL/          ;REWIND AND UNLOAD.
2958          003352                            .EVEN
2959  003352  046103      116                   .ASCII  /CLN/          ;CLEAN TAPE.
2960          003356                            .EVEN
2961  003356  041523      110                   .ASCII  /SCH/          ;SET CHARACTERISTICS.  WHERE BRF=200, 40, 20, 0.
2962                                                                    ;SEE TS11/TS04 PROGRAMMING SPECIFICATION FOR DESCRIPTION
2963          003362                            .EVEN
2964  003362  044504      101                   .ASCII  /DIA/          ;DIAGNOSTICS.  SEE TS11/TS04 PROGRAMMING SPECIFICATION
2965                                                                    ;FOR DESCRIPTION.  ODT MUST BE USED TO LOAD DIAGNOSTIC D
2966                                                                    ;INTO THE WRITE BUFFER BEFORE THIS CMD IS ISSUED.
2967          003366                            .EVEN
2968  003366  046512      120                   .ASCII  /JMP/          ;JUMP TO THE NTH COMMAND IN THE COMMAND
2969                                                                    ;SEQUENCE TABLE, WHERE N IS DEFINED IN
```

```
2970                                                    ;THE # OF OPERATIONS.
2971            003372          .EVEN
2972  003372   046104    131    .ASCII  /DLY/          ;DELAY 'N'' MS, WHERE N IS DEFINED IN
2973                                                    ;THE # OF OPERATIONS.
2974
2975            003376          .EVEN
2976  003376   047105    104    .ASCII  /END/          ;END OF COMMAND SEQUENCE.
2977            003402          .EVEN
2978
2979
2980
2981                    ;*******************************************************************************
2982                    ;*******************************************************************************
2983                    ;       PATCH AREA
2984
2985  003402   000102          .BLKW   66.
2986                    ;*******************************************************************************
2987                    ;*******************************************************************************
```

```
                                .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
                                ;
                                        DEVTYP  <TS04>
003606                          L$DVTYP::


                                ;
                                ; FORMAT STATEMENTS USED IN PRINT CALLS
                                ;

                                        .NLIST  BEX

003614  051524  032060  042040  DESCM:: .ASCIZ  /TS04 DRT/
003625     045  022516  052501  CODELM:: .ASCIZ /%N%AUNIT %D1%S2%ATS04 CODE LEVEL = P%03%N%N/
           003702                       .EVEN
003702  054130  020130  046503  HALTM:: .ASCIZ  /XXX CMD - TYPE <CR> TO CONTINUE/
003742  046503  020104  040520  CMDPKM:: .ASCIZ /CMD PACKET ADR NOT ON MODULO 4 BOUNDRY/
           004012                       .EVEN
004012  054130  020130  040504  W1VERM:: .ASCIZ /XXX DATA COMPARE ERROR/
004041     116  020117  051524  TOERM:: .ASCIZ  /NO TS04 RESPONSE/
004062  047125  042504  044506  SCERM:: .ASCIZ  /UNDEFINED SPECIAL CONDITION/
004116  043122  020103  047516  RFCERM:: .ASCIZ /RFC NON ZERO/
004133     124  030123  020064  NSSRM:: .ASCIZ  /TS04 NOT READY/
004152  042522  051124  020131  RLEXM:: .ASCIZ  /RETRY LIMIT EXCEEDED ON ABOVE ERROR/
004216  052101  042524  052116  ATTNM:: .ASCIZ  /ATTENTION CONDITION - UNIT OFF LINE/
004262  052506  041516  044524  FUNRM:: .ASCIZ  /FUNCTION REJECT/
004302  040506  040524  020114  FATSM:: .ASCIZ  /FATAL SUBSYSTEM ERROR/
004330  047516  044440  052116  NOINTM:: .ASCIZ /NO INTERRUPT/
004345     124  050101  020105  TSAM::  .ASCIZ  /TAPE STATUS ALERT/
004367     124  047517  046440  TOOMM:: .ASCIZ  /TOO MANY INTERRUPTS/
004413     103  050101  052123  RNYM::  .ASCIZ  /CAPSTAN RUNAWAY/
004433     122  041505  053117  RERM::  .ASCIZ  /RECOVERABLE ERROR/
004455     125  051116  041505  URERM:: .ASCIZ  /UNRECOVERABLE ERROR/
004501     045  022516  052501  DROPDM:: .ASCIZ /%N%AUNIT %D1%A HAS BEEN DROPPED%N/
004543     045  022516  040501  AUDRPM:: .ASCIZ /%N%AALL UNITS DROPPED%N%N/
                                .LIST   BEX
004576                          .EVEN
```

```
3009                                    .SBTTL  GLOBAL ERROR REPORT SECTION
3010
3011                                    ;++
3012                                    ; THE GLOBAL ERROR REPORT SECTION CONTAINS THE PRINTB AND PRINTX CALLS
3013                                    ; THAT ARE USED IN MORE THAN ONE TEST.  IT ALSO INCLUDES THE ASCII MESSAGES
3014                                    ; THAT ARE USED BY THE PRINTB AND PRINTX CALLS..
3015                                    ;--
3016
3017
3018  004576                                    BGNMSG  DTAERM
3019  004576                            DTAERM::
3020
3021  004576                                    PRINTB  #DTAER1,DEVTBL(R5),<B,TIME1>,<B,TIME2>,R2,RECCNT(R5)
3022
3023  004644                                    EXIT    MSG
3024
3025
3026
3027                                      .NLIST  BEX
      004650  040445  047125  052111    DTAER1: .ASCIZ  '%AUNIT %D1%A  WAS:%B8%A  S/B:%B8%A  BYTE:%D4%A  RECORD:%D5%N''
                                          .LIST   BEX
3028          004746                      .EVEN
3029
3030  004746                                    ENDMSG
3031  004746                            L10002:
3032
3033  004750                                    BGNMSG  STAERM
3034  004750                            STAERM::
3035
3036  004750                                    PRINTB  #STAER1,DEVTBL(R5),PASCNT(R5),RECCNT(R5)
3037  005004                                    PRINTX  #STAER7
3038  005024                                    PRINTX  #STAER2
3039  005044                                    PRINTX  #STAER3,CMDPKT,@TSDB(R5),MSGPKT+MS.RFC,@TSSR(R5),CTCC
3040  005110                                    PRINTX  #STAER4,CMDPKT+2,CMDPKT+4,CMDPKT+6
3041  005144                                    PRINTX  #STAER0
3042  005164                                    PRINTX  #STAER6,MSGPKT+MS.XS0,MSGPKT+MS.XS1,MSGPKT+MS.XS2,MSGPKT+MS.XS3
3043  005224                                    EXIT    MSG
3044
3045                                      .NLIST  BEX
      005230  040445  054130  020130    STAER1: .ASCIZ  /%AXXX CMD FAILED - UNIT %D1%S3%APASS:%D5%S3%ARECORD:%D5%N/
                                          .EVEN
      005322  040445  051120  053105    STAER7: .ASCIZ  /%APREVIOUS CMD WAS  XXX %N/
      005355     045  041501  042115    STAER2: .ASCIZ  /%ACMDPKT%S2%ATSBA%S4%ARFC%S5%ATSSR%S3%ATCC%N/
      005432  047445  022466  031123    STAER3: .ASCIZ  /%06%S2%06%S2%06%S2%06%S2%D1%N/
      005470  047445  022466     116    STAER4: .ASCII  /%06%N/
      005475     045  033117  047045            .ASCII  /%06%N/
      005502  047445  022466  000116            .ASCIZ  /%06%N/
      005510  040445  051530  030124    STAER0: .ASCIZ  /%AXST0%S4%AXST1%S4%AXST2%S4%AXST3%N/
      005554  047445  022466  031123    STAER6: .ASCIZ  /%06%S2%06%S2%06%S2%06%N/
                                          .LIST   BEX
3046                                      .EVEN
3047
3048  005604                                    ENDMSG
3049  005604                            L10003:
```

```
 3050  005606                                  BGNMSG  NURTYM
 3051  005606                          NURTYM::
 3052  005606                                  EXIT    MSG
 3053
 3054                                          .NLIST  BEX
       005612  040445  042522  047503  NURTY1: .ASCIZ  /%ARECOVERED FROM ABOVE ERROR ON RETRY #%D2%A.%N/
                                                .LIST   BEX
 3055                                           .EVEN
 3056
 3057  005672                                  ENDMSG
 3058  005672                          L10004:
```

```
                        .SBTTL  GLOBAL SUBROUTINES SECTION

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

                        ;       MODULES TO HANDLE TS04 INTERRUPTS.

005674                          BGNSRV  TS4IN0                  ;DEVICE 0.
005674                  TS4IN0::
005674                          SETPRI INTPRI                   ;SET INTERRUPT PRIORITY.
005702                          LET INTFLG := INTFLG + #1        ;SET INTERRUPT OCCURRED FLAG.
005706                          ENDSRV
005706                  L10005:

005710                          BGNSRV  TS4IN1                  ;DEVICE 1.
005710                  TS4IN1::
005710                          SETPRI INTPRI                   ;SET INTERRUPT PRIORITY.
005716                          LET INTFLG+2 := INTFLG+2 + #1    ;SET INTERRUPT OCCURRED FLAG.
005722                          ENDSRV
005722                  L10006:

005724                          BGNSRV  TS4IN2                  ;DEVICE 2.
005724                  TS4IN2::
005724                          SETPRI INTPRI                   ;SET INTERRUPT PRIORITY.
005732                          LET INTFLG+4 := INTFLG+4 + #1    ;SET INTERRUPT OCCURRED FLAG.
005736                          ENDSRV
005736                  L10007:

005740                          BGNSRV  TS4IN3                  ;DEVICE 3.
005740                  TS4IN3::
005740                          SETPRI INTPRI                   ;SET INTERRUPT PRIORITY.
005746                          LET INTFLG+6 := INTFLG+6 + #1    ;SET INTERRUPT OCCURRED FLAG.
005752                          ENDSRV
005752                  L10010:

    :
```

```
                                        ;       SUBROUTINE TO STORE A  SET CHARACTERISTIC COMMAND AS
                                        ;       THE FIRST ENTRY IN THE SEQUENCE TABLE.
                                        ;       INPUTS:
                                        ;       OUTPUTS:
                                        ;       REGISTERS:
                                        ;       CALLS:

005754                                  SETCH:: LET R1 := #CMDSEQ               ;INIT COMMAND SEQUENCE TABLE POINTER.
005760  012721  140004                          MOV     #SCH,(R1)+              ;THIS CODE SETS UP A SET CHARACTERISTIC
005764  012721  000040                          MOV     #DFTSCH,(R1)+           ;COMMAND AS THE FIRST COMMAND IN THE
005770  012721  000001                          MOV     #1,(R1)+                ;SEQUENCE TABLE.
005774  005721                                  TST     (R1)+                   ;SKIP PATTERN LOCATION.
005776  000207                                  RTS PC


                                        ;       SUBROUTINE TO STORE A REWIND COMMAND IN THE SEQUENCE TABLE
                                        ;       INPUTS:
                                        ;       OUTPUTS:
                                        ;       REGISTERS:
                                        ;       CALLS:

006000                                  SETRW:: LET (R1)+ := #RWD               ;CMD = REWIND.
006004                                          LET (R1)+ := #1                 ;BRF.
006010                                          LET (R1)+ := #1                 ;# OF OPERATIONS.
006014  005721                                  TST (R1)+                       ;SKIP PATTERN.
006016  000207                                  RTS     PC                      ;RETURN
```

```
3123                                    ;       SUBROUTINE TO EXECUTE ALL COMMANDS IN THE SEQUENCE TABLE ON ALL
3124                                    ;       DEVICES.
3125                                    ;       INPUTS:
3126                                    ;       OUTPUTS:        R2 = TERMINATION INDICATOR (0=END OF TABLE,1-EOT)
3127                                    ;       REGISTERS:
3128                                    ;       CALLS:          CMDAC,SETUP,EXECUTE,GOWAIT,CKHAE,NEXTU,FIRSTU,VFYDAT.
3129
3130  006020                            EXALL:: LET R1 := #CMDSEQ                       ;INIT SEQUENCE TABLE POINTER.
3131  006024                                    WHILE (R1) NE #END DO                   ;WHILE THERE ARE CMDS IN THE SEQUENCE TABLE.
3132  006032  004737  006450                    JSR   PC,SETUP                          ;GO SETUP THE COMMAND BLOCK.
3133  006036                                    WHILE NCNT NE #0 DO                     ;WHILE THERE ARE RECORDS REMAINING:
3134  006044  004737  006360                      JSR PC,CMDAC                          ;STORE CMD ASCII IN ERROR MESSAGE.
3135  006050                                      IFB RANDOM NE #0 THEN               ;IF IN RANDOM MODE:
3136  006056                                        IF CMDWRD EQ #WRT THEN            ;IF CMD IS A WRITE THEN:
3137  006066                                          IFB VFYFLG NE #0 THEN           ;IF DATA IS TO BE VERIFIED THEN:
3138  006074                                            LET BRFCNT := RANS CLR.BY #177740 ;ALLOW BYTE COUNT OF 16-31.
3139  006110                                          FLSE                            ;ELSE IF DATA IS NOT TO BE VERIFIED:
3140  006112                                            LET RANB := RANB + RANS
3141  006120                                            LET RANS := RANS + RANB
3142  006126                                            LET BRFCNT := RANS CLR.BY LENMSK  ;SET UP RANDOM LENGTH
3143  006142                                          ENDIF
3144  006142                                          IF BRFCNT LT #^D16 THEN ;DO NOT ALLOW BYTE COUNT OF LESS THAN 16.
3145  006152                                            LET BRFCNT :- #20             ;CHANGE 0 TO 16 BYTES.
3146  006160                                          ENDIF
3147  006160                                          LET CMDPKT+CP.CNT := BRFCNT   ;MOVE BRF TO CMD PACKET.
3148  006166                                        ENDIF
3149  006166                                      ENDIF
3150  006166  004737  012300                      JSR PC,FIRSTU                       ;SET UP FOR FIRST UNIT.
3151  006172                                      IF DEVTBL(R5) EQ #END THEN          ;IF ALL DEVICES HAVE BEEN DROPPED:
3152  006202                                        DOCLN                               ;DO CLEAN CODE + TERMINATE PASS.
3153  006204                                      ENDIF
3154  006204                                      WHILE DEVTBL(R5) NE #END DO ;WHILE THERE ARE MORE DEVICES:
3155  006214  004737  007316                        JSR       PC,EXCUTE               ;GO EXECUTE THE COMMAND.
3156  006220  004737  012326                        JSR       PC,NEXTU                ;FIND NEXT UNIT IN TEST CYCLE.
3157  006224                                      ENDDO
3158  006226                                      IFB RPTFLG NE #0 THEN               ;IF REPORT HAS BEEN REQUESTED THEN:
3159  006234                                        LET RPTFLG :B= #0                 ;CLR THE FLAG,
3160  006240                                        DORPT                             ;PRINT THE PERFORMANCE REPORT.
3161  006242                                      ENDIF                               ;
3162  006242  004737  012300                      JSR PC,FIRSTU                       ;SET UP FOR FIRST UNIT.
3163  006246                                      WHILE DEVTBL(R5) NE #END DO ;WHILE THERE ARE MORE DEVICES:
3164  006256  004737  007600                        JSR       PC,GOWAIT               ;GO WAIT FOR INTERRUPT + CHECK FOR ERRORS.
3165  006262                                        IF #X0.EOT SETIN MSGPKT+MS.XS0 THEN       ;IF AT EOT:
3166  006272                                          LET EOTFLG :B= #1               ;SET EOT FLAG.
3167  006300                                        ENDIF
3168  006300  004737  012326                        JSR       PC,NEXTU                ;FIND NEXT UNIT IN TEST CYCLE.
3169  006304                                      ENDDO
3170  006306  004737  012672                      JSR PC,CKHAE                        ;CHECK HALT AFTER EACH CMD FLAG.
3171  006312                                      IFB EOTFLG NE #0 THEN               ;IF EOT HAS BEEN REACHED THEN:
3172  006320                                        LET EOTFLG :B= #0                 ;CLR EOT FLAG,
3173  006324                                        LET R2 := #1                      ;SET EOT INDICATORS
3174  006330  000412                               BR        EXARTN                  ;RETURN
3175  006332                                      ENDIF
3176  006332                                      LET NCNT := NCNT - #1               ;UPDATE RECORD COUNT.
3177  006336                                      LET PCMDWD := CMDWRD                ;SAVE PREVIOUS COMMAND WORD.
3178  006344                                    ENDDO
```

```
3179  006346  004737  011540                    JSR   PC,VFYDAT              ;IF LAST CMD WAS A WRITE VERIFY, THEN GO
3180                                                                           ;VERIFY THE LAST N RECORDS OF DATA.
3181  006352                                    ENDDO
3182  006354                                    LET R2 := #0                   ;SET NORMAL RETURN INDICATOR.
3183  006356  000207                     EXARTN: RTS PC                         ;RETURN.
3184
3185
3186
3187                                      ;     THIS SUBROUTINE STORES THE ASCII FOR THE CURRENT COMMAND AND PREVIOUS
3188                                      ;     COMMAND IN THE STANDARD ERROR MESSAGE.  ON ENTRY LOCATION CMDWRD
3189                                      ;     CONTAINS CURRENT CMD AND LOCATION DCMWD CONTAINS PREVIOUS CMD.
3190                                      ;     INPUTS:
3191                                      ;     OUTPUTS:
3192                                      ;     REGISTERS:      R3, R4.
3193                                      ;     CALLS:          GCMDA
3194
3195  006360                              CMDAC:: LET R4 := CMDWRD               ;R4 = CMD BINARY.
3196  006364  004737  006422                     JSR     PC,GCMDA              ;GET CMD ASCII.
3197  006370  012337  005232                     MOV     (R3)+,STAER1+2        ;MOVE CMD ASCII
3198  006374  111337  005234                     MOVB    (R3),STAER1+4         ;INTO MSG.
3199  006400                                    LET R4 := PCMDWD               ;R4 = PREVIOUS CMD BINARY.
3200  006404  004737  006422                     JSR     PC,GCMDA              ;GET CMD ASCII.
3201  006410                                    LET STAER7+24 := (R3)+         ;MOVE CMD ASCII
3202  006414                                    LET STAER7+26 :B= (R3)         ;INTO MSG.
3203  006420  000207                           RTS     PC                     ;RETURN. GO EXECUTE NEXT FUNCTION.
3204
3205
3206
3207                                      ;     SUBROUTINE TO FIND THE ASCII EQUIVILENT OF THE COMMAND IN R4.
3208                                      ;     ADDRESS OF ASCII 1ST WORD IS RETURNED IN R3.
3209                                      ;     INPUTS:         R4 = PRESENT COMMAND WORD.
3210                                      ;     OUTPUTS:        R3 = ADDRESS OF PRESENT COMMAND ASCII.
3211                                      ;     REGISTERS:
3212                                      ;     CALLS:
3213
3214  006422                              GCMDA:: LET R3 := #0                   ;INIT CMD TBL POINTER.
3215  006424                                    WHILE CMDTBL(R3) NE R4 DO       ;UNTIL CURRENT CMD IS FOUND:
3216  006432                                      LET R3 := R3 + #2             ;SEARCH CMD TABLE.
3217  006436                                    ENDDO
3218  006440                                    LET R3 := R3 SHIFT +1 + #CMDASC ;POINT TO ASCII FOR THAT COMMAND.
3219  006446  000207                           RTS     PC                     ;RETURN.
```

```
3220                                    ;       THIS SUBROUTINE LOADS THE TS04 COMMAND PACKET FROM ONE
3221                                    ;       ENTRY IN THE SEQUENCE TABLE.
3222                                    ;       INPUTS:
3223                                    ;       OUTPUTS:
3224                                    ;       REGISTERS:      R2, R3.
3225                                    ;       CALLS:          GENPAT.
3226
3227  006450                            SETUP:: LET CMDLG := #0                 ;CLR CMD LOGGING CODE(DISABLES LOGGING)
3228  006454  012137  002224                   MOV     (R1)+,CMDPKT            ;LOAD THE COMMAND WORD.
3229  006460  011137  002232                   MOV     (R1),CMDPKT+CP.CNT      ;LOAD THE BYTE/RECORD/FILE COUNT.
3230  006464  011137  002760                   MOV     (R1),BRFCNT             ;SAVE BRF FOR THIS COMMAND.
3231  006470  013702  002224                   MOV     CMDPKT,R2               ;GET CMD.
3232  006474  042702  177740                   BIC     #NCMD.C,R2              ;CLR ALL BUT CMD BITS.
3233  006500  010203                           MOV     R2,R3                   ;SAVE IT TWICE.
3234  006502  162703  000010                   SUB     #CMD.C3,R3              ;POSITION COMMAND?
3235  006506  001003                           BNE     2$                      ;BR IF NOT.
3236  006510  011137  002226                   MOV     (R1),CMDPKT+2           ;MOVE BPCR IN 2ND PKT WORD FOR POSITION CMD.
3237  006514  000461                           BR      3$
3238  006516                            2$:     IF CMDPKT EQ #WTM THEN          ;IF CMD IS A WRITE TAPE MARK THEN:
3239  006526                                      LET CMDLG :- #2                 ;WTM LOGGING CODE IS 2.
3240  006534                                    ENDIF
3241  006534  010203                           MOV     R2,R3
3242  006536  162703  000001                   SUB     #CMD.C0,R3              ;IS IT A READ?
3243  006542  001017                           BNE     1$                      ;BR IF NOT.
3244  006544  013737  002752  002226           MOV     DATARD,CMDPKT+CP.ADL    ;IF SO, LOAD THE BUFFER ADDR.
3245  006552                                    IF #MOD.C0 SETIN CMDPKT THEN    ;IF CMD IS A READ REV THEN:
3246  006562                                      LET CMDLG := #4                 ;LOGGING CODE IS 4.
3247  006570                                    ELSE                            ;ELSE - IF CMD IS A READ FWD:
3248  006572                                      LET CMDLG := #6                 ;LOGGING CODE IS 6.
3249  006600                                    ENDIF
3250  006600  000427                           BR      3$                      ;CONTINUE.
3251  006602  010203                    1$:    MOV     R2,R3                   ;IS IT
3252  006604  162703  000004                   SUB     #CMD.C2,R3              ;A SET CHARACTERISTICS CMD?
3253  006610  001011                           BNE     4$                      ;BR IF NOT.
3254  006612                                    LET CMDPKT+CP.ADL := #SCHBK     ;SET UP ADR LO FOR SET CHAR.
3255  006620  012737  000010  002232           MOV     #SCHCNT,CMDPKT+CP.CNT   ;SET BUFFER EXTENT
3256  006626                                    LET SCHBK+6 := (R1)             ;STORE CHARACTERISTIC CODE IN SCH BLOCK.
3257  006632  000412                           BR      3$                      ;CONTINUE.
3258  006634  010203                    4$:    MOV     R2,R3                   ;IS IT
3259  006636  162703  000006                   SUB     #CMD.C1!CMD.C2,R3       ;A DIAGNOSTIC (DIA) CMD?
3260  006642  001006                           BNE     3$                      ;BR IF NOT.
3261  006644  012737  000020  002232           MOV     #DIACNT,CMDPKT+CP.CNT   ;LOAD BUFFER EXTENT.
3262  006652  012737  002750  002226           MOV     #DIABLK,CMDPKT+CP.ADL   ;LOAD BUFFER ADR LOW.
3263  006660  005721                    3$:    TST     (R1)+                   ;POINT TO N (NUMBER OF TIMES TO EXECUTE THIS INS
3264  006662  012137  002754                   MOV     (R1)+,NCNT              ;SAVE N.
3265  006666                                    LET NCNT1 := NCNT               ;SAVE N.
3266  006674  012137  003010                   MOV     (R1)+,PATERN            ;SAVE PATTERN CODE FOR CURRENT CMD.
3267  006700  010203                           MOV     R2,R3                   ;IS IT
3268  006702  162703  000005                   SUB     #CMD.C0!CMD.C2,R3       ;A WRITE?
3269  006706  001010                           BNE     5$                      ;BR IF NOT.
3270  006710  013737  002750  002226           MOV     DATAWT,CMDPKT+CP.ADL    ;LOAD WRITE BUFFER LO ORDER.
3271  006716  004737  007030                   JSR     PC,GENPAT               ;GO GENERATE THE WRITE PATTERN.
3272  006722                                    LET CMDLG := #2                 ;WRITE LOGGING CODE IS 2.
3273  006730                            5$:     IF #VFY.C SETIN CMDPKT THEN     ;IF DATA VERIFICATION IS REQUIRED:
3274  006740                                      LET VFY.G :B- #1                ;SET VERIFY FLAG.
3275  006746  042737  000100  002224             BIC   #VFY.C,CMDPKT             ;CLEAR VERIFY BIT(NOT USED BY HARDWARE).
```

```
3276  006754                                  ELSE                                    ;IF DATA VERIFICATION IS NOT REQUIRED:
3277  006756                                    LET VFYFLG :B= #0                     ;CLR VERIFY FLAG.
3278  006762                                  ENDIF
3279  006762                                  LET PCMDWD := CMDWRD                    ;SAVE PREVIOUS CMD WORD.
3280  006770                                  LET CMDWRD := CMDPKT                    ;SAVE PRESENT CMD WORD.
3281  006776                                  IFB SWBFLG NE #0 THEN                   ;IF SWAP BYTES IS ENABLED:
3282  007004                                    LET CMDPKT := CMDPKT SET.BY #SWB.C    ;SET SWAP BIT IN COMMAND.
3283  007012                                  ENDIF
3284  007012  042737  004000  002224          BIC     #BRF.C,CMDPKT                   ;CLR BRF BIT (INTERNAL ONLY).
3285  007020                                  LET CMDSAV := CMDPKT                    ;SAVE 1ST WORD OF COMMAND PACKET.
3286  007026  000207                          RTS     PC                              ;RETURN.
```

```
3287                                    ;       THIS SUBROUTINE SETS UP AND CALLS THE APPROPRIATE SUBROUTINE TO GENERATE
3288                                    ;       THE DESIRED PATTERN FOR THE WRITE AND WRITE/VERIFY COMMANDS.
3289                                    ;       INPUTS:
3290                                    ;       OUTPUTS:
3291                                    ;       REGISTERS:      R2, R3, R4.
3292                                    ;       CALLS:          PATR0 - PATR7
3293
3294  007030  013703  003010            GENPAT:: MOV    PATERN,R3
3295  007034                                  LET R3 := R3 SHIFT 1    ;SET UP PATTERN ROUTINE POINTER.
3296  007036  013704  002760                  MOV     BRFCNT,R4       ;SAVE BYTE COUNT.
3297  007042  005204                          INC     R4              ;
3298  007044                                  LET R4 := R4 CLR.BY #1  ;
3299  007050  013702  002750                  MOV     DATAWT,R2       ;SAVE DATA WRITE BUFFER ADDRESS.
3300  007054  004773  007062                  JSR     PC,@PATTBL(R3)  ;GO GENERATE THE APPROPRIATE PATTERN.
3301  007060  000207                          RTS     PC              ;RETURN TO SETUP SUBROUTINE.
3302
3303                                          ;TS04 WRITE PATTERN LOOKUP TABLE.  USED TO JSR TO THE
3304                                          ;CORRECT DATA PATTERN GENERATING ROUTINE.
3305
3306  007062  007104                  PATTBL: PATR0
3307  007064  007142                          PATR1
3308  007066  007162                          PATR2
3309  007070  007172                          PATR3
3310  007072  007216                          PATR4
3311  007074  007230                          PATR5
3312  007076  007242                          PATR6
3313  007100  007262                          PATR7
3314  007102  007314                          PATR8
3315
3316
3317                                          ;INCREMENTING PATTERN.  0 - 377.
3318
3319  007104                          PATR0:: LET R3 := #400
3320  007110                          1$:     LET R4 := R4 - #2       ;DECREMENT WORD COUNT.
3321  007114  100411                          BMI     2$              ;BR IF DONE.
3322  007116                                  LET (R2)+ := R3         ;STORE DATA WORD.
3323  007120                                  LET R3 := R3 + #1002    ;UPDATE PATTERN.
3324  007124                                  IF R3 EQ #1000 THEN     ;IF PATTERN HAS WRAPPED AROUND THEN:
3325  007132                                    LET R3 := #400          ;INIT THE PATTERN AGAIN.
3326  007136                                  ENDIF
3327  007136  000764                          BR      1$              ;DO IT AGAIN.
3328  007140  000207                  2$:     RTS     PC              ;RETURN.
3329
3330                                          ;ALL ONE'S PATTERN.
3331
3332  007142  012703  177777          PATR1:: MOV     #-1,R3          ;ALL ONES PATTERN;.
3333  007146                          ZROPAT: LET R4 := R4 - #2       ;DECREMENT BYTE COUNT.
3334  007152  100402                          BMI     1$              ;DONE?,BR IF YES.
3335  007154  010322                          MOV     R3,(R2)+        ;IF NOT LOAD NEXT BYTE WITH PATTERN.
3336  007156  000773                          BR      ZROPAT          ;DO IT AGAIN.
3337
3338  007160  000207                  1$:     RTS     PC              ;RETURN.
```

```
3339                                        ;ALL ZEROES PATTERN.
3340
3341  007162  005003            PATR2:: CLR     R3              ;CLR PATTERN REGISTER.
3342  007164  004737  007146            JSR     PC,ZROPAT       ;GO GENERATE IT.
3343  007170  000207                    RTS     PC              ;RETURN.
3344
3345                                        ;ONE BIT WALKING FROM R TO L IN A FIELD OF ZEROES.
3346
3347  007172  012703  00040'      PATR3:: MOV     #401,R3         ;INIT PATTERN REGISTER.
3348  007176                      WLKZRO: LET R4 := R4 - #2       ;DECREMENT WORD COUNT.
3349  007202  100404                    BMI     1$              ;BR IF DONE.
3350  007204  010322                    MOV     R3,(R2)+        ;LOAD DATA.
3351  007206  006303                    ASL     R3              ;SHIFT PATTERN.
3352  007210  005503                    ADC     R3              ;ADD CARRY BACK INTO PATTERN.
3353  007212  000771                    BR      WLKZRO          ;DO IT AGAIN.
3354  007214  000207            1$:     RTS     PC              ;RETURN.
3355
3356                                        ;ZERO BIT WALKING FROM R TO L IN A FIELD OF 1'S.
3357
3358  007216  012703  177376      PATR4:: MOV     #177376,R3      ;INIT PATTERN REGISTER.
3359  007222  004737  007176            JSR     PC,WLKZRO       ;GO GENERATE ;IT.
3360  007226  000207                    RTS     PC              ;RETURN.
3361
3362                                        ;ALTERNATING ONE AND ZERO BITS WITH ALTERNATE BYTES
3363                                        ;COMPLEMENTED.
3364
3365  007230  012703  125125      PATR5:: MOV     #125125,R3      ;INIT PATTERN REGISTER.
3366  007234  004737  007146            JSR     PC,ZROPAT       ;GO GENERATE IT.
3367  007240  000207                    RTS     PC              ;RETURN.
3368
3369                                        ;ALTERNATING BYTES OF 000 AND 377.
3370
3371  007242  012703  177400      PATR6:: MOV     #177400,R3      ;INIT PATTERN REGISTER.
3372  007246                      1$:     LET R4 := R4 - #2       ;DECREMENT WORD COUNT.
3373  007252  100402                    BMI     2$              ;BR IF DONE.
3374  007254  010322                    MOV     R3,(R2)+        ;LOAD DATA.
3375  007256  000773                    BR      1$              ;DO IT AGAIN.
3376  007260  000207            2$:     RTS     PC              ;RETURN.
3377
3378                                        ;RANDOM PATTERN GENERATOR
3379
3380  007262                      PATR7:: LET R4 := R4 - #2       ;DECREMENT WORD COUNT
3381  007266  100411                    BMI     GIT             ;BR IF DONE.
3382  007270  063737  002776  002774      ADD     RANS,RANB
3383  007276  063737  002774  002776      ADD     RANB,RANS       ;GET NEW #.
3384  007304  013722  002776            MOV     RANS,(R2)+      ;SAVE #.
3385  007310  000764                    BR      PATR7           ;CONTINUE.
3386  007312  000207            GIT:    RTS     PC              ;RETURN
3387
3388                                        ;       NO PATTERN GENERATION.
3389
3390  007314  000207            PATR8:: RTS     PC              ;RETURN.
```

```
                                ;       THIS SUBROUTINE INITIATES TS04 COMMAND EXECUTION
                                ;       AND CHECKS FOR TS04 RESPONSE.
                                ;       INPUTS:
                                ;       OUTPUTS:
                                ;       REGISTERS:      R2, R3, R4.
                                ;       CALLS:          DROPU, MOVMSG, FIRSTU, NEXTU.

007316                          EXCUTE:: LET TIME1 := #-1                ;INIT TIMEOUT COUNTER.
007324                                   REPEAT                          ;WAIT -
007324                                     LET TIME1 := TIME1 - #1       ;UPDATE TIMEOUT COUNTER.
007330                                     IF TIME1 EQ #0 THEN           ;IF TIMED OUT:
007336  004737  010020                       JSR PC,MOVMSG               ;MOVE CURRENT PACKET MSG.
007342                                       LET R2 := #2                ;ERROR NUMBER.
007346                                       LET R4 := #NSSRM            ;MESSAGE ADDRESS.
007352  004737  012350                       JSR PC,DROPU                ;DROP THE UNIT.
007356  000507                             BR  EXCRTN                    ;RETURN.
007360                                     ENDIF
007360                                   UNTIL #TS.SSR SETIN @TSSR(R5)   ;WAIT UNTIL DEVICE IS READY.
007370                                   IF CMDWRD EQ #SCH THEN          ;IF WE ARE DOING A SET CHAR CMD THEN:
007400                                     LET R5SAVE := R5                ;SAVE CURRENT DEVICE POINTER.
007404  004737  012300                     JSR   PC,FIRSTU                 ;FIND FIRST UNIT.
007410                                     WHILE DEVTBL(R5) NE #END DO
007420  004737  007764                       JSR PC,WSSR                     ;WAIT FOR UNIT READY OR TIME OUT,
007424  004737  012326                       JSR PC,NEXTU                    ;FIND NEXT UNIT.
007430                                     ENDDO
007432                                     LET R5 := R5SAVE                ;RESTORE CURRENT DEVICE POINTER.
007436                                     LET SCHBK := MSGPKA(R5)         ;SET UP ADR OF MSG PKT IN SCH BLOCK.
007444                                   ENDIF
007444                                   LET R3 := MSGPKA(R5)            ;ADR OF THIS UNIT'S MSG PACKET.
007450                                   LET R2 := #0                    ;CLR COUNTER.
007452                                   WHILE R2 NE #MSGCNT DO          ;WHILE THERE ARE MORE LOCATIONS:
007460                                     LET (R3)+ := #-1                ;INIT THE MSG PACKET WITH ALL 1'S
007464                                     LET R2 := R2 + #2               ;UPDATE COUNTER.
007470                                   ENDDO
007472  105737  002142                   TSTB    DINT                    ;ARE INTERRUPTS DISABLED.
007476  001020                           BNE     1$                      ;BR IF YES.
007500                                   IFB INTFLG(R5) GT #1 THEN       ;IF MORE THAN ONE INTERRUPT HAS OCCURED:
007510                                     LET R2 := #15.                  ;ERROR NUMBER,
007514                                     LET R4 := #TOOMM                ;MESSAGE ADDRESS.
007520  004737  012350                     JSR PC,DROPU                    ;DROP THE UNIT
007524  000424                           BR  EXCRTN                      ;RETURN - UNIT HAS BEEN DROPPED.
007526                                   ENDIF
007526                                   LET INTFLG(R5) := #0            ;CLR INTERRUPT FLAG FOR THIS DEV.
007532  052737  000200  002224           BIS     #IE.C,CMDPKT            ;SET INT ENABLE BIT.
007540  012775  002224  002366  1$:      MOV     #CMDPKT,@TSDB(R5)       ;LOAD TSDB WITH CMDPKT ADDRESS
                                                                         ;THIS INITIATES COMMAND EXECUTION.
007546                                   IF #TS.SSR SETIN @TSSR(R5) THEN ;IF READY DID NOT DROP THEN:
007556  004737  010020                     JSR   PC,MOVMSG                 ;MOVE CURRENT MESSAGE PACKET TO COMMON.
007562                                     LET R2 := #3                    ;ERROR NUMBER.
007566                                     LET R4 := #TOERM                ;MESSAGE ADDRESS.
007572  004737  012350                     JSR PC,DROPU                    ;DROP THE UNIT
007576                                   ENDIF
007576  000207                  EXCRTN:  RTS     PC                      ;RETURN.
```

```
                        ;       THIS SUBROUTINE WAITS FOR THE TS04 INERRUPT OR DONE BIT TO SET AND ALLOWS THE
                        ;       OPERATOR TO TRANSFER CONROL TO THE SUPERVISOR.
                        ;       UPON APPEARANCE OF THE INTERRUPT OR DONE, CHECK TSSR FOR STATUS ERRORS,
                        ;       LOG BYTES AND ERRORS AND PERFORM ERROR RECOVERY IF NESSASARY.
                        ;       INPUTS:
                        ;       OUTPUTS:
                        ;       REGISTERS:      R2, R3.
                        ;       CALLS:          DROPU, MOVMSG, RECUD, CHKERR, LOG, CLRERR.

007600                  GOWAIT:: LET TIME1 := #-1               ;INIT TIME OUT COUNTER.
007606                          REPEAT                          ;REPEAT UNTIL INTERRUPT OCCURES:
007606                            BREAK                         ;GO TO THE SUPER TO ALLOW TTY INPUT.
007610                            IF CMDWRD EQ #RWD THEN        ;IF COMMAND WAS REWIND THEN:
007620                              WAITUS 100.                 ;WAIT AN EXTRA 10 MSEC EACH LOOP.
007626                            ENDIF
007626                            IFB DINT EQ #0 THEN           ;IF INTERRUPTS ARE ENABLED.
007634                              LET R2 := INTFLG(R5)        ;FETCH INTERRUPT OCCURRED FLAG.
007640                            ELSE                          ;IF IN BRUTUS MODE:
007642                              LET R3 := COMP #TS.SSR      ;SET UP A MASK FOR THE DONE BIT.
007650                              LET R2 := @TSSR(R5) CLR.BY R3  ;FETCH DONE BIT.
007656                            ENDIF
007656                            LET TIME1 := TIME1 - #1       ;UPDATE TIMEOUT COUNTER.
007662                            IF TIME1 EQ #0 THEN           ;IF TIME OUT HAS OCCURRED:
007670  004737  010020              JSR PC,MOVMSG               ;MOVE CURRENT MSG PACKET TO COMMON AREA.
007674                              LET R2 := #4                ;ERROR NUMBER.
007700                              LET R4 := #NOINTM           ;MESSAGE ADDRESS.
007704  004737  012350              JSR PC,DROPU                ;DROP THE UNIT.
007710  000412                      BR  GOWRTN                  ;RETURN.
007712                            ENDIF
007712                          UNTIL R2 NE #0                  ;REPEAT UNTIL INTERRUPT OR READY OCCURES.
007716  004737  010020          JSR     PC,MOVMSG               ;MOVE CURRENT MSG. PACKET TO COMMON AREA.
007722  004737  010070          JSR     PC,RECUD                ;UPDATE THE RECORD COUNT.
007726  004737  010212          JSR     PC,CHKERR               ;CHECK FOR STATUS ERRORS.
007732  004737  011254          JSR     PC,LOG                  ;LOG BYTES AND ERRORS.
007736                  GOWRTN: LET R3 :- #ENDERF
007742  004737  007750          JSR PC,CLRERR                   ;CLEAR ALL ERROR FLAGS
007746  000207                  RTS     PC                      ;RETURN IF DONE.
```

```
                                ;       SUBROUTINE TO CLEAR FLAGS.
                                ;       INPUTS:         R3 = LWA TO BE CLEARED + 2.
                                ;       OUTPUTS:
                                ;       REGISTERS:      R2
                                ;       CALLS:

007750                          CLRERR:: LET R2 := #BGNFLG
007754                                  REPEAT
007754                                    LET (R2)+ := #0
007756                                  UNTIL R2 EQ R3
007762  000207                          RTS PC


                                ;       SUBROUTINE TO WAIT UNTIL CURRENT UNIT IS READY OR UNTIL TIME OUT.
                                ;       INPUTS:
                                ;       OUTPUTS:
                                ;       REGISTERS:
                                ;       CALLS:

007764                          WSSR::  LET TIME1 := #-1                ;INIT TIMEOUT COUNTER.
007772                                  REPEAT                          ;REPEAT UNTIL DEV READY OR TIMEOUT:
007772                                    BREAK                           ;BREAK TO THE SUPERVISOR.
007774                                    LET TIME1 := TIME1 - #1         ;UPDATE TIMEOUT COUNTER.
010000                                  UNTIL #TS.SSR SETIN @TSSR(R5) OR TIME1 EQ #0
                                                                        ;REPEAT UNTIL DEV READY OR TIMEOUT.
010016  000207                          RTS PC                          ;RETURN.


                                ;       SUBROUTINE TO MOVE THE CURRENT MESSAGE PACKET TO THE COMMON AREA AND
                                ;       TO UPDATE THE CURRENT TERMINATION CLASS CODE.
                                ;       INPUTS:
                                ;       OUTPUTS:
                                ;       REGISTERS:      R2, R3.
                                ;       CALLS:

010020                          MOVMSG:: LET R3 := MSGPKA(R5)           ;ADR OF THIS DEVICE'S MSG.
010024                                  LET R2 := #0                    ;CLR COUNTER.
010026                                  WHILE R2 NE #MSGCNT DO          ;WHILE THERE ARE MORE LOCATIONS:
010034                                    LET MSGPKT(R2) := (R3)+       ;MOVE MSG TO COMMON AREA.
010040                                    LET R2 := R2 + #2             ;UPDATE COUNTER.
010044                                  ENDDO
010046                                  LET R2 := @TSSR(R5) CLR.BY #TSC.TCC  ;FETCH THE TERMINATION CLASS CODE.
010056                                  LET CTCC := R2 SHIFT -1         ;SAVE THE TCC.
010066  000207                          RTS     PC
```

```
                                ;       SUBROUTINE TO UPDATE THE RECORD COUNT.
                                ;       INPUTS:
                                ;       OUTPUTS:
                                ;       REGISTERS:
                                ;       CALLS:
                                
010070                          RECUD:: IFB RECLOG EQ #0 THEN           ;IF RECORD HAS NOT BEEN LOGGED:
010076                            IF #BIT0 NOTSETIN CTCC THEN           ;IF TCC IS EVEN THEN:
010106                              LET RECLOG :B= RECLOG + #1          ;SET RECORD LOGGED,
010112                              IF CMDWRD EQ #RWD THEN              ;IF THIS IS A REWIND CMD:
010122                                LET RECCNT(R5) := #0              ;CLEAR RECORD COUNT,
010126                              ELSE
010130                                IF #BRF.C SETIN CMDWRD THEN       ;IF BRF USED, UPDATE RECORD COUNT.
010140                                  IF #MOD.CO NOTSETIN CMDWRD THEN ;IF A FORWARD CMD:
010150                                    IF #MOD.CO NOTSETIN PCMDWD THEN ;IF PREV CMD WAS A FWD ALSO:
010160                                      LET RECCNT(R5) := RECCNT(R5) + #1 ;INCREMENT RECORD COUNT.
010164                                    ENDIF
010164                                  ELSE                            ;IF REVERSE CMD:
010166                                    IF #MOD.CO SETIN PCMDWD THEN  ;IF PREVIOUS CMD WAS A REV ALSO:
010176                                      IF RECCNT(R5) NE #0 THEN    ;INSURE A POSITIVE COUNT.
010204                                        LET RECCNT(R5) := RECCNT(R5) - #1 ;DECREMENT RECORD COUNT.
010210                                      ENDIF
010210                                    ENDIF
010210                                  ENDIF
010210                                ENDIF
010210                              ENDIF
010210                            ENDIF
010210                          ENDIF
010210  000207                  RTS     PC                              ;RETURN.
```

```
                                ;       THIS IS THE ERROR CHECK SUBROUTINE.  AFTER INTERRUPT THIS
                                ;       SUBROUTINE IS CALLED TO CHECK THE TS04 STATUS.
                                ;       IF SPECIAL COND IS SET THEN THE TCC HANDLING SUBROUTINE IS ENTERED.
                                ;       IF THE RFC IS NON ZERO FOR A COMMAND REQUIRING A BPCR,
                                ;       THEN AN ERROR RFC IS REPORTED,
                                ;       INPUTS:
                                ;       OUTPUTS:
                                ;       REGISTERS:      R2, R4.
                                ;       CALLS:          TCC0-TCC7.

010212                          CHKERR:: IF #TS.SC SETIN @TSSR(R5) THEN ;IF SPECIAL COND STATUS IS SET THEN:
010222                                     IF CTCC NE #2 THEN               ;IF TCC IS NOT 2 THEN:
010232                                       IFB ERRREC EQ #0 THEN            ;IF NOT IN ERROR RECOVERY:
010240  005265  002710                         INC     SCCNT(R5)                ;INC SC COUNTER.
010244                                       ENDIF
010244                                     ENDIF
010244                                     LET R2 := CTCC SHIFT 1           ;CURRENT TCC X 2.
010252  004772  010344                     JSR   PC,@TCCRA(R2)              ;GO TO THE TCC HANDLING SUBROUTINE.
010256                                   ELSE
010260                                     IF #BRF.C SETIN CMDWRD THEN    ;IF BRF IS USED IN THIS CMD THEN:
010270                                       IF MSGPKT+MS.RFC NE #0 THEN    ;IF THERE IS AN RFC THEN:
010276                                         IFB RANDOM EQ #0 THEN          ;IF NOT IN RANDOM MODE:
010304                                           IFB IRE EQ #0 THEN             ;IF RFC ERROR REPORTS ARE ALLOWED:
010312                                             LET HRDCNT(R5) := HRDCNT(R5) + #1  ;UPDATE HARD ERROR COUNT
010316                                             ERRHRD #13,RFCERM,STAERM       ;REPORT RFC ERROR
010326                                           ENDIF
010326                                         ENDIF
010326                                       ENDIF
010326                                     ENDIF
010326                                   ENDIF
010326                                   IFB RWERR NE #0 THEN             ;IF A READ/WRITE ERROR HAS OCCURRED THEN:
010334                                     LET CMDPKT := CMDSAV             ;RESTORE CMD PACKET AFTER ERROR RECOV.
010342                                   ENDIF
010342  000207                         RTS     PC                       ;RETURN.

                                ;       ADDRESSES OF TCC HANDLING ROUTINES FOR TERMINATION CLASS CODES 0 - 7.

010344  010364                  TCCRA:  TCC0
010346  010402                          TCC1
010350  010420                          TCC2
010352  010514                          TCC3
010354  010532                          TCC4
010356  010656                          TCC5
010360  010742                          TCC6
010362  011104                          TCC7
```

```
                                ;       SUBROUTINE TO HANDLE TERMINATION CLASS CODE 0, UNDEFINED SPECIAL
                                ;       CONDITION ERROR.
                                ;       INPUTS:
                                ;       OUTPUTS:
                                ;       REGISTERS:
                                ;       CALLS:

010364                          TCC0::  LET HRDCNT(R5) := HRDCNT(R5) + #1  ;UPDATE HARD ERROR COUNT.
010370                                  ERRHRD #5,SCERM,STAERM             ;REPORT SPECIAL CONDITION ERROR.
010400  000207                          RTS PC                             ;RETURN.



                                ;       SUBROUTINE TO HANDLE TERMINATION CLASS CODE 1, ATTENTION CONDITION.
                                ;       THIS TCC INDICATES THAT THE DRIVE HAS UNDERGONE A STATUS CHANGE
                                ;       SUCH AS GOING OFFLINE OR COMING ONLINE.
                                ;       INPUTS:
                                ;       OUTPUTS:
                                ;       REGISTERS:      R2,R4
                                ;       CALLS:          DROPU

010402                          TCC1::  LET R2 := #6                       ;ERROR NUMBER.
010406                                  LET R4 := #ATTNM                   ;MESSAGE ADDRESS.
010412  004737  012350                  JSR PC,DROPU                       ;DROP THE UNIT.
010416  000207                          RTS PC                             ;RETURN.
```

```
3628                                    ;       SUBROUTINE TO HANDLE TERMINATION CLASS CODE 2, TAPE STATUS ALERT.
3629                                    ;       A STATUS CONDITION HAS BEEN ENCOUNTERED THAT MAY HAVE SIGNIFICANCE
3630                                    ;       TO THE PROGRAM.  BITS OF INTEREST INCLUDE TMK, RLS, LET, RLL, EOT.
3631                                    ;       INPUTS:
3632                                    ;       OUTPUTS:
3633                                    ;       REGISTERS:
3634                                    ;       CALLS:
3635
3636  010420                            TCC2::  IF #X0.TMK!X0.RLS!X0.LET!X0.RLL SETIN MSGPKT+MS.XS0 THEN
3637                                                                            ;IF TAPE MARK, RECORD LENGTH ERROR OR
3638                                                                            ;LOGICAL EOT THEN:
3639  010430                                      IF #X0.TMK!X0.LET NOTSETIN MSGPKT+MS.XS0 THEN ;IF RECORD LENGTH ERROR:
3640  010440                                        IFB IRE NE #0 OR RANDOM NE #0 THEN ;IF RFC ERROR REPORTS ARE
3641                                                                                    ;INHIBITED OR IN RANDOM MODE THEN:
3642  010454  000416                                   BR   TC2RTN                       ;RETURN - TCC2 CAUSED BY EOT.
3643  010456                                        ENDIF
3644  010456                                      ENDIF
3645  010456                                      IFB ERRREC NE #0 THEN           ;IF WE ARE IN ERROR RECOVERY THEN:
3646  010464                                        LET UNREC :B= UNREC + #1        ;SET UNRECOVERABLE FLAG FOR LOG.
3647  010470                                      ELSE                            ;ELSE - IF NOT IN ERROR RECOVERY:
3648  010472                                        LET SCCNT(R5) := SCCNT(R5) + #1 ;INCREMENT THE SPEC COND COUNTER.
3649  010476                                      ENDIF
3650  010476                                        LET HRDCNT(R5) := HRDCNT(R5) + #1   ;UPDATE HARD ERROR COUNT.
3651  010502                                        ERRHRD #7,TSAM,STAERM               ;REPORT TAPE STATUS ALERT.
3652  010512                                    ENDIF
3653  010512  000207                    TC2RTN: RTS PC                          ;RETURN.
3654
3655
3656
3657
3658
3659                                    ;       SUBROUTINE TO HANDLE TERMINATION CLASS CODE 3, FUNCTION REJECT.
3660                                    ;       THE SPECIFIED FUNCTION WAS NOT INITIATED.  BITS OF INTEREST ARE
3661                                    ;       RMR, OFL, VCK, BOT, ILC, WLE, ILA, AND NBA.
3662                                    ;       INPUTS:
3663                                    ;       OUTPUTS:
3664                                    ;       REGISTERS:      R2,R4
3665                                    ;       CALLS:          DROPU
3666
3667  010514                            TCC3::  LET R2 := #8.                   ;ERROR NUMBER.
3668  010520                                    LET R4 := #FUNRM                ;MESSAGE ADDRESS.
3669  010524  004737  012350                    JSR PC,DROPU                    ;DROP THE UNIT.
3670  010530  000207                            RTS PC                          ;RETURN.
```

```
3671                                    ;       SUBROUTINE TO HANDLE TERMINATION CLASS CODE 4, RECOVERABLE ERROR.
3672                                    ;       TAPE POSITION IS ONE RECORD BEYOND WHAT ITS POSITION WAS WHEN
3673                                    ;       THE FUNCTION WAS INITIATED.  RECOVERY PROCEDURE IS TO LOG THE
3674                                    ;       ERROR AND ISSUE THE APPROPRIATE RETRY COMMAND.
3675                                    ;       INPUTS:
3676                                    ;       OUTPUTS:
3677                                    ;       REGISTERS:      R2,R4.
3678                                    ;       CALLS:          RTLE, EXCUTE, GOWAIT, DROPU
3679
3680  010532  004737  011122          TCC4::  JSR PC,RTLE                     ;CHECK FOR RETRY LIMIT EXCEEDED.
3681  010536                                  IF CMDLG GT #2 THEN             ;IF READ CMD THEN:
3682  010546                                    LET R2 := #RRECL SHIFT -1     ;R2=READ RETRY COUNT LIMIT / 2
3683  010554                                    IF RETRYC GE R2 THEN          ;IF RETRY COUNT IS MORE THAN HALF LIMIT:
3684  010562                                      LET CMDPKT := CMDPKT SET.BY #OPP.C  ;SET OPPOSITE BIT FOR RETRY2.
3685  010570                                    ENDIF
3686  010570                                  ENDIF
3687  010570                                  IF RETRYC EQ #0 THEN            ;IF THIS IS THE ORIGINAL ERROR THEN:
3688  010576                                    ERRSOFT #9,RERM,STAERM        ;REPORT RECOVERABLE ERROR
3689  010606                                  ENDIF
3690  010606                                  LET RETRYC := RETRYC + #1        ;UPDATE RETRY COUNT.
3691  010612                                  LET CMDPKT :- CMDPKT SET.BY #MOD.C1     ;SET RETRY BIT IN CMD PACKET.
3692  010620                                  IFB IREC EQ #0 THEN             ;IF ERROR RECOVERY ENABLED:
3693  010626                                    LET ERRREC :B= ERRREC + #1    ;SET ERROR RECOVERY FLAG.
3694  010632                                    POP R2,R2                     ;POP 2 RTN ADRS FROM STACK.
3695  010636  004737  007316                   JSR PC,EXCUTE                 ;GO EXECUTE THE RETRY COMMAND.
3696  010642  000137  007600                   JMP GOWAIT                    ;GO WAIT FOR INTERRUPT + CHECK STATUS.
3697  010646                                  ELSE                            ;ELSE IF ERROR RECOVERY IS NOT ENABLED:
3698  010650                                    LET UNREC :B  UNREC + #1      ;SET UNRECOVERABLE ERROR FLAG.
3699  010654                                  ENDIF
3700  010654  000207                         RTS PC                          ;RETURN
```

```
3701                                    ;       SUBROUTINE TO HANDLE TERMINATION CLASS CODE 5, RECOVERABLE ERROR.
3702                                    ;       TAPE POSITION HAS NOT CHANGED.  RECOVERY PROCEDURE IS TO LOG THE
3703                                    ;       ERROR AND RE-ISSUE THE ORIGINAL COMMAND.
3704                                    ;       INPUTS:
3705                                    ;       OUTPUTS:
3706                                    ;       REGISTERS:      R2,R4.
3707                                    ;       CALLS:          RTLE, EXCUTE, GOWAIT, DROPU.
3708
3709  010656  004737  011122           TCC5::  JSR PC,RTLE                     ;CHECK FOR RETRY LIMIT EXCEEDED
3710  010662                                  IF RETRYC EQ #0 THEN            ;IF THIS IS THE ORIGINAL ERROR THEN:
3711  010670                                    ERRSOFT #10,RERM,STAERM       ;REPORT RECOVERABLE ERROR.
3712  010700                                  ENDIF
3713  010700                                  LET RETRYC := RETRYC + #1        ;UPDATE RETRY COUNTER.
3714  010704                                  IFB IREC EQ #0 THEN              ;IF ERROR RECOVERY IS ENABLED:
3715  010712                                    LET ERRREC :B= ERRREC + #1     ;SET ERROR RECOVERY FLAG.
3716  010716                                    POP R2,R2                      ;POP 2 RTN ADRS FROM STACK.
3717  010722  004737  007316                   JSR PC,EXCUTE                  ;GO RE-ISSUE THE COMMAND.
3718  010726  000137  007600                   JMP GOWAIT                     ;GO WAIT FOR INTERRUPT + CHECK STATUS.
3719  010732                                  ELSE                             ;ELSE IF ERROR RECOVERY IS NOT ENABLED:
3720  010734                                    LET UNREC :B= UNREC + #1       ;SET UNRECOVERABLE ERROR FLAG.
3721  010740                                  ENDIF
3722  010740  000207                         RTS PC                           ;RETURN.
3723
3724
```

```
3725                                    ;       SUBROUTINE TO HANDLE TERMINATION CLASS CODE 6, UNRECOVERABLE ERROR.
3726                                    ;       TAPE POSITION HAS BEEN LOST.  THE ONLY VALID RECOVERY PROCEDURE
3727                                    ;       IS TO REWIND AND START OVER AT BOT UNLESS THE TAPE HAS LABELS OR
3728                                    ;       SEQUENCE NUMBERS.  THIS DIAGNOSTIC WILL REWIND AND RETRY THE
3729                                    ;       COMMAND ONLY IF DENSITY CHECK IS SET, OTHERWISE THE UNIT WILL BE
3730                                    ;       DROPPED FROM THE TEST SEQUENCE.
3731                                    ;       INPUTS:
3732                                    ;       OUTPUTS:
3733                                    ;       REGISTERS:      R2, R4
3734                                    ;       CALLS:          RTLE, WSSR, EXCUTE, GOWAIT, DROPU
3735
3736  010742                            TCC6::  IF X3.DCK NOTSETIN MSGPKT+MS.XS3 THEN
3737                                                                      ;IF THERE IS NO DENSITY CHECK THEN:
3738  010752                                      IF CMDLG NE #0 THEN       ;IF CMD IS A READ OR WRITE THEN:
3739  010760                                        LET RWERR :B= RWERR + #1  ;SET RD/WR ERROR FLAG,
3740  010764                                        LET UNREC :B= UNREC + #1  ;SET UNRECOVERABLE ERROR FLAG.
3741  010770                                      ENDIF                     ;
3742  010770                                      LET R2 := #11.            ;ERROR NUMBER.
3743  010774                                      LET R4 := #URERM          ;MESSAGE ADDRESS.
3744  011000  004737  012350                     JSR PC,DROPU              ;REPORT ERROR + DROP UNIT.
3745  011004                                    ELSE                        ;ELSE-IF THERE IS DENSITY CHECK:
3746  011006  004737  011122                     JSR PC,RTLE               ;CHECK FOR RETRY LIMIT EXCEEDED.
3747  011012                                      IF RETRYC EQ #0 THEN      ;IF THIS IS THE ORIGINAL ERROR THEN:
3748  011020                                        ERRSOFT #11,URERM,STAERM  ;REPORT DENSITY CHECK ERROR.
3749  011030                                      ENDIF
3750  011030                                      LET RETRYC := RETRYC + #1  ;UPDATE RETRY COUNT.
3751  011034                                      IFB IRE EQ #0 THEN        ;IF ERROR RECOVERY IS ENABLED THEN:
3752  011042                                        LET ERRREC :B= ERRREC + #1  ;SET ERROR RECOVERY FLAG,
3753  011046                                        LET @TSDB(R5) := #RWCPK   ;ISSUE A REWIND COMMAND,
3754  011054  004737  007764                       JSR PC,WSSR               ;WAIT FOR SUBSYSTEM READY,
3755  011060                                        POP R2,R2                 ;POP 2 RTN ADR'S FROM STACK,
3756  011064  004737  007316                       JSR PC,EXCUTE             ;REISSUE THE COMMAND,
3757  011070  000137  007600                       JMP GOWAIT                ;WAIT FOR INTERRUPT
3758  011074                                      ELSE                      ;ELSE-IF ERR REC DISABLED:
3759  011076                                        LET UNREC :B  UNREC + #1  ;SET UNRECOVERABLE ERROR FLAG.
3760  011102                                      ENDIF                     ;
3761  011102                                    ENDIF                       ;
3762  011102  000207                           RTS PC                      ;RETURN
```

```
                                ;       SUBROUTINE TO HANDLE TERMINATION CLASS CODE 7, FATAL SUBSYSTEM
                                ;       ERROR.  THE SUBSYSTEM IS INCAPABLE OF PROPERLY PERFORMING
                                ;       COMMANDS OR AT LEAST ITS INTEGRITY IS SERIOUSLY QUESTIONABLE.
                                ;       REFER TO THE FATAL CLASS CODE FIELD IN THE TSSR REGISTER FOR
                                ;       ADDITIONAL INFORMATION ON THE TYPE OF FATAL ERROR.
                                ;       INPUTS:
                                ;       OUTPUTS:
                                ;       REGISTERS:      R2, R4
                                ;       CALLS:

011104                          TCC7::  LET R2 := #12.                  ;ERROR NUMBER.
011110                                  LET R4 := #FATSM                ;MESSAGE ADDRESS.
011114  004737  012350                  JSR PC,DROPU                    ;DROP THE UNIT.
011120  000207                          RTS PC                          ;RETURN.


                                ;       SUBROUTINE TO CHECK FOR RETRY LIMIT EXCEEDED.  PRINTS ERROR MESSAGE
                                ;       IF EXCEEDED AND DROP UNIT UNLESS COMMAND IS A READ.
                                ;       INPUTS:
                                ;       OUTPUTS:
                                ;       REGISTERS:      R2, R4.
                                ;       CALLS:          DROPU

011122                          RTLE::  IF CMDLG EQ #0 THEN             ;IF CMD IS NOT A READ OR WRITE THEN:
011130                                    LET R2 := #11.                ;ERROR NUMBER.
011134                                    LET R4 := #URERM              ;MESSAGE ADDRESS.
011140  004737  012350                    JSR PC,DROPU                  ;DROP THE UNIT.
011144                                    POP R2
011146  000441                           BR RTLRTN                     ;AND RETURN.
011150                                  ENDIF
011150                                  LET RWERR :B= RWERR + #1       ;SET READ/WRITE ERROR FLAG.
011154                                  IF CMDLG EQ #2 THEN            ;IF CMD IS A WRT OR WTM:
011164                                    IF RETRYC EQ #WRECL THEN     ;IF RETRY COUNT HAS REACHED LIMIT:
011174                                      LET UNREC :B= UNREC + #1   ;SET UNRECOVERABLE FLAG
011200                                      LET R2 := #14.             ;ERROR NUMBER.
011204                                      LET R4 := #RLEXM           ;MESSAGE ADDRESS.
011210  004737  012350                      JSR PC,DROPU               ;DROP THE UNIT.
011214                                      POP R2
011216  000415                             BR RTLRTN                  ;AND RETURN.
011220                                    ENDIF
011220                                  ELSE                           ;ELSE - CMD IS A READ:
011222                                    IF RETRYC EQ #RRECL THEN     ;IF RETRY COUNT HAS REACHED LIMIT:
011232                                      LET UNREC :B= UNREC + #1   ;SET UNRECOVERABLE FLAG
011236                                      ERRSOFT #14,RLEXM,STAERM   ;REPORT RECOVERABLE ERROR.
011246                                      POP R2
011250  000400                             BR RTLRTN                  ;AND RETURN.
011252                                    ENDIF
011252                                  ENDIF
011252  000207                  RTLRTN: RTS PC                         ;RETURN
```

```
3813                            ;       SUBROUTINE TO LOG BYTES READ/WRITTEN.
3814                            ;       ALSO UPDATES READ/WRITE ERROR COUNTERS.
3815                            ;       INPUTS:
3816                            ;       OUTPUTS:
3817                            ;       REGISTERS:      R2, R3, R4.
3818                            ;       CALLS:
3819
3820  011254                    LOG::   IFB ERLOG EQ #0 THEN            ;IF DATA AND ERRORS HAVE NOT BEEN LOGGED THEN:
3821  011262                            LET ERLOG :B= ERLOG + #1        ;SET LOG DONE FLAG.
3822  011266                            LET R4 := CMDLG                 ;GET CURRENT CMD LOGGING CODE.
3823  011272                            IF R4 NE #0 THEN                ;IF THERE IS A CODE THEN:
3824  011276                              LET R4 := R4 - #2             ;ADJUST THE CODE FOR TABLE INDEX.
3825  011302                              LET R2 := R5 + BINC(R4) + #CNTBGN  ;R2 = ADR OF BYTE COUNT LSW.
3826  011314                              LET (R2) := (R2) + BRFCNT     ;ADD BRF TO LSW.
3827  011320                              IF MSGPKT+MS.RFC LOS BRFCNT THEN  ;IF THE RFC IS LOWER OR THE SAME AS BRF THEN
3828  011330                                LET (R2) := (R2) - MSGPKT+MS.RFC  ;SUBTRACT RFC FROM EXPECTED BRF.
3829  011334                              ENDIF
3830  011334                              LET R3 := R2 + #10            ;R3 = ADR OF 2ND WORD.
3831  011342                              WHILE (R2) GT #999. DO
3832  011350                                LET (R2) := (R2) - #1000.   ;UPDATE BYTE COUNT
3833  011354                                LET (R3) := (R3) + #1       ;2ND WORD.
3834  011356                              ENDDO
3835  011360                              LET R2 := R3 + #10            ;R2 = ADR OF 3RD WORD.
3836  011366                              WHILE (R3) GT #999. DO
3837  011374                                LET (R3) := (R3) - #1000.   ;UPDATE BYTE COUNT
3838  011400                                LET (R2) := (R2) + #1       ;3RD WORD.
3839  011402                              ENDDO
3840  011404                              LET R3 := R2 + #10            ;R3 = ADR OF 4TH WORD.
3841  011412                              WHILE (R2) GT #999. DO
3842  011420                                LET (R2) := (R2) - #1000.   ;UPDATE BYTE COUNT
3843  011424                                LET (R3) := (R3) + #1       ;4TH WORD.
3844  011426                              ENDDO
3845  011430                              IFB RWERR NE #0 THEN          ;IF R/W ERROR, UPDATE ERROR COUNT.
3846  011436                                LET R2 := R5 + EINC(R4) + #WRREC  ;R2 = ADR OF COUNTER.
3847  011450                                IFB UNREC NE #0 THEN        ;IS THE ERROR UNRECOVERABLE?
3848  011456                                  LET R2 := R2 + #10        ;YES, POINT TO NEXT COUNTER.
3849  011462                                  LET (R2) := (R2) + #1     ;UPDATE THE ERROR COUNTER
3850  011464                                ELSE                        ;ELSE - IF ERROR IS RECOVERABLE:
3851  011466                                  LET (R2) := (R2) + #1     ;UPDATE THE ERROR COUNTER
3852  011470                                  IFB IREC EQ #0 THEN       ;IF ERROR RECOVERY IS ENABLED:
3853  011476                                    PRINTB #NURTY1,RETRYC     ;PRINT # OF RETRIES TO RECOVER.
3854  011522                                  ENDIF
3855  011522                                ENDIF
3856  011522                              ENDIF
3857  011522                            ENDIF
3858  011522                            ENDIF
3859  011522  000207                    RTS PC
3860                            ;       INDEXES TO BYTE COUNTERS.
3861  011524  000000            BINC:   0                               ;WRITE.
3862  011526  000040                    40                              ;READ REV.
3863  011530  000100                    100                             ;READ FWD.
3864                            ;       INDEXES TO READ/WRITE ERROR COUNTERS.
3865  011532  000000            EINC:   0                               ;WRITE.
3866  011534  000020                    20                              ;READ REV.
3867  011536  000040                    40                              ;READ FWD.
```

```
                        ;       IF A WRITE/VERIFY COMMAND IS ISSUED, CONTROL IS THEN
                        ;       TRANSFERRED TO THIS SUBROUTINE TO READ REVERSE, CHECK DATA,
                        ;       READ FORWARD, CHECK DATA, THEN CONTINUE TO NEXT COMMAND.
                        ;       INPUTS:
                        ;       OUTPUTS:
                        ;       REGISTERS:
                        ;       CALLS:          VFEXC.

011540                  VFYDAT:: IFB VFYFLG NE #0 THEN          ;IF DATA IS TO BE VERIFIED:
011546                             LET PCMDWD := CMDWRD         ;SAVE THE PREVIOUS COMMAND WORD.
011554                             LET CMDWRD := #RDR           ;COMMAND IS READ REV.
011562                             LET CMDLG := #4              ;SET UP CMD LOGGING INDEX.
011570  004737  011624             JSR   PC,VFEXC               ;GO READ ALL THE RECORDS REV.
011574                             LET PCMDWD := CMDWRD         ;SAVE THE PREVIOUS COMMAND WORD.
011602                             LET CMDWRD := #RDF           ;COMMAND IS READ FWD.
011610                             LET CMDLG := #6              ;SET UP CMD LOGGING INDEX.
011616  004737  011624             JSR   PC,VFEXC               ;GO READ ALL RECORDS FWD.
011622                           ENDIF
011622  000207                   RTS     PC      ;RETURN.
```

```
                                ;       SUBROUTINE TO EXECUTE THE READ AND VERIFY, FORWARD OR REVERSE.
                                ;       INPUTS:
                                ;       OUTPUTS:
                                ;       REGISTERS:      R2
                                ;       CALLS:          CMDAC, EXCUTE, GOWAIT, CKDATA, CKHAE, NEXTU, FIRSTU.
011624                          VFEXC:: LET CMDPKT := CMDWRD CLR.BY #BRF.C  ;COMMAND PACKET = READ REV OR FWD.
011640                                  IFB SWBFLG NE #0 THEN           ;IF BYTES ARE TO BE SWAPPED:
011646                                    LET CMDPKT := CMDPKT SET.BY #SWB.C  ;SET SWAB BIT IN CMD PACKET.
011654                                  ENDIF
011654                                  LET CMDSAV := CMDPKT            ;SAVE COMMAND PACKET 1ST WORD.
011662                                  LET NCNT := NCNT1               ;SET NUMBER OF RECORDS.
011670  013737  002752  002226          MOV     DATARD,CMDPKT+CP.ADL    ;SAVE BUFFER START ADDRESS.
011676                                  WHILE NCNT NE #0 DO             ;WHILE THERE ARE RECORDS REMAINING:
011704  004737  006360                    JSR PC,CMDAC                  ;STORE CMD ASCII IN ERROR MSG.
011710  004737  012300                    JSR   PC,FIRSTU               ;SET UP FOR FIRST UNIT.
011714                                    IF DEVTBL(R5) EQ #END THEN    ;IF ALL UNITS HAVE BEEN DROPPED THEN:
011724                                      DOCLN                         ;DO CLEAN CODE AND TERMINATE PASS.
011726                                    ENDIF
011726                                    WHILE DEVTBL(R5) NE #END DO   ;WHILE THERE ARE DEVICES REMAINING:
011736                                      LET R2 := DATARD + #8.      ;INIT READ BUFFER POINTER.
011746                                      WHILE R2 NE DATARD DO       ;UNTIL 8 BYTES HAVE BEEN SET,
011754                                        LET -(R2) := #-1          ;INIT READ BUFFER.
011760                                      ENDDO
011762  004737  007316                    JSR PC,EXCUTE                 ;GO EXECUTE THE COMMAND.
011766                                    IFB DROPED EQ #0 THEN         ;IF UNIT HAS NOT BEEN DROPPED THEN:
011774  004737  007600                      JSR       PC,GOWAIT         ;GO WAIT FOR DONE BIT.
012000                                    ENDIF
012000                                    IFB DROPED EQ #0 THEN         ;IF UNIT HAS NOT BEEN DROPPED THEN:
012006  004737  012042                      JSR       PC,CKDATA         ;GO VERIFY DATA.
012012                                    ENDIF
012012  004737  012672                    JSR PC,CKHAE                  ;CHECK FOR HALT AFTER EACH CMD.
012016  004737  012326                    JSR PC,NEXTU                  ;GO FIND THE NEXT UNIT.
012022                                  ENDDO
012024                                  LET NCNT := NCNT - #1           ;UPDATE THE RECORD COUNT.
012030                                  LET PCMDWD := CMDWRD            ;SAVE PREVIOUS COMMAND WORD.
012036                          ENDDO
012040  000207                  RTS     PC                              ;RETURN.
```

```
                                ;       SUBROUTINE TO COMPARE DATA BETWEEN READ AND WRITE BUFFERS
                                ;       AND PRINT ERROR MESSAGE ON MISCOMPARE.
                                ;       INPUTS:
                                ;       OUTPUTS:
                                ;       REGISTERS:      R2, R3, R4.
                                ;       CALLS:          GCMDA
                                
012042                          CKDATA:: IF MSGPKT+MS.RFC LOS BRFCNT THEN  ;IF RFC IS LOWER OR THE SAME AS BRF THEN:
012052                                     LET R3 := BRFCNT - MSGPKT+MS.RFC  ;VERIFY LENGTH = EXP LEN - RFC.
012062                                   ELSE                              ;ELSE, IS RFC IS NEGATIVE:
012064                                     LET R3 := BRFCNT                ;VERIFY LENGTH = EXP LEN.
012070                                   ENDIF
012070                                   IF R3 NE #0 THEN                  ;IF THE LENGTH IS NOT ZERO THEN:
012074                                     LET CKDCNT := R3 - #1           ;SAVE VERIFICATION LENGTH - 1.
012104                                     LET R4 := CMDWRD                ;R4=CMD BINARY.
012110  004737  006422                     JSR PC,GCMDA                    ;GET CMD ASCII.
012114                                     LET WTVERM := (R3)+             ;MOVE CMD ASCII.
012120                                     LET WTVERM+2 :B- (R3)           ;INTO MSG.
012124  105037  012276                     CLRB  CKDFF                     ;INIT 1ST TIME THRU FLAG.
012130  005002                             CLR   R2                        ;INIT BYTE COUNTER
012132                                     LET R3 := DATAWT                ;GET WRITE BUFFER ADDRESS.
012136                                     LET R4 := DATARD                ;GET READ BUFFER ADDRESS.
012142                                     REPEAT                          ;REPEAT UNTIL ALL DATA IS COMPARED:
012142                                       IF R2 EQ CKDCNT THEN          ;IF THIS IS THE LAST BYTE THEN:
012150                                         IFB SWBFLG NE #0 THEN       ;IF BYTE SWAPPING IS ENABLED THEN:
012156                                           IF #BIT00 NOTSETIN CKDCNT THEN  ;IF RECORD LENGTH IS ODD THEN:
012166  105723                                     TSTB  (R3)+             ;LAST BYTE WILL BE IN
012170  105724                                     TSTB  (R4)+             ;THE UPPER BYTE.
012172                                           ENDIF
012172                                         ENDIF
012172                                       ENDIF
012172  121314                               CMPB (R3),(R4)                ;ARE THEY EQUAL.
012174  001430                               BEQ 3$                        ;BR IF SO.
012176  105737  012276                     TSTB CKDFF                      ;1 ST TIME THRU?
012202  001007                             BNE 2$                        ;BR IF NOT.
012204  005265  002720                     INC VFYCNT(R5)                  ;INC THE VERIFY ERROR COUNTER.
012210  005265  002730                     INC HRDCNT(R5)                  ;INC THE HARD ERROR COUNT.
012214                                     LET CKDFF := #1                 ;CLR 1ST TIME THRU FLAG.
012222  111437  003000          2$:        MOVB (R4),TIME1                 ;SAVE WAS DATA FOR TYPOUT.
012226  042737  177400  003000             BIC #177400,TIME1               ;CLEAR GARBAGE.
012234  111337  003002                     MOVB (R3),TIME2                 ;SAVE SHOULD BE DATA FOR TYPOUT.
012240  042737  177400  003002             BIC #177400,TIME2               ;CLEAR GARBAGE.
012246                                     ERRHRD #17,WTVERM,DTAERM        ;REPORT WRITE/ VERIFY ERROR.
012256  105723                  3$:        TSTB (R3)+                      ;UPDATE WRITE BUFFER ADDRESS.
012260  105724                             TSTB (R4)+                      ;UPDATE READ BUFFER ADDRESS.
012262  105722                             TSTB (R2)+                      ;UPDATE BYTE COUNTER.
012264                                   UNTIL R2 GT CKDCNT                ;END OF DATA COMPARE REPEAT LOOP.
012272                                   ENDIF
012272  000207                           RTS     PC                        ;OTHERWISE, RETURN.
                                
012274  000000                  CKDCNT: .WORD   0                         ;# OF BYTES TO BE VERIFIED -1.
012276     000                  CKDFF:  .BYTE   0                         ;FIRST TIME THRU DATA ERROR LOOP FLAG.
012300                                  .EVEN
```

```
3979                                    ;       SUBROUTINE TO FIND THE FIRST DEVICE IN THF TEST SEQUENCE.
3980                                    ;       INPUTS:
3981                                    ;       OUTPUTS:
3982                                    ;       REGISTERS:
3983                                    ;       CALLS:
3984
3985  012300                            FIRSTU:: LET DROPED :B= #0                ;CLR UNIT DROPPED FLAG
3986  012304                                     LET R5 := #0                     ;CLR DEVICE POINTER.
3987  012306                                     WHILE DEVTBL(R5) EQ #NINUSE DO   ;WHILE DEVICES ARE NOT IN USE:
3988  012310                                       LET R5 := R5 + #2              ;POINT TO NEXT DEVICE.
3989  012322                                     ENDDO
3990  012324  000207                            RTS     PC                       ;RETURN WITH 1ST DEVICE IN R5.
3991
3992
3993
3994
3995
3996                                    ;       SUBROUTINE TO FIND THE NEXT UNIT IN THE TEST CYCLE.
3997                                    ;       INPUTS:
3998                                    ;       OUTPUTS:
3999                                    ;       REGISTERS:
4000                                    ;       CALLS:
4001
4002  012326                            NEXTU:: LET DROPED :B= #0                 ;CLR UNIT DROPPED FLAG
4003  012332                                     REPEAT                           ;REPEAT UNTIL THE NEXT DEVICE IS FOUND.
4004  012332                                       LET R5 :- R5 + #2              ;UPDATE DEVICE TABLE POINTER.
4005  012336                                     UNTIL DEVTBL(R5) NE #NINUSE
4006  012346  000207                            RTS     PC                       ;RETURN.
4007
4008
4009
```

```
                                ;       SUBROUTINE TO DROP A DEVICE FROM THE TEST SEQUENCE.
                                ;       ***************************************************************
                                ;       THIS SUBROUTINE DYNAMICALLY MODIFIES A SUPERVISOR CALL. ************
                                ;       ***************************************************************
                                ;       INPUTS:         R2=ERROR #, R4=BASIC MESSAGE ADDRESS.
                                ;       OUTPUTS:
                                ;       REGISTERS:      R2, R4
                                ;       CALLS:          MOVMSG, PRXST, LOG

012350                          DROPU:: LET DRO100+2 := R2              ;STORE ERROR # IN ERROR CALL.
012354                                  LET DRO100+4 := R4              ;STORE MSG ADR IN ERROR CALL.
012360                                  LET HRDCNT(R5) := HRDCNT(R5) + #1  ;INCREMENT THE HARD ERROR COUNT.
012364                                  LET DROPN := DEVTBL(R5)         ;SAVE # OF DEVICE TO BE DROPPED.
012372                          DRO100: ERRDF R2,R4,STAERM              ;PRINT THE ERROR MESSAGE,
012402                                  LET R4 := MSGPKT+MS.XS3 SHIFT -8. ;GET UDIAG ERROR CODE FROM XSTAT3.
012426                                  LET @TSDB(R5) := #GSCPK         ;INITIATE A GET STATUS COMMAND.
012434                                  WAITUS 10.                      ;GO TO SUPER-WAIT 1 MSEC.
012442  004737  010020                  JSR PC,MOVMSG                   ;MOVE MSG PACKET TO COMMON AREA.
012446                                  IFB R4 EQ #X3.RNY THEN          ;IF WE HAVE A CAPSTAN RUNAWAY THEN:
012454                                    ERRDF #16,RNYM,STAERM           ;REPORT CAPSTAN RUNAWAY WITH TACH CNT.
012464                                  ENDIF
012464  004737  012610                  JSR PC,PRXST                    ;PRINT EXTENDED STATUS REGISTERS.
012470                                  IFB RECLOG NE #0 THEN           ;IF THE RECORD HAS BEEN LOGGED THEN:
012476  004737  011254                    JSR PC,LOG                      ;LOG DATA BYTES + RD/WR ERRORS.
012502                                  ENDIF
012502                                  DORPT                           ;PRINT PERFORMANCE REPORT
012504                                  IF PASCNT(R5) NE #0 THEN
012512                                    LET PASCNT(R5) := PASCNT(R5) - #1
012516                                  ENDIF
012516                                  LET R0 := R5 SHIFT -1           ;R0=LOGICAL DEVICE NUMBER
012522                                  DODU R0                         ;DROP THE UNIT.
012524                                  BCOMPLETE DRO200                ;BR IF DROPPING OF UNITS IS ENABLED.
012526                                    IFB IREC EQ #0 THEN             ;IF RECOVERY IS ENABLED THEN:
012534                                      LET @TSSR(R5) := #0             ;ISSUE SUBSYSTEM INIT .
012540                                      LET STAFLG :B= STAFLG + #1      ;SET START FLAG TO ENABLE REWIND,
012544                                      DOCLN                           ;DO CLEAN CODE AND ABORT PASS.
012546                                    ELSE                            ;ELSE - RECOVERY IS DISABLED:
012550  000415                              BR  DRORTN                      ;RETURN AND CONTINUE TEST SEQUENCE.
012552                                    ENDIF
012552                          DRO200: PRINTF  #DROPDM,DROPN           ;PRINT DROP DEVICE MESSAGE
012576                                  LET DROPED :B- #1               ;SET UNIT DROPPED FLAG.
012604  000207                  DRORTN: RTS     PC                      ;RETURN.

012606  000000                  DPOPN:  .WORD   0                       ;# OF UNIT TO BE DROPPED
```

```
                                ;       SUBROUTINE TO PRINT EXTENDED STATUS REGISTERS.
                                ;       INPUTS:
                                ;       OUTPUTS:
                                ;       REGISTERS:
                                ;       CALLS:

012610                          PRXST:: PRINTX  #STAER0             ;TYPE OUT THE X-ST REGS.
012630                                  PRINTX  #STAER6,MSGPKT+MS.XS0,MSGPKT+MS.XS1,MSGPKT+MS.XS2,MSGPKT+MS.XS3
012670  000207                          RTS PC


                                ;       SUBROUTINE TO HALT AFTER EACH COMMAND.
                                ;       INPUTS:
                                ;       OUTPUTS:
                                ;       REGISTERS:      R3, R4
                                ;       CALLS:

012672                          CKHAE:: IFB HAE NE #0 THEN                  ;IF HALT FLAG IS SET:
012700                                    MANUAL                            ;IS MANUAL INTERVENTION ALLOWED?
012702                                    BNCOMPLETE CKHRTN                 ;BR IF NOT.
012704                                    LET R4 := CMDWRD                  ;COMMAND WORD.
012710  004737  006422                    JSR   PC,GCMDA                    ;FETCH ADR OF CMD ASCII.
012714                                    LET HALTM := (R3)+                ;MOVE CMD ASCII
012720                                    LET HALTM+2 :B= (R3)              ;INTO MESSAGE.
012724                                    GMANIL HALTM,TIME1,1,YES          ;HALT - WAIT FOR AN OEPRATOR INPUT.
012740                          10000$:
012740                                  ENDIF
012740  000207                  CKHRTN: RTS     PC                          ;RETURN
                                        .EVEN

                                        ENDMOD
012742
```

```
                                .TITLE MISCELLANEOUS SECTIONS
                                .SBTTL  REPORT CODING SECTION

012742                                  BGNMOD

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

012742                                  BGNRPT
012742                          L$RPT::

012742                                  LET     R5SAVE := R5            ;SAVE CURRENT DEVICE POINTER.
012746  004737  012300                  JSR     PC,FIRSTU               ;FIND THE FIRST UNIT.
012752                                  WHILE DEVTBL(R5) NE #END DO     ;WHILE THERE ARE MORE DEVICES:
012762                                    PRINTS        #RPT1A,DEVTBL(R5),PASCNT(R5),RECCNT(R5)
013016                                    PRINTS        #RPT1B,WRBC+30(R5),WRBC+20(R5),WRBC+10(R5),WRBC(R5)
013056                                    PRINTS        #RPT1C,RRBC+30(R5),RRBC+20(R5),RRBC+10(R5),RRBC(R5)
013116                                    PRINTS        #RPT1D,RFBC+30(R5),RFBC+20(R5),RFBC+10(R5),RFBC(R5)
013156                                    PRINTS        #RPT1E
013176                                    PRINTS        #RPT1F,WRREC(R5),RRREC(R5),RFREC(R5)
013232                                    PRINTS        #RPT1G,WRUNR(R5),RRUNR(R5),RFUNR(R5)
013266                                    PRINTS        #RPT1H
013306                                    PRINTS        #RPT1I,SCCNT(R5),HRDCNT(R5),VFYCNT(R5)
013342  004737  012326                    JSR   PC,NEXTU                ;FIND THE NEXT UNIT.
013346                                  ENDDO
013350                                  LET R5 := R5SAVE                ;RESTORE CURRENT DEVICE POINTER.
013354                                  EXIT    RPT


                                .NLIST  BEX
013360  047045  047045  040445  RPT1A: .ASCIZ  /%N%N%AUNIT %D1%S3%APASS·%D5%S3%ARECORD:%D5%N/
013435    045  041101  052131  RPT1B: .ASCIZ  /%ABYTES WRITTEN  = %D3%A,%Z3%A,%Z3%A,%Z3%N/
013510  040445  054502  042524  RPT1C: .ASCIZ  /%ABYTES READ REV = %D3%A,%Z3%A,%Z3%A,%Z3%N/
013563    045  041101  052131  RPT1D: .ASCIZ  /%ABYTES READ FWD = %D3%A,%Z3%A,%Z3%A,%Z3%N/
013636  051445  032462  040445  RPT1E: .ASCIZ  /%S25%AWRT%S4%ARDR%S4%ARDF%N/
013672  040445  042522  047503  RPT1F: .ASCIZ  /%ARECOVERABLE ERRORS    - %D5%S2%D5%S2%D5%N/
013745    045  052501  051116  RPT1G: .ASCIZ  /%AUNRECOVERABLE ERRORS - %D5%S2%D5%S2%D5%N%N/
014022  040445  050123  041505  RPT1H: .ASCIZ  '%ASPECIAL CONDITION%S3%AHARD/FATAL%S3%ADATA COMPARE%N''
014110  051445  022465  032504  RPT1I: .ASCIZ  /%S5%D5%S11%D5%S9%D5%N%N/
                                .LIST   BEX
                                .EVEN

014140                                  ENDRPT
014140                          L10011:
```

```
                                .SBTTL  INITIALIZE SECTION

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

014142                                  BGNINIT
014142                          L$INIT::

014142                          INIT10: IF #BIT0!BIT1 SETIN #CMDPKT THEN  ;IF CMD PACKET IS NOT ON MODULO 4 BOUNDRY:
014152                                    ERRSF #1,CMDPKM                 ;PRINT ERROR MSG,
014160                                    WAITMS 100.                     ;GO TO SUPERVISOR, WAIT 10 SECONDS.
014166  000765                            BR    INIT10                    ;
014170                                  ENDIF

014170                                  IFB CLRFLG NE #0 THEN             ;IF CLR COUNTERS FLAG SET:
014176  105037  002134                    CLRB  CLRFLG                    ;INIT CLR FLAG.
014202                                    LET R2 := #0
014204                                    WHILE R2 NE #CNTLEN DO
014212                                      LET WRBC(R2) := #0            ;CLR ALL STATISTICAL COUNTERS.
014216                                      LET R2 := R2 + #2
014222                                    ENDDO
014224                                  ENDIF

014224                                  IFB RRANV NE #0 THEN              ;IF RESET RANDOM VARIABLE FLAG IS SET THEN:
014232                                    LET RANB := #RANBC                ;RESET RANDOM BASE #.
014240                                    LET RANS := #RANSC                ;RESET RANDOM SAVE LOCATION.
014246                                  ENDIF

014246                                  READEF  #EF.START                 ;READ START COMMAND EVENT FLAG.
014254                                  BNCOMPLETE      INIT15            ;BRANCH IF NOT STARTING.
014256                                  LET STAFLG :B= STAFLG + #1         ;SET START COMMAND FLAG.
014262                                  LET R5 := #6
014266                                  REPEAT                            ;INITIATE UNIT NUMBER TABLE
014266                                    LET DEVTBL(R5) := #NINUSE       ;BY STORING NOT IN USE IN EACH LOCATION.
014274                                    LET R5 := R5 - #2
014300                                  UNTIL R5 EQ #0
014304                                  LET R5 := L$UNIT SHIFT 1
014312                                  REPEAT                            ;STORE ALL UNIT
014312                                    LET R5 := R5 - #2               ;NUMBERS IN DEVTBL.
014316                                    LET DEVTBL(R5) := R5 SHIFT -1 + #1
014332                                  UNTIL R5 EQ #0

014336                          INIT15: READEF #EF.PWR                    ;HAS THERE BE A POWER FAILURE?
014344                                  BNCOMPLETE INIT16                 ;BRANCH IF NOT.
014346                                    LET STAFLG :B= STAFLG + #1         ;IF SO - SET THE START FLAG.
014352                                    LET PWRFLG :B= PWRFLG + #1       ;IF SO - SET THE POWER FAIL FLAG.

014356  004737  012300          INIT16: JSR     PC,FIRSTU                 ;INIT DEVICE POINTER.
014362                                  LET R2 := #0                      ;INIT DEVICE COUNTER.
014364                                  WHILE DEVTBL(R5) NE #END DO
014374                                    LET R2 := R2 + #1
014376                                    LET R0 := R5 SHIFT -1
014402                                    GPHARD  R0,R0                   ;GET HARDWARE P TABLE FROM SUPER.
014404                                    LET TSDB(R5) := (R0)            ;SAVE TSDB ADDRESS.
```

```
014410                                     LET TSSR(R5) := (R0)+ + #2      ;SAVE TSSR ADDRESS.
014422                                     LET TSVCT(R5) := (R0)           ;SAVE INTERRUPT VECTOR ADDRESS.
014426                                     SETVEC TSVCT(R5),TS4INT(R5),#INTPRI   ;SET UP INTERUPT PROCESSING CONDITIONS.
014454                                     IFB PWRFLG EQ #0 THEN           ;IF POWER FAIL HAS NOT OCCURRED THEN:
014462                                       LET PASCNT(R5) := PASCNT(R5) + #1   ;UPDATE PASS COUNT.
014466                                     ENDIF
014466  004737  012326                     JSR    PC,NEXTU                 ;DO IT FOR ALL DEVICES.
014472                                   ENDDO

014474                                   IF R2 EQ #0 THEN                  ;IF THERE ARE NO UNITS:
014500                                     PRINTF #AUDRPM                  ;PRINT ALL UNITS DROPPED.
014520                                     WAITMS 50.                      ;GO TO SUPERVISOR, WAIT 5 SECONDS.
014526                                     BREAK                           ;GO TO SUPERVISOR, CHECK TTY.
014530                                   DOCLN                             ;DO CLEAN CODE + ABORT PASS.
014532                                   ENDIF

014532  004737  012300                   JSR PC,FIRSTU                     ;SET UP FOR FIRST UNIT.
014536                                   WHILE DEVTBL(R5) NE #END DO       ;WHILE THERE ARE MORE DEVICES:
014546                                     LET TIME1 := #-1                  ;INIT TIMEOUT COUNTER.
014554                                     REPEAT                            ;REPEAT UNTIL UNIT IS ON LINE:
014554                                       BREAK                             ;BREAK TO THE SUPERVISOR.
014556                                       LET TIME1 := TIME1 - #1           ;UPDATE TIMEOUT COUNTER.
014562                                       IF TIME1 EQ #0 THEN               ;IF TIMED OUT THEN:
014570  004737  010020                         JSR PC,MOVMSG                     ;MOVE MSG PACKET TO COMMON AREA.
014574  004737  010402                         JSR PC,TCC1                       ;PRINT UNIT OFF-LINE + DROP UNIT.
014600                                       ELSE                              ;ELSE - IF NOT TIMED OUT:
014602                                         LET @TSDB(R5) := #GSCPK           ;ISSUE GET STATUS COMMAND.
014610                                         WAITUS 100.                       ;WAIT 10 MSEC.
014616                                       ENDIF
014616                                     UNTIL #TS.OFL NOTSETIN @TSSR(R5) OR TIME1 EQ #0
                                                                             ;REPEAT UNTIL ON LINE OR TIMED OUT.
014634  004737  012326                     JSR PC,NEXTU                      ;SET UP FOR NEXT UNIT.
014640                                   ENDDO

014642                                   LET R2 := #DATCNT SHIFT -8.       ;GENERATE PAGE COUNT FROM MAX LENGTH.
014666                                   BUFFER R2,R3                      ;REQUEST MEMORY FROM SUPER FOR RD/WR BUFFERS.
014674                                   BCOMPLETE INIT20                  ;BRANCH IF ENOUGH MEMORY IS AVAILABLE.
014676                                     DOCLN                             ;DO CLEAN CODE + TERMINATE PASS.
014700                          INIT20:  LET DATAWT := R3                  ;SAVE WRITE BUFFER ADDRESS.
014704                                   LET DATARD := #DATCNT + R3        ;SAVE READ BUFFER ADDRESS.

014716                                   LET CHGFLG :B= #0                 ;CLR CHANGE CMD SEQ TBL FLAG.
014722                                   LET R3 := #ENDFLG
014726  004737  007750                   JSR     PC,CLRERR                 ;CLEAR ALL FLAGS.
014732                                   LET PWRFLG :B= #0                 ;CLEAR THE POWER FAIL FLAG.

014736                                   EXIT    INIT
                                         .EVEN

014742                                   ENDINIT
014742                          L10012:
```

CLEANUP CODING SECTION SEQ 0098

```
                        .SBTTL  CLEANUP CODING SECTION

                        ;++
                        ; THE CLEANUP CODING SECTION CONTAINS THE CODING THAT IS PERFORMED
                        ; AT THE END OF EACH PASS.
                        ;--

014744                          BGNCLN
014744                  L$CLEAN::

014744  004737  012300          JSR     PC,FIRSTU               ;FIND FIRST UNIT.
014750                          WHILE DEVTBL(R5) NE #END DO
014760  004737  007764            JSR PC,WSSR                   ;WAIT FOR UNIT READY OR TIMEOUT,
014764                            LET @TSDB(R5) := #BRCPK       ;ISSUE MSG BUFFER RELEASE CMD.
014772                            CLRVEC        TSVCT(R5)       ;RELEASE INTERRUPT VECTORS FOR ALL DEV.
015000  004737  012326            JSR   PC,NEXTU                ;FIND NEXT UNIT.
015004                          ENDDO
015006                          UNBUFF  DATAWT                  ;RELEASE THE READ/WRITE BUFFERS TO SUPER.

015014                          EXIT    CLN
                                .EVEN

015020                          ENDCLN
015020                  L10013:
```

DROP UNIT SECTION SEQ 0099

```
                                .SBTTL  DROP UNIT SECTION

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

015022                                  BGNDU
015022                          L$DU::

015022                                  LET R5 := R0 SHIFT 1            ;R5 = LOGICAL DEVICE NUMBER X 2.
015026  004737  007764                  JSR PC,WSSR                     ;WAIT FOR UNIT READY OR TIMEOUT.
015032                                  LET @TSDB(R5) := #BRCPK         ;ISSUE MSG BUFFER RELEASE CMD.
015040                                  LET DEVTBL(R5) := #NINUSE       ;SET NOT IN USE FLAG FOR THE DEVICE.
015046                                  CLRVEC TSVCT(R5)                ;RELEASE THE INTERRUPT VECTOR.

015054                                  EXIT    DU
                                        .EVEN

015060                                  ENDDU
015060                          L100'4:
```

```
                                .SBTTL  ADD UNIT SECTION

                                ;++
                                ; THE ADD-UNIT SECTION CONTAINS THE CODING THAT CAUSES A DEVICE
                                ;  TO BE (A) TESTED FOR THE FIRST TIME, OR (B) RESUMED IN TESTING.  IF
                                ;  'EF.AUNIT'' IS SET, THE UNIT WILL BE TESTED AS A NEW UNIT.
                                ;--

015062                                  BGNAU
015062                          L$AU::

                                        LET R5 := R0 SHIFT 1            ;R5 = LOGICAL DEVICE NUMBER X 2.
015062                                  LET DEVTBL(R5) := R0 + #1        ;STORE UNIT # IN DEVICE TABLE.
015066                                  GPHARD  R0,R0                    ;GET HARDWARE P TABLE FROM SUPER.
015076                                  LET TSDB(R5) := (R0)             ;SAVE TSDB ADDRESS.
015100                                  LET TSSR(R5) := (R0)+ + #2       ;SAVE TSSR ADDRESS.
015104                                  LET TSVCT(R5) := (R0)            ;SAVE INTERRUPT VECTOR ADDRESS.
015116                                  SETVEC TSVCT(R5),TS4INT(R5),#INTPRI     ;SET UP INTERUPT PROCESSING CONDITIONS.
015122                                  LET INTFLG(R5) := #0             ;CLEAR INTERRUPT FLAGS.
015150
                                        EXIT    AU
015154
                                        .EVEN
                                        ENDAU
015160                          L10015:
015160
                                        ENDMOD
015162
```

```
                                .TITLE HARDWARE TESTS

                                .SBTTL  TEST 1:  BASIC FUNCTIONS.

                                ;++
                                ; TEST TO EXECUTE ALL TS04 FUNCTIONS.
                                ;--

015162                                  BGNMOD

015162                                  BGNTST
015162                          T1::

015162                                  LET RANDOM :B- #0               ;CLR THE RANDOM OPERATIONS FLAG.

015166                                  BGNSUB                          ;SUBTEST 1 - SET CHAR, DRIVE INIT, GET STATUS.
015166                          T1.1:

015170                                  LET R2 :- #BFSEQ0               ;ADR OF CMD SEQ.
015174  004737  015754                  JSR     PC,BFSEQ                ;SET UP CMD SEQ.
015200  004737  006020                  JSR     PC,EXALL                ;EXECUTE CMD SEQ ON ALL DEVICES.
015204  004737  012300                  JSR     PC,FIRSTU               ;FIND THE FIRST UNIT.
015210                                  WHILE DEVTBL(R5) NE #END DO     ;WHILE THERE ARE MORE DEVICES:
015220                                    LET R2 := MSGPKA(R5)          ;GET MSG PACKET ADR,
015224                                    LET R2 := R2 + #12            ;GET XSTAT2 ADR,
015230                                    LET TS4CL(R5) := (R2) CLR.BY #177400  ;STORE CODE LEVEL FROM DTR BYTE,
015242                                    IF PASCNT(R5) EQ #1 THEN      ;IF THIS IS PASS 1 THEN:
015252                                      PRINTF #CODELM,DEVTBL(R5),TS4CL(R5) ;PRINT THE TS04 MICROCODE LEVEL.
015302                                    ENDIF
015302  004737  012326                    JSR   PC,NEXTU                ;FIND NEXT UNIT.
015306                                  ENDDO
015310                                  ENDSUB
015310                          L10017:

015312                                  BGNSUB                          ;SUBTEST 2 - REWIND.
015312                          T1.2:

015314                                  LET R2 := #BFSEQ1               ;ADR OF CMD SEQ.
015320  004737  015754                  JSR     PC,BFSEQ                ;SET UP CMD SEQ.
015324  004737  006020                  JSR     PC,EXALL                ;EXECUTE CMD SEQ ON ALL DEVICES.
015330                                  ENDSUB
015330                          L10020:

015332                                  BGNSUB                          ;SUBTEST 3 - WRITE/VERIFY.
015332                          T1.3:

015334                                  LET R2 := #BFSEQ2               ;ADR OF CMD SEQ.
015340  004737  015754                  JSR     PC,BFSEQ                ;SET UP CMD SEQ.
015344  004737  006020                  JSR     PC,EXALL                ;EXECUTE CMD SEQ ON ALL DEVICES.
015350                                  ENDSUB
015350                          L10021:

015352                                  BGNSUB                          ;SUBTEST 4 - WRITE TAPE MARK, ERASE.
015352                          T1.4:
```

```
4364  015354
4365  015360  004737  015754                    LET R2 := #BFSEQ3               ;ADR OF CMD SEQ.
4366  015364  004737  006020                    JSR     PC,BFSEQ                ;SET UP CMD SEQ.
4367  015370                                    JSR     PC,EXALL                ;EXECUTE CMD SEQ ON ALL DEVICES.
4368  015370                                    ENDSUB
                                        L10022:
4369
4370  015372                                    BGNSUB                          ;SUBTEST 5 - SPACE FILES.
4371  015372                                T1.5:
4372
4373  015374                                    LET R2 := #BFSEQ4               ;ADR OF CMD SEQ.
4374  015400  004737  015754                    JSR     PC,BFSEQ                ;SET UP CMD SEQ.
4375  015404  004737  006020                    JSR     PC,EXALL                ;EXECUTE CMD SEQ ON ALL DEVICES.
4376  015410                                    ENDSUB
4377  015410                                L10023:
4378
4379  015412                                    BGNSUB                          ;SUBTEST 6 - SPACE RECORDS.
4380  015412                                 T1.6:
4381
4382  015414                                    LET R2 := #BFSEQ5               ;ADR OF CMD SEQ.
4383  015420  004737  015754                    JSR     PC,BFSEQ                ;SET UP CMD SEQ.
4384  015424  004737  006020                    JSR     PC,EXALL                ;EXECUTE CMD SEQ ON ALL DEVICES.
4385  015430                                    ENDSUB
4386  015430                                L10024:
4387
4388  015432                                    BGNSUB                          ;SUBTEST 7 - WRITE RETRY.
4389  015432                                T1.7:
4390
4391  015434                                    LET R2 := #BFSEQ6               ;ADR OF CMD SEQ.
4392  015440  004737  015754                    JSR     PC,BFSEQ                ;SET UP CMD SEQ.
4393  015444  004737  006020                    JSR     PC,EXALL                ;EXECUTE CMD SEQ ON ALL DEVICES.
4394  015450                                    ENDSUB
4395  015450                                L10025:
4396
4397  015452                                    BGNSUB                          ;SUBTEST 8 - READ REV RETRY.
4398  015452                                T1.8:
4399
4400  015454                                    LET R2 := #BFSEQ7               ;ADR OF CMD SEQ.
4401  015460  004737  015754                    JSR     PC,BFSEQ                ;SET UP CMD SEQ.
4402  015464  004737  006020                    JSR     PC,EXALL                ;EXECUTE CMD SEQ ON ALL DEVICES.
4403  015470                                    ENDSUB
4404  015470                                L10026:
4405
4406  015472                                    BGNSUB                          ;SUBTEST 9 - READ FWD RETRY.
4407  015472                                T1.9:
4408
4409  015474                                    LET R2 := #BFSEQ8               ;ADR OF CMD SEQ.
4410  015500  004737  015754                    JSR     PC,BFSEQ                ;SET UP CMD SEQ.
4411  015504  004737  006020                    JSR     PC,EXALL                ;EXECUTE CMD SEQ ON ALL DEVICES.
4412  015510                                    ENDSUB
4413  015510                                L10027:
4414
4415  015512                                    BGNSUB                          ;SUBTEST 10- CLEAN.
4416  015512                                T1.10:
4417
4418  015514                                    LET R2 := #BFSEQ9               ;ADR OF CMD SEQ.
4419  015520  004737  015754                    JSR     PC,BFSEQ                ;SET UP CMD SEQ.
```

```
4420  015524  004737  006020                  JSR     PC,EXALL                ;EXECUTE CMD SEQ ON ALL DEVICES.
4421  015530                                  ENDSUB
4422  015530                          L10030:
4423
4424  015532                                  BGNSUB                          ;SUBTEST 11 - WTV SWAPPED DATA BYTES.
4425  015532                          T1.11:
4426
4427  015534                                  LET R2 := #BFSE10               ;ADR OF CMD SEQ.
4428  015540  004737  015754                  JSR     PC,BFSEQ                ;SET UP CMD SEQ.
4429  015544  004737  006020                  JSR     PC,EXALL                ;WRITE/VERIFY RECORDS 1 AND 2.
4430  015550                                  LET SWBFLG :B= #1               ;ENABLE BYTE SWAPPING.
4431  015556  004737  006020                  JSR     PC,EXALL                ;WRITE/VERIFY RECORDS 3 AND 4.
4432  015562                                  LET SWBFLG :B= #0               ;DISABLE BYTE SWAPPING.
4433  015566                                  ENDSUB
4434  015566                          L10031:
4435
4436  015570                                  LET R2 :- DATAWT + #8.          ;INIT WRITE BUFFER POINTER.
4437  015600                                  WHILE R2 NE DATAWT DO           ;UNTIL 8 BYTES HAVE BEEN SWAPPED.
4438  015606  000342                            SWAB -(R2)                    ;SWAP DATA BYTES IN WRITE BUFFER.
4439  015610                                  ENDDO
4440
4441  015612                                  BGNSUB                          ;SUBTEST 12 - READ SWAPPED DATA BYTES.
4442  015612                          T1.12:
4443
4444  015614                                  LET CMDWRD := #RDR              ;CMD IS READ REV.
4445  015622  004737  011624                  JSR     PC,VFEXC                ;VERIFY ODD LENGTH SWAP (RECORD 4).
4446  015626                                  LET CMDPKT+CP.CNT :  #10        ;CHANGE BYTE COUNT TO 8.
4447  015634  004737  011624                  JSR     PC,VFEXC                ;VERIFY EVEN LENGTH SWAP (RECORD 3).
4448  015640                                  LET SWBFLG :B= #1               ;ENABLE BYTE SWAPPING.
4449  015646                                  LET CMDPKT+CP.CNT :  #7         ;CHANGE BYTE COUNT TO 7.
4450  015654  004737  011624                  JSR     PC,VFEXC                ;VERIFY ODD LENGTH SWAP (RECORD 2).
4451  015660                                  LET CMDPKT+CP.CNT :- #10        ;CHANGE BYTE COUNT TO 8.
4452  015666  004737  011624                  JSR     PC,VFEXC                ;VERIFY EVEN LENGTH SWAP (RECORD 1).
4453  015672                                  LET CMDWRD := #RDF              ;CMD IS READ FWD.
4454  015700  004737  011624                  JSR     PC,VFEXC                ;VERIFY EVEN LENGTH SWAP (RECORD 1).
4455  015704                                  LET CMDPKT+CP.CNT :- #7         ;CHANGE BYTE COUNT TO 7.
4456  015712  004737  011624                  JSR     PC,VFEXC                ;VERIFY ODD LENGTH SWAP (RECORD 2).
4457  015716                                  LET SWBFLG :B- #0               ;DISABLE BYTE SWAPPING.
4458  015722                                  LET CMDPKT+CP.CNT :- #10        ;CHANGE BYTE COUNT TO 8.
4459  015730  004737  011624                  JSR     PC,VFEXC                ;VERIFY EVEN LENGTH SWAP (RECORD 3).
4460  015734                                  LET CMDPKT+CP.CNT :  #7         ;CHANGE BYTE COUNT TO 7.
4461  015742  004737  011624                  JSR     PC,VFEXC                ;VERIFY ODD LENGTH SWAP (RECORD 4).
4462  015746                                  ENDSUB
4463  015746                          L10032:
4464
4465  015750                                  EXIT    TST
```

```
                                ;       SUBROUTINE TO MOVE A COMMAND SEQUENCE TO THE SEQUENCE TABLE.
                                ;       INPUTS:         R2 = FWA OF COMMAND SEQUENCE.
                                ;       OUTPUTS:
                                ;       REGISTERS:
                                ;       CALLS:

015754                          BFSEQ:  LET R1 := #CMDSEQ               ;INIT SEQ TABLE ADDRESS.
015760                                  WHILE (R2) NE #END DO           ;WHILE THERE ARE MORE COMMANDS:
015766                                    LET (R1)+ :  (R2)+            ;MOVE COMMANDS TO SEQ TABLE.
015770                                  ENDDO
015772                                  LET (R1) := #END                ;STORE END OF SEQUENCE CODE.
015776  000207                        RTS     PC                      ;RETURN.


                                ;       BASIC FUNCTION COMMAND SEQUENCE

016000  140004                  BFSEQ0: .WORD   SCH                     ;SET CHAR. 200.         (1)
016002  000200                          200
016004  000001                          1
016006  000000                          0
016010  100013                          DRI                     ;DRIVE INIT.            (2)
016012  000001                          1
016014  000001                          1
016016  000000                          0
016020  140004                          SCH                     ;SET CHAR. 20           (3)
016022  000020                          20
016024  000001                          1
016026  000000                          0
016030  100017                          GES                     ;GET STATUS.            (4)
016032  000001                          1
016034  000001                          1
016036  000000                          0
016040  140004                          SCH                     ;SET CHAR. 40.          (5)
016042  000040                          40
016044  000001                          1
016046  000000                          0
016050  177777                  .WORD   END

016052  102010                  BFSEQ1:         RWD                     ;REWIND TWICE.          (6)
016054  000001                          1
016056  000002                          2
016060  000000                          0
016062  177777                  .WORD   END

016064  104105                  BFSEQ2:         WTV                     ;WRITE/VERIFY PAT 1.    (7)
016066  010000                          DATCNT
016070  000001                          1
016072  000001                          1
016074  104105                          WTV                     ;WTV PAT 2.             (8)
016076  010000                          DATCNT
016100  000001                          1
016102  000002                          2
016104  104105                          WTV                     ;WTV PAT 3.             (9)
016106  010000                          DATCNT
016110  000001                          1
```

```
4522  016112  000003                          3
4523  016114  104105                          WTV             ;WTV PAT 4.     (10)
4524  016116  010000                          DATCNT
4525  016120  000001                          1
4526  016122  000004                          4
4527  016124  104105                          WTV             ;WTV PAT 5.     (11)
4528  016126  010000                          DATCNT
4529  016130  000001                          1
4530  016132  000005                          5
4531  016134  104105                          WTV             ;WTV PAT 6.     (12)
4532  016136  010000                          DATCNT
4533  016140  000001                          1
4534  016142  000006                          6
4535  016144  104105                          WTV             ;WTV PAT 0.     (13)
4536  016146  010000                          DATCNT
4537  016150  000001                          1
4538  016152  000000                          0
4539  016154  177777                .WORD     END
4540
4541  016156  100011          BFSEQ3:         WTM             ;WRITE TAPE MARK.   (14)
4542  016160  000001                          1
4543  016162  000001                          1
4544  016164  000000                          0
4545  016166  104005                          WRT             ;WRITE 10 RECORDS.  (15)
4546  016170  010000                          DATCNT
4547  016172  000010                          10
4548  016174  000001                          1
4549  016176  100411                          ERS             ;ERASE 10 TIMES.    (16)
4550  016200  000001                          1
4551  016202  000010                          10
4552  016204  000000                          0
4553  016206  100011                          WTM             ;WRITE TAPE MARK.   (17)
4554  016210  000001                          1
4555  016212  000001                          1
4556  016214  000000                          0
4557  016216  101011                          WTR             ;WTM RETRY          (18)
4558  016220  000001                          1
4559  016222  000001                          1
4560  016224  000000                          0
4561  016226  177777                .WORD     END
4562
4563  016230  105410          BFSEQ4:         SFR             ;SPACE 2 FILES REV. (19)
4564  016232  000002                          2
4565  016234  000001                          1
4566  016236  000000                          0
4567  016240  105010                          SFF             ;SPACE 2 FILES FWD. (20)
4568  016242  000002                          2
4569  016244  000001                          1
4570  016246  000000                          0
4571  016250  105410                          SFR             ;SPACE 2 FILES REV. (21)
4572  016252  000001                          1
4573  016254  000002                          2
4574  016256  000000                          0
4575  016260  105010                          SFF             ;SPACE 2 FILES FWD. (22)
4576  016262  000001                          1
4577  016264  000002                          2
```

```
 4578  016266  000000                          0
 4579  016270  177777                  .WORD   END
 4580
 4581  016272  102010          BFSEQ5:         RWD             ;REWIND.                (23)
 4582  016274  000001                          1
 4583  016276  000001                          1
 4584  016300  000000                          0
 4585  016302  104010                          SRF             ;SPACE 7 RECORDS FWD.   (24)
 4586  016304  000007                          7
 4587  016306  000001                          1
 4588  016310  000000                          0
 4589  016312  104410                          SRR             ;SPACE 7 RECORDS REV.   (25)
 4590  016314  000007                          7
 4591  016316  000001                          1
 4592  016320  000000                          0
 4593  016322  104010                          SRF             ;SPACE 7 RECORDS FWD.   (26)
 4594  016324  000001                          1
 4595  016326  000007                          7
 4596  016330  000000                          0
 4597  016332  104410                          SRR             ;SPACE 7 RECORDS REV.   (27)
 4598  016334  000001                          1
 4599  016336  000007                          7
 4600  016340  000000                          0
 4601  016342  177777                  .WORD   END
 4602
 4603  016344  102010          BFSEQ6:         RWD             ;REWIND.                (28)
 4604  016346  000001                          1
 4605  016350  000001                          1
 4606  016352  000000                          0
 4607  016354  104005                          WRT             ;WRITE.                 (29)
 4608  016356  010000                          DATCNT
 4609  016360  000001                          1
 4610  016362  000001                          1
 4611  016364  105005                          WRR             ;WRITE RETRY.           (30)
 4612  016366  010000                          DATCNT
 4613  016370  000001                          1
 4614  016372  000001                          1
 4615  016374  177777                  .WORD   END
 4616
 4617  016376  104401          BFSEQ7:         RDR             ;READ REV.              (31)
 4618  016400  010000                          DATCNT
 4619  016402  000001                          1
 4620  016404  000001                          1
 4621  016406  105401                          RNR             ;READ NEXT REV.         (32)
 4622  016410  010000                          DATCNT
 4623  016412  000001                          1
 4624  016414  000001                          1
 4625  016416  125401                          RNF             ;READ NEXT FWD.         (33)
 4626  016420  010000                          DATCNT
 4627  016422  000001                          1
 4628  016424  000001                          1
 4629  016426  177777                  .WORD   END
 4630
 4631  016430  104001          BFSEQ8:         RDF             ;READ FWD.              (34)
 4632  016432  010000                          DATCNT
 4633  016434  000001                          1
```

```
016436  000001                              1
016440  105001                              RPF             ;READ PREVIOUS FWD.        (35)
016442  010000                              DATCNT
016444  000001                              1
016446  000001                              1
016450  125001                              RPR             ;READ PREVIOUS REV.        (36)
016452  010000                              DATCNT
016454  000001                              1
016456  000001                              1
016460  177777                      .WORD   END

016462  101012              BFSEQ9: .WORD   CLN             ;CLEAN.                    (37)
016464  000001                              1
016466  000001                              1
016470  000000                              0
016472  102010                              RWD             ;REWIND                    (38)
016474  000001                              1
016476  000001                              1
016500  000000                              0
016502  177777                      .WORD   END             ;END OF SEQUENCE.

016504  104105              BFSE10:         WTV             ;WRITE/VERIFY EVEN LENGTH.        (39)
016506  000010                              10
016510  000001                              1
016512  000000                              0
016514  104105                              WTV             ;WRITE/VERIFY ODD LENGTH.         (40)
016516  000007                              7
016520  000001                              1
016522  000000                              0
016524  177777                      .WORD   END
                                    .EVEN

016526                              ENDTST
016526                      L10016:
```

TEST 2: DATA RELIABILITY. SEQ 0108

```
                                .SBTTL  TEST 2: DATA RELIABILITY.

                                ;++
                                ; TEST TO CHECK THE DATA RELIABILITY OF THE TS04.
                                ;--
016530                                  BGNTST
016530                          T2::

                                        LET RANDOM :B= #1               ;SET THE RANDOM OPERATIONS FLAG.
016536                                  LET R2 := #DATCNT - #1          ;SET UP THE RECORD LENGTH MASK.
016544                                  LET LENMSK := COMP R2           ;ALLOW MAXIMUM BUFFER.
016554  004737  005754                  JSR PC,SETCH                    ;CMD 1 = SET CHARACTERISTIC.
016560                                  IFB STAFLG NE #0 THEN           ;IF STARTING THEN:
016566  004737  006000                    JSR   PC,SETRW                ;CMD2=REWIND
016572                                    LET STAFLG :B= #0             ;CLR START FLAG.
016576                                  ENDIF
016576                                  LET (R1)+ := #WTV               ;CMD3 = WRITE/ VERIFY.
016602                                  LET (R1)+ := #DATCNT            ;SET BRF TO MAX FOR PATTERN GENERATION.
016606                                  LET R2 := COMP #RNOPSC
016614                                  LET (R1)+ := R2                 ;63 OPERATIONS.
016616                                  LET (R1)+ := #RANP              ;RANDOM PATTERN.
016622                                  REPEAT                          ;REPEAT TO EOT:
016622                                    WHILE R1 LT #SEQEND DO        ;FILL SEQ TBL WITH RANDOM CMDS.
016630                                      LET RANS := RANS + RANB
016636                                      LET R2 := RANS CLR.BY #177741   ;R2 = RANDOM # (0 - 36).
016646  004772  016762                      JSR PC,@RANCMD(R2)          ;SET UP A RANDOM CMD + BRF.
016652                                    ENDDO
016654                                    LET (R1) := #END              ;STORE END OF SEQUENCE CODE IN TABLE.
016660  004737  006020                    JSR   PC,EXALL                ;GO EXECUTE ALL CMDS IN SEQUENCE TABLE.
016664                                    LET R1 := #CMDSEQ             ;INIT CMD SEQ TBL POINTER,
016670                                  UNTIL R2 NE #0                  ;REPEAT UNTIL EOT IS REACHED
016674  004737  017022                  JSR     PC,RANRD                ;SET UP READ REV/FWD CMDS,
016700                                  LET CMDSEQ+4 := COMP #RNOPSC    ;# OF RECORDS FOR READ REV.
016712                                  LET CMDSEQ+14 := CMDSEQ+4       ;# OF RECORDS FOR READ FORWARD.
016720                                  LET (R1) := #END                ;STORE END OF SEQUENSE CODE IN SEQ TABLE.
016724  004737  006020                  JSR     PC,EXALL                ;GO EXECUTE READ REV/FWD OF LAST N RECORDS.
016730                                  LET RPTFLG :B= #1               ;REQUEST PERFORMANCE REPORT DURING REWIND.
016736                                  LET R1 := #CMDSEQ               ;INIT SEQ TBL POINTER,
016742  004737  006000                  JSR PC,SETRW                    ;STORE REWIND IN SEQ TBL,
016746                                  LET (R1) := #END                ;STORE END IN SEQ TBL,
016752  004737  006020                  JSR PC,EXALL                    ;EXECUTE REWIND CMD ON ALL UNITS

016756                                  EXIT    TST
```

```
                                ;       ADDRESSES OF SUBROUTINES USED TO SET UP RANDOM OPERATIONS IN
                                ;       THE DATA RELIABILITY TEST.
                                
016762  017110                  RANCMD: RANWV                   ;WRITE/VERIFY.
016764  017076                          RANWR                   ;WRITE.
016766  017076                          RANWR                   ;WRITE.
016770  017076                          RANWR                   ;WRITE.
016772  017076                          RANWR                   ;WRITE.
016774  017076                          RANWR                   ;WRITE.
016776  017076                          RANWR                   ;WRITE.
017000  017076                          RANWR                   ;WRITE.
017002  017022                          RANRD                   ;READ.
017004  017022                          RANRD                   ;READ.
017006  017022                          RANRD                   ;READ.
017010  017022                          RANRD                   ;READ.
017012  017022                          RANRD                   ;READ.
017014  017022                          RANRD                   ;READ.
017016  017022                          RANRD                   ;READ.
017020  017022                          RANRD                   ;READ.
                                
                                
                                
                                
                                
                                ;       SUBROUTINE TO SET UP READ COMMANDS IN SEQUENCE TABLE.
                                ;       INPUTS:
                                ;       OUTPUTS:
                                ;       REGISTERS:      R2
                                ;       CALLS:
                                
017022                          RANRD:  LET (R1)+ :- #RDR               ;STORE READ REV CMD.
017026                                  LET (R1)+ := #DATCNT            ;SET BRF TO MAX FOR READ RANDOM LENGTHS.
017032                                  LET RANB :- RANB + RANS
017040                                  LET R2 := RANB CLR.BY #RNOPSC
017050                                  LET (R1)+ := R2                 ;SET RANDOM # OF OPERATIONS.
017052                                  LET (R1)+ := #RANP              ;RANDOM PATTERN.
017056                                  LET (R1)+ := #RDF               ;STORE READ FWD CMD.
017062                                  LET (R1)+ := #DATCNT            ;SET BRF TO MAX TO READ RANDOM LENGTHS.
017066                                  LET (R1)+ := R2                 ;SET RANDOM # OF OPERATIONS.
017070                                  LET (R1)+ :- #RANP              ;RANDOM PATTERN.
017074  000207                        RTS PC
```

```
4753                                    ;       SUBROUTINE TO SET UP A WRITE COMMAND IN THE SEQUENCE TABLE.
4754                                    ;       INPUTS:
4755                                    ;       OUTPUTS:
4756                                    ;       REGISTERS:
4757                                    ;       CALLS:
4758
4759  017076                            RANWR:  LET (R1)+ := #WRT               ;STORE WRITE CMD.
4760  017102  004737  017122                   JSR PC,RANW                     ;STORE BRF, # OF OPERATIONS, PATTERN.
4761  017106  000207                           RTS PC
4762
4763
4764
4765
4766
4767                                    ;       SUBROUTINE TO SET UP A WRITE/VERIFY COMMAND IN THE SEQUENCE TABLE.
4768                                    ;       INPUTS:
4769                                    ;       OUTPUTS:
4770                                    ;       REGISTERS:
4771                                    ;       CALLS:
4772
4773  017110                            RANWV:  LET (R1)+ := #WTV               ;STORE WRITE/VERIFY CMD.
4774  017114  004737  017122                   JSR PC,RANW                     ;STORE BRF, # OF OPERATIONS, PATTERN.
4775  017120  000207                           RTS     PC
4776
4777
4778
4779
4780
4781                                    ;       SUBROUTINE TO STORE BRF, # OF OPERATIONS, PATTERN IN COMMAND
4782                                    ;       SEQUENCE TABLE FOR WRITE AND WRITE/VERIFY COMMANDS.
4783                                    ;       INPUTS:
4784                                    ;       OUTPUTS:
4785                                    ;       REGISTERS:      R2
4786                                    ;       CALLS:
4787
4788  017122                            RANW:   LET (R1)+ := #DATCNT            ;SET BRF TO MAX FOR PATTERN GENERATION.
4789                                                                            ;RANDOM BRF WILL BE GENERATED FOR EACH RECORD.
4790  017126                                    LET RANB := RANB + RANS
4791  017134                                    LET R2 := RANB CLR.BY #RNOPSC
4792  017144                                    LET (R1)+ := R2                 ;SET RANDOM # OF OPERATIONS.
4793  017146                                    LET (R1)+ := #RANP              ;RANDOM PATTERN.
4794  017152  000207                           RTS PC                          ;RETURN.
4795
4796                                          .EVEN
4797
4798  017154                                  ENDTST
4799  017154                            L10033:
4800
```

TEST 3: WRITE COMPATABILITY/WRITE UTILITY. SEQ 0111

```
                                .SBTTL  TEST 3: WRITE COMPATABILITY/WRITE UTILITY.

                                ;++
                                ; TEST TO WRITE RECORDS FROM BOT TO EOT.
                                ;--

                                        BGNTST
                                T3::

                                        LET RANDOM :B- #1               ;SET THE RANDOM OPERATIONS FLAG.
                                        LET R2 := #DATCNT - #1          ;SET UP THE RECORD LENGTH MASK.
                                        LET LENMSK :- COMP R2           ;ALLOW MAXIMUM BUFFER.
017202  004737  005754                  JSR PC,SETCH                    ;CMD 1 = SET CHARACTERISTIC.
017206  004737  006000                  JSR PC,SETRW                    ;CMD2=REWIND
017212                                  REPEAT                          ;REPEAT TO EOT.
017212                                    WHILE R1 LT #SEQEND DO        ;WHILE THERE IS MORE ROOM IN SEQ TABLE:
017220  004737  017076                      JSR PC,RANWR                  ;STORE A WRITE CMD IN SEQUENCE TABLE.
017224                                    ENDDO
017226                                    LET (R1) := #END              ;STORE END OF SEQUENCE CODE IN TABLE.
017232  004737  006020                    JSR   PC,EXALL                ;EXECUTE ALL CMDS IN SEQ TBL ON UNITS.
017236                                    LET R1 := #CMDSEQ             ;INIT SEQ TBL POINTER,
017242                                  UNTIL R2 NE #0                  ;REPEAT UNTIL EOT IS REACHED
017246  004737  006000                  JSR PC,SETRW                    ;STORE REWIND IN SEQ TBL,
017252                                  LET (R1) := #END                ;STORE END IN SEQ TBL,
017256  004737  006020                  JSR PC,EXALL                    ;EXECUTE REWIND CMD ON ALL UNITS

017262                                  EXIT    TST

                                        .EVEN

017266                                  ENDTST
017266                          L10034:
```

```
                                TEST 3: WRITE COMPATABILITY/WRITE UTILITY.                                      SEQ 0112

4834
4835                            .SBTTL  TEST 4:  READ COMPATABILITY/READ UTILITY.
4836
4837                            ;++
4838                            ; TEST TO READ ENTIRE TAPE FORWARD AND REVERSE.
4839                            ;--
4840
4841  017270                            BGNTST
4842  017270                    T4::
4843
4844  017270                            LET RANDOM :B- #1             ;SET THE RANDOM OPERATIONS FLAG.
4845  017276  004737  005754           JSR PC,SETCH                  ;CMD 1 = SET CHARACTERISTIC.
4846  017302  004737  006000           JSR PC,SETRW                  ;CMD2=REWIND.
4847  017306                            LET (R1)+ := #RDF             ;CMD3 = READ FORWARD.
4848  017312                            LET (R1)+ := #DATCNT          ;SET LENGTH TO MAX FOR UNKNOWN LENGTHS.
4849  017316                            LET (R1)+ := #77777           ;SET RECORD COUNT TO MAX FOR WHOLE TAPE.
4850  017322                            LET (R1)+ := #RANP            ;PATTERN = RANDOM.
4851  017326                            LET (R1) := #END              ;STORE END OF SEQUENCE CODE IN TABLE.
4852  017332  004737  006020           JSR     PC,EXALL              ;EXECUTE ALL CMDS IN SEQ TBL ON ALL UNITS.
4853  017336                            LET P1 := #CMDSEQ             ;INIT CMD SEQ TBL POINTER.
4854  017342                            LET (R1)+ := #RDR             ;CMD1 = READ REVERSE.
4855  017346                            LET (R1)+ := #DATCNT          ;SET LENGTH TO MAX FOR UNKNOWN LENGTHS.
4856  017352  004737  012300           JSR     PC,FIRSTU             ;SET UP R5 TO FIND RECORD COUNT.
4857  017356                            LET (R1)+ := RECCNT(R5)       ;RECORD COUNT = # OF RECORDS ON TAPE.
4858  017362                            LET (R1)+ := #RANP            ;PATTERN = RANDOM.
4859  017366                            LET (R1) := #END              ;STORE END OF SEQUENCE CODE IN TABLE.
4860  017372  004737  006020           JSR     PC,EXALL              ;GO EXECUTE READ REV. OF ENTIRE TAPE.
4861
4862  017376                            EXIT    TST
4863
4864                                    .EVEN
4865
4866  017402                            ENDTST
4867  017402                    L10035:
```

TEST 5: EXECUTE OPERATOR SELECTED COMMAND SEQUENCE. SEQ 0113

```
                                        .SBTTL  TEST 5: EXECUTE OPERATOR SELECTED COMMAND SEQUENCE.

                                        ;++
                                        ; TEST TO EXECUTE  OPERATOR SELECTED COMMAND SEQUENCE.
                                        ;--

                                                BGNTST
                                        T5::

                                                LET RANDOM := #0                ;CLEAR RAMDOM MODE FLAG.
                                                LET IRE :B= PIRE                ;MOVE INHIBIT RFC ERROR REPORT FLAG.
                                                JSR PC,SETCH                    ;CMD 1 = SET CHARACTERISTIC.
                                                LET CMDSEQ+2 := CHAR            ;MOVE CHAR CODE FROM P TBL TO SEQ TBL.
                                                LET R2 := #CMDD                 ;R2 POINTS TO CMD2 IN SOFT P TABLE.
                                                JSR     PC,PTCMDS               ;MOVE CMD 2 FROM P TBL TO SEQ TBL.
                                                JSR     PC,PTCMDS               ;MOVE CMD 3 FROM P TBL TO SEQ TBL.
                                                JSR     PC,PTCMDS               ;MOVE CMD 4 FROM P TBL TO SEQ TBL.
                                                JSR     PC,PTCMDS               ;MOVE CMD 5 FROM P TBL TO SEQ TBL.
                                                JSR     PC,PTCMDS               ;MOVE END CMD FROM P TBL TO SEQ TBL.
                                                LET JLOOP := #0                 ;CLEAR JMP CMD LOOP COUNT.
                                                LET R1 := #CMDSEQ               ;INIT SEQUENCE TABLE POINTER.
                                        3$:     WHILE (R1) NE #END DO           ;WHILE THERE ARE CMDS LEFT IN SEQUENCE TBLE:
                                                  CMP   #JMP.C,(R1)             ;IS THIS A JUMP CMD?
                                                  BNE   6$                      ;BR IF NOT.
                                                  LET R1 := R1 + #2             ;POINT TO BRF.
                                                  MOV   (R1)+,JLOC              ;SAVE BRF (LOCATION).
                                                  LET JLOOP := JLOOP + #1       ;UPDATE THE LOOP COUNT.
                                                  CMP (R1)+,JLOOP               ;HAS LOOP COUNT BE SATISFIED?
                                                  BNE   1$                      ;IF NOT, JMP AGAIN.
                                                  LFT R1 := R1 + #2             ;IF SO, ADJUST SEQ POUNTER
                                                  BR    3$                      ;AND GO TO NEXT COMMAND.
                                        1$:       LET R1 := #CMDSEQ             ;INIT CMD SEQ TABLE POINTER.
                                        2$:       DEC   JLOC                    ;DECR LOCATION COUNTER.
                                                  BEQ   3$                      ;IF THIS IS THE RIGHT LOCATION TO JMP TO, GO SET
                                                  LET R1 := R1 + #10            ;IF NOT, UPDATE SEQ POINTER TO NEXT CMD.
                                                  BR    2$                      ;DO IT AGAIN.
                                        6$:       CMP   #DLY.C,(R1)             ;DELAY?
                                                  BNE   4$                      ;BR IF NOT.
                                                  LET R1 :- R1 + #4             ;R1 = LOCATION OF N COUNT.
                                                  LET TIME2 :- (R1)             ;SAVE N COUNT.
                                        7$:       WAITUS 10.                    ;GO TO SUPER-WAIT 1 MSEC.
                                                  DEC   TIME2
                                                  BNE   7$
                                                  LET R1 :- R1 + #4             ;POINT TO NEXT CMD.
                                                  BR    3$                      ;GO CHECK NEXT CMD.
                                        4$:       JSR   PC,SETUP                ;GO SETUP THE COMMAND BLOCK.
                                                  WHILE NCNT NE #0 DO           ;WHILE THERE ARE RECORDS REMAINING:
                                                    JSR PC,CMDAC                ;STORE CMD ASCII IN ERROR MSG.
                                                    JSR PC,FIRSTU               ;SET UP FOR 1ST UNIT.
                                                    IF DEVTBL(R5) EQ #END THEN  ;IF ALL DEVICES HAVE BEEN DROPPED:
                                                      DOCLN                     ;DO CLEAN CODE AND ABORT PASS.
                                                    ENDIF
                                                    WHILE DEVTBL(R5) NE #END DO ;WHILE THERE ARE UNITS REMAINING:
                                                      JSR       PC,EXCUTE       ;GO EXECUTE THE COMMAND.
                                                      JSR       PC,NEXTU        ;FIND NEXT UNIT.
                                                    ENDDO
```

4868				
4869				
4870				
4871				
4872				
4873				
4874	017404			
4875	017404			
4876				
4877	017404			
4878	017410			
4879	017416	004737	005754	
4880	017422			
4881	017430			
4882	017434	004737	020014	
4883	017440	004737	020014	
4884	017444	004737	020014	
4885	017450	004737	020014	
4886	017454	004737	020014	
4887	017460			
4888	017464			
4889	017470			
4890	017476	022711	000040	
4891	017502	001024		
4892	017504			
4893	017510	012137	003006	
4894	017514			
4895	017520	022137	003004	
4896	017524	001003		
4897	017526			
4898	017532	000756		
4899	017534			
4900	017540	005337	003006	
4901	017544	001751		
4902	017546			
4903	017552	000772		
4904	017554	022711	000020	
4905	017560	001015		
4906	017562			
4907	017566			
4908	017572			
4909	017600	005337	003002	
4910	017604	001372		
4911	017606			
4912	017612	000726		
4913	017614	004737	006450	
4914	017620			
4915	017626	004737	006360	
4916	017632	004737	012300	
4917	017636			
4918	017646			
4919	017650			
4920	017650			
4921	017660	004737	007316	
4922	017664	004737	012326	
4923	017670			

TEST 5: EXECUTE OPERATOR SELECTED COMMAND SEQUENCE. SEQ 0114

```
4924  017672  004737  012300                    JSR PC,FIRSTU                ;SET UP FOR 1ST UNIT.
4925  017676                                    WHILE DEVTBL(R5) NE #END DO ;WHILE THERE ARE MORE UNITS.
4926  017706  004737  007600                      JSR       PC,GOWAIT        ;GO WAIT FOR INTERRUPT + CHECK FOR ERRORS.
4927  017712  023727  002762  100017              CMP       CMDWRD,#GES      ;IS THIS A GET STATUS CMD?
4928  017720  001002                              BNE       5$               ;BR IF NOT.
4929  017722  004737  012610                        JSR PC,PRXST               ;PRINT EXTENDED STATUS REGISTERS.
4930  017726                            5$:         IF #XO.EOT SETIN MSGPKT+MS.XSO OR #XO.BOT SETIN MSGPKT+MS.XSO THEN
4931  017746                                          LET NCNT := #1           ;FORCE TERMINATION OF COMMAND.
4932  017754                                        ENDIF
4933  017754  004737  012672                        JSR       PC,CKHAE       ;CHECK HALT AFTER EACH CMD FLAG.
4934  017760  004737  012326                        JSR       PC,NEXTU       ;FIND NEXT UNIT IN TEST SEQUENCE.
4935  017764                                      ENDDO
4936  017766                                      LET NCNT := NCNT - #1        ;UPDATE RECORD COUNT.
4937  017772                                      LET PCMDWD := CMDWRD         ;SAVE PREVIOUS COMMAND WORD.
4938  020000                                    ENDDO
4939  020002  004737  011540                    JSR   PC,VFYDAT              ;IF LAST CMD WAS A WRITE VERIFY, THEN GO
4940                                                                         ;VERIFY THE LAST N RECORDS OF DATA.
4941  020006                                  ENDDO
4942
4943  020010                            ENDT5:  EXIT    TST
4944
4945
4946
4947
4948
4949
4950                                      ;       SUBROUTINE TO MOVE A COMMAND FROM THE SOFTWARE P TABLE TO
4951                                      ;       THE COMMAND SEQUENCE TABLE.
4952                                      ;       INPUTS:         R2 = POINTER TO SOFT 'P' TABLE
4953                                      ;       OUTPUTS:
4954                                      ;       REGISTERS:      R3.
4955                                      ;       CALLS:
4956
4957  020014                              PTCMDS: LET R3 := (R2)+ - #1 SHIFT +1    ;R3 = COMMAND TABLE INDEX.
4958  020022                                      LET (R1)+ := CMDTBL(R3)          ;MOVE COMMAND WORD.
4959  020026                                      LET (R1)+ := (R2)+               ;MOVE # OF BYTES.
4960  020030                                      LET (R1)+ := (R2)+               ;MOVE # OF OPERATIONS.
4961  020032                                      LET (R1)+ := (R2)+               ;MOVE PATTERN CODE.
4962  020034  000207                             RTS PC
4963                                              .EVEN
4964
4965  020036                                    ENDTST
4966  020036                            L10036:
4967
4968  020040                                    ENDMOD
```

```
                                .TITLE PARAMETER CODING

                                .SBTTL  HARDWARE PARAMETER CODING SECTION

020040                                  BGNMOD

                                ;++
                                ; 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.
                                ;--

020040                                  BGNHRD
020042                          L$HARD::

020042                                  GPRMA   TS4ADR,0,0,160000,177564,YES
020052                                  GPRMD   TS4VCT,2,0,777,60,776,YES

020064                                  EXIT HRD

                                        .NLIST  BEX
020066  051524  041104  040440  TS4ADR: .ASCIZ  /TSDB ADDRESS/
020103     126  041505  047524  TS4VCT: .ASCIZ  /VECTOR/
                                        .LIST   BEX
                                        .EVEN

020112                                  ENDHRD
020112                          L10037:
```

```
                        .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.
                        ;--

020112                          BGNSFT
020114                  L$SOFT::


020114                          GPRML   CLRM,0,1,YES
020122                          GPRML   RRVM,0,400,YES
020130                          GPRML   HAEM,2,1,YES
020136                          GPRML   DINTM,6,1,YES
020144                          GPRML   IRECM,6,400,YES
020152                          GPRML   CHGM,10,1,YES
020160                          XFERF   ENDSP
020162                          GPRML   IREM,12,1,YES
020170                          GPRMD   CHARM,14,0,377,0,200,YES
020202                          GPRMD   CMD2M,16,D,37,1,33,YES
020214                          GPRMD   BPCRM,20,D,-1,1,DATCNT,YES
020226                          GPRMD   NUMBM,22,D,-1,1,-1,YES
020240                          GPRMD   PATTM,24,D,17,0,10,YES
020252                          GPRMD   CMD3M,26,D,37,1,33,YES
020264                          GPRMD   BPCRM,30,D,-1,1,DATCNT,YES
020276                          GPRMD   NUMBM,32,D,-1,1,-1,YES
020310                          GPRMD   PATTM,34,D,17,0,10,YES
020322                          GPRMD   CMD4M,36,D,37,1,33,YES
020334                          GPRMD   BPCRM,40,D,-1,1,DATCNT,YES
020346                          GPRMD   NUMBM,42,D,-1,1,-1,YES
020360                          GPRMD   PATTM,44,D,17,0,10,YES
020372                          GPRMD   CMD5M,46,D,37,1,33,YES
020404                          GPRMD   BPCRM,50,D,-1,1,DATCNT,YES
020416                          GPRMD   NUMBM,52,D,-1,1,-1,YES
020430                          GPRMD   PATTM,54,D,17,0,10,YES
020442                  ENDSP:
020442                          EXIT SFT
```

```
5039
5040                                                    .NLIST  BEX
     020444  046103  040503  020122  CLRM:              .ASCIZ  /CLEAR COUNTERS/
     020463     122  051505  052105  RRVM:              .ASCIZ  /RESET RANDOM VARIABLES/
     020512  040510  052114  040440  HAEM:              .ASCIZ  /HALT AFTER EACH CMD/
     020536  044504  040523  046102  DINTM:             .ASCIZ  /DISABLE INTERRUPTS/
     020561     111  044116  041111  IRECM:             .ASCIZ  /INHIBIT RECOVERY/
     020602  044103  047101  042507  CHGM:              .ASCIZ  /CHANGE CMD SEQUENCE/
     020626  047111  044510  044502  IREM:              .ASCIZ  /INHIBIT RFC ERROR REPORT/
     020657     103  040510  040522  CHARM:             .ASCIZ  /CHARACTERISTICS CODE/
     020704  046503  027504  000062  CMD2M:             .ASCIZ  "CMD/2"
     020712  051102  020106  047503  BPCRM:             .ASCIZ  /BRF COUNT/
     020724  020043  043117  047440  NUMBM:             .ASCIZ  /# OF OPERATIONS/
     020744  040520  052124  051105  PATTM:             .ASCIZ  /PATTERN/
     020754  046503  027504  000063  CMD3M:             .ASCIZ  "CMD/3"
     020762  046503  027504  000064  CMD4M:             .ASCIZ  "CMD/4"
     020770  046503  027504  000065  CMD5M:             .ASCIZ  "CMD/5"
                                                        .LIST   BEX
5041                                                    .EVEN
5042
5043  020776                                            ENDSF'
5044  020776                                L10040:
5045
5046  020776                                            LASTAD
5047  020776                                L$LAST::
5048  020776                                            ENDMOD
```

```
 5049
 5050  051572  000000                    .SBTTL  DIAGNOSTIC SUPERVISOR -- LOW CORE SET UP
       051574  000000                    .WORD   0               ;SPACE FOR USER POOL POINTER
       051576  000000                    .WORD   0               ;SIZE
       051600  000000                    .WORD   0               ;CHECKSUM (NOT CURRENTLY USED)
                                          .WORD   0               ;SIZE OF H.W. PTAB. ALLOCATION
               051604                    END.SUPV-.+2
               000200                    .END 200
```

```
ABOFLA  021322 G        5050#*
ABOPAS  021240 G        5050#*
ABO.FM  023602           5050#
ACK.C = 100000 G         2511#   2595    2600    2603    2606    2609    2612    2615    2618    2621    2624    2627    2630
                         2633    2636    2639    2642    2645    2648    2651    2654    2657    2660    2663    2666    2668
AFSI    021030 G         5050#
ALLOC   041742           5050#
APT.ER  022732           5050#
ATTNM   004216 G         3007#   3626
AUDRPM  004543 G         3007#   4192
A$AAV   025600           5050#
A$AAW   025614           5050#
A$AAX   025626           5050#
A$AAY   025634           5050#
A$AAZ   025650           5050#
A$ABA   025660           5050#
BFSEQ   015754           4328    4347    4356    4365    4374    4383    4392    4401    4410    4419    4428    4472#
BFSEQ0  016000           4328    4483#
BFSEQ1  016052           4347    4505#
BFSEQ2  016064           4356    4511#
BFSEQ3  016156           4365    4541#
BFSEQ4  016230           4374    4563#
BFSEQ5  016272           4383    4581#
BFSEQ6  016344           4392    4603#
BFSEQ7  016376           4401    4617#
BFSEQ8  016430           4410    4631#
BFSEQ9  016462           4419    4645#
BFSE10  016504           4428    4655#
BGNFLG= 003016           2824#   3488
BGN.SU= 020776           5050#
BINC    011524           3826    3861#
BINMSG  040252           5050#
BIT0  = 000001 G         2443#   3535    4136
BIT00 = 000001 G         2432#   2443    3952
BIT01 = 000002 G         2431#   2442
BIT02 = 000004 G         2430#   2441
BIT03 = 000010 G         2429#   2440
BIT04 = 000020 G         2428#   2439
BIT05 = 000040 G         2427#   2438
BIT06 = 000100 G         2426#   2437
BIT07 = 000200 G         2425#   2436
BIT08 = 000400 G         2424#   2435
BIT09 = 001000 G         2423#   2434
BIT1  = 000002 G         2442#   4136
BIT10 = 002000 G         2422#
BIT11 = 004000 G         2421#
BIT12 = 010000 G         2420#
BIT13 = 020000 G         2419#
BIT14 = 040000 G         2418#
BIT15 = 100000 G         2417#
BIT2  = 000004 G         2441#
BIT3  = 000010 G         2440#
BIT4  = 000020 G         2439#
BIT5  = 000040 G         2438#
BIT6  = 000100 G         2437#
BIT7    000200 G         2436#
```

```
BIT8  = 000400 G          2435#
BIT9  = 001000 G          2434#
BLD.HW  026464            5050#
BLOCK   044076            5050#
BPCRM   020712            5023    5027    5031    5035    5040#
BRCPK   002240 G          2708#   4247    4270
BRFCNT  002760 G          2806#   3139*   3143*   3145    3146*   3148    3230*   3296    3827    3828    3934    3935    3937
BRF.C = 004000 G          2516#   2603    2606    2609    2612    2615    2618    2621    2624    2627    2630    2633    2648
                          2651    3284    3540    3576    3894
B$AAB   030066            5050#
B$AAF   030000            5050#
CALLPC= 000022            5050#*
CALLPS= 000024            5050#*
CALLSP= 000026            5050#*
CALLTC= 000030            5050#*
CAL.CL  04646             5050#*
CAL.TI  046522 G          5050#
CHAR    002150 G          2379#   4881
CHARM   020657            5021    5040#
CHGFLG  002144 G          2375#   4223*
CHGM    020602            5018    5040#
CHKERR  010212 G          3476    3566#
CHKLUP  030102            5050#
CHKSTR  042304            5050#
CHKTTY  040372            5050#
CHK.MA  026242            5050#
CHK.PC  033372            5050#*
CHK.SW  022432            5050#
CHRCNT  041624            5050#*
CH.EAI= 000040 G          2379    2539#   2541    2740    2857
CH.ERI= 000020 G          2540#
CH.ESS= 000200 G          2538#
CH.FLA  025750            5050#*
CH.PAS  025766            5050#
CKDATA  012042 G          3916    3933#
CKDCNT  012274            3940*   3950    3952    3973    3976#
CKDFF   012276            3944*   3959    3964*   3977#
CKHAE   012672 G          3170    3918    4073#   4933
CKHRTN  012740            4076    4083#
CLEAR.  027364            5050#
CLKACC  021236 G          5050#*
CLKBFR  046466            5050#*
CLKCNT  021234 G          5050#*
CLKJUM  047( ? G          5050#
CLKRES  0500?4 G          5050#
CLKSER  050230 G          5050#
CLKSON  021274 G          5050#*
CLK.SE  026044            5050#
CLN   = 101012 G          2663#   2907    4645
CLRERR  007750 G          3479    3487#   4224
CLRFLG  002134 G          2367#   4142*
CLRM    020444            5013    5040#
CLR.MA  026320            5050#
CMDAC   006360 G          3134    3195#   3901    4915
CMDASC  003226 G          2916#   3219
CMDD    002152 G          2380#   4882
```

```
CMDLG   002770 G   2810#  3228*  3240*  3247*  3249*  3273*  3682   3739   3788   3796   3823   3880*  3884*
CMDPKM  003742 G   3007#  4137
CMDPKT  002224 G   2693#  3040   3041   3148*  3228*  3229*  3231   3236*  3239   3244*  3246   3255*  3261*
                   3262*  3270*  3274   3275*  3281   3283*  3284*  3286   3434*  3435   3588*  3685*  3692*
                   3894*  3896*  3898   3899*  4136   4447*  4450*  4452*  4456*  4459*  4461*
CMDSAV  002764 G   2808#  3286*  3588   3898*
CMDSEQ  003046 G   2856#  3103   3131   4473   4698   4701*  4702*  4706   4822   4854   4881*  4889   4900
CMDSE2  003056 G   2860#
CMDTBL  003140 G   2884#  3216   4959
CMDWRD  002762 G   2807#  3137   3178   3196   3280   3281*  3410   3457   3537   3540   3541   3576   3878
                   3879*  3882   3883*  3894   3923   3941   4077   4445*  4454*  4927   4938
CMD.C0= 000001 G   2534#  2600   2603   2606   2609   2612   2621   2624   2627   2630   2633   2642   2645
                   2654   2657   3242   3268
CMD.C1= 000002 G   2533#  2600   2639   2654   2660   2663   2668   3259
CMD.C2= 000004 G   2532#  2609   2612   2633   2654   2666   2668   3252   3259   3268
CMD.C3= 000010 G   2531#  2600   2615   2618   2636   2639   2642   2645   2648   2651   2654   2657   2660
                   2663   3234
CMD.C4= 000020 G   2529#
CMD2M   020704     5022   5040#
CMD3M   020754     5026   5040#
CMD4M   020762     5030   5040#
CMD5M   020770     5034   5040#
CNTBGN= 002460     2587   2781#  3826
CNTEND= 002740     2587   2795#
CNTLEN= 000260 G   2587#  4145
CNVT    044542     5050#
CODELM  003625 G   3007#  4337
COMMAN  021046 G   5050#*
COMMTA  044356     5050#
CONTCL  050154 G   5050#
CP.ADH= 000004 G   2572#
CP.ADL= 000002 G   2571#  3244*  3255*  3262*  3270*  3899*
CP.CMD= 000000 G   2570#
CP.CNT= 000006 G   2573#  3148*  3229*  3255*  3261*  4447*  4450*  4452*  4456*  4459*  4461*
CRLF    040454     5050#
CTCC    003012 G   2819#  3040   3526*  3535   3568   3573
CURR.S  021004 G   5050#*
CURR.T  021006 G   5050#*
CVC.C = 040000 G   2512#  2595   2666
C$AAD   033344     5050#
C$AAE   033356     5050#
C$AAK   034354     5050#
C$AAL   034520     5050#
C$ABRT= 000021     2280#
C$ADR = 000020     2280#  3581   3610   3652   3689   3712   3749   3808   3969   4024   4030   4137
C$AU  = 000054     2280#  4305
C$BRK = 000022     2280#  3456   3504   4194   4202
C$BSEG= 000004     2280#
C$BSUB= 000002     2280#  4326   4345   4354   4363   4372   4381   4390   4399   4408   4417   4426   4443
C$BUFF= 000030     2280#  4217
C$CEFG= 000046     2280#
C$CLEA= 000012     2280#  4257
C$CLP1- 000006     2280#
C$CVEC= 000036     2280#  4248   4272
C$DCLN= 000044     2280#  3153   3905   4046   4195   4219   4919
C$DODU  000053     2280#  4041
```

```
C$DRPT= 000024          2280#  3161   4036
C$DU  = 000055          2280#  4278
C$EDIT= 000000          2280#  2313
C$ERDF= 000002          2280#  4024   4030
C$ERHR= 000003          2280#  3581   3610   3652   3969
C$ERSF= 000001          2280#  4137
C$ERSO= 000004          2280#  3689   3712   3749   3808
C$ESCA= 000010          2280#
C$ESEG= 000005          2280#
C$ESUB= 000003          2280#  4342   4351   4360   4369   4378   4387   4396   4405   4414   4423   4435   4464
C$ETST= 000001          2280#  4668   4800   4833   4868   4967
C$EXIT= 000032          2280#  4228   4253   4466   4711   4828   4863   4944
C$GMAN= 000043          2280#  4081
C$GPHR= 000042          2280#  4180   4293
C$GPRI= 000040          2280#
C$GTIM= 000052          2280#
C$INIT= 000011          2280#  4232
C$INLP= 000020          2280#
C$KWOF= 000035          2280#
C$KWON= 000034          2280#
C$LOOP= 000100          2280#
C$MANI= 000051          2280#  4075
C$MSG = 000023          2280#  3032   3050   3059
C$PNTB= 000014          2280#  3022   3037   3854
C$PNTF= 000017          2280#  4050   4192   4337
C$PNTS= 000016          2280#  4106   4107   4108   4109   4110   4111   4112   4113   4114
C$SYNTX= 000015         2280#  3038   3039   3040   3041   3042   3043   4061   4062
C$POIN= 000040          2280#  3581   3610   3652   3689   3712   3749   3808   3969   4024   4030
C$QIO = 000377          2280#
C$RDBU= 000007          2280#
C$REFG= 000050          2280#  4156   4170
C$REQT= 000045          2280#
C$RESE= 000033          2280#
C$REVI= 000000          2280#  2313
C$RPT = 000025          2280#  4125
C$SEFG= 000047          2280#
C$SPRI= 000041          2280#  3071   3078   3085   3092
C$SVEC= 000037          2280#  4184   4297
C$TPRI= 000013          2280#
C$UNBU= 000031          2280#  4251
C$WTM = 000026          2280#  4138   4193
C$WTU   000027          2280#  3458   4027   4209   4909
DATARD  002752 G        2803#  3244   3899   3908   3909   3948   4221*
DATAWT  002750 G        2582   2802#  3270   3299   3947   4220*  4251   4437   4438
DATCNT  010000 G        2381   2385   2389   2393   2584#  2861   2865   2869   2873   4216   4221   4512   4516
                        4520   4524   4528   4532   4536   4546   4608   4612   4618   4622   4626   4632   4636
                        4640   4678   4686   4744   4750   4789   4812   4849   4856   5023   5027   5031   5035
DECMSG  040266          5050#
DESCM   003614 G        2325   3007#
DEVTBL  002446 G        2774#  3022   3037   3152   3155   3164   3413   3904   3907   3988   4006   4023   4105
                        4106   4161*  4167*  4177   4199   4245   4271*  4292*  4332   4337   4918   4921   4926
DEV.CO  021010 G        5050#*
DFPTBL  002126 G        2348#
DFTSCH= 000040 G        2541#  3104
DIA   - 100006 G        2668#  2909
DIABLK  002750 G        2582#  3262
```

```
DIACNT= 000020 G        2583#   3261
DIAG.T  021330 G        5050#*
DINT    002142 G        2373#   3425    3460
DINTM   020536          5016    5040#
DLY   = 000020 G        2672#   2911
DLY.C = 000020 G        2530#   2672    4904
DPDVD   050740 G        5050#
DPMUL   050626 G        5050#
DRI   = 100013 G        2600#   2884    4487
DROPDM  004501 G        3007#   4050
DROPED  003025 G        2831#   3913    3916    3986*   4003*   4051*
DROPN   012606          4023*   4050    4053#
DROPU   012350 G        3405    3430    3441    3470    3626    3669    3744    3775    3790    3800    4019#
DRORTN  012604          4047    4051#
DRO100  012372          4020*   4021*   4023#
DRO200  012552          4042    4049#
DTAERM  004576 G        3019#   3969
DTAER1  004650          3022    3027#
DUNIT.  021244 G        5050#*
DVC.FT  034324          5050#
D$AAG   035230          5050#
D$AAH   035246          5050#
D$AAI   040014          5050#
D$AAJ   040020          5050#
D$AAK   040036          5050#
D$AAL   040054          5050#
D$AAM   040064          5050#   -
EF.CON= 000036 G        2451#
EF.NEW= 000035 G        2452#
EF.PWR= 000034 G        2453#   4170
EF.RES= 000037 G        2450#
EF.STA= 000040 G        2449#   4156
EF01  = 000001 G        2470#
EF02  = 000002 G        2469#
EF03  = 000003 G        2468#
EF04  = 000004 G        2467#
EF05  = 000005 G        2466#
EF06  = 000006 G        2465#
EF07  = 000007 G        2464#
EF08  = 000010 G        2463#
EF09  = 000011 G        2462#
EF10    000012 G        2461#
EF11  = 000013 G        2460#
EF12  = 000014 G        2459#
EF13  - 000015 G        2458#
EF14  = 000016 G        2457#
EF15  = 000017 G        2456#
EF16  = 000020 G        2455#
EINC    011532          3847    3865#
EMT.TR  021326 G        5050#*
END     177777 G        2674#   2778    2807    2808    2809    2877    2878    2879    2880    2881    2912    3132    3152
                        3155    3164    3413    3904    3907    4105    4177    4199    4245    4332    4474    4477    4503
                        4509    4539    4561    4579    4601    4615    4629    4643    4653    4663    4696    4703    4708
                        4820    4825    4852    4860    4890    4918    4921    4926
ENDERF  003026          2833#   3479
ENDFLG  003044          2845#   4224
```

```
ENDSP   020442           5019    5037#
ENDT5   020010           4943#
END.OF  027352           5050#
END.SU= 051604           5050#*
ENVIRO  021050 G         5050#*
EOP.CH  050252 G         5050#
EOP.FM  023616           5050#
EOP.IN  025762           5050#*
EOTFLG  003040 G         2840#   3167*   3172    3173*
ERLOG   003021 G         2827#   3821    3822*
ERRFOR  034576           5050#
ERRHAN  033376           5050#
ERRREC  003024 G         2830#   3569    3646    3694*   3716*   3753*
ERR.HR  034334           5050#
ERR.NU  021000 G         5050#*
ERR.SF  034340           5050#
ERR1FO  034662           5050#
ERS   = 100411 G         2657#   2905    4549
ESC.PC  033370           5050#*
EV.COU  021002 G         5050#*
EXALL   006020 G         3130#   4329    4348    4357    4366    4375    4384    4393    4402    4411    4420    4429    4431
                         4696    4703    4708    4820    4825    4852    4860
EXARTN  006356           3174    3183#
EXCRTN  007576           3406    3431    3443#
EXCUTE  007316 G         3155    3398#   3695    3717    3756    3911    4921
FATSM   004302 G         3007#   3775
FILL    041122           5050#
FILL.C  000204 G         5050#
FIRSTU  012300 G         3150    3162    3411    3902    3985#   4103    4174    4197    4243    4330    4856    4916    4924
FLAGS   021042 G         5050#*
FLAGS1  021044 G         5050#
FLAGTA  044274           5050#
FLAG.I  026030           5050#
FLA.SE  044242           5050#
FLG.MA  025770           5050#
FMT.CO= 000040 G         2525#   2595
FMT.C1= 000100 G         2522#   2595
FORM.T  034672           5050#*
FREE    042200           5050#
FUNRM   004262 G         3007#   3669
F$ALU - 000015           2280#   4287    4304
F$BGN   000040           2280#   2284    2402    2407    3019    3024    3034    3044    3051    3053    3069    3076    3083
                         3090    4087    4092    4099    4118    4133    4228    4240    4253    4265    4274    4287    4300
                         4307    4318    4320    4325    4341    4344    4350    4353    4359    4362    4368    4371    4377
                         4380    4386    4389    4395    4398    4404    4407    4413    4416    4422    4425    4434    4442
                         4463    4466    4667    4674    47 1    4799    4808    4828    4832    4842    4863    4867    4875
                         4944    4966    4969    4974    4985    4991    5009    5039    5049
F$CLEA  000007           2280#   4240    4256
F$DU  = 000016           2280#   4265    4277
F$END - 000041           2280#   2284    2402    2407    3024    3032    3044    3050    3053    3059    3074    3081    3088
                         3095    4087    4092    4118    4125    4228    4232    4253    4257    4274    4278    4300    4305
                         4307    4318    4320    4325    4341    4342    4344    4350    4351    4353    4359    4360    4362
                         4368    4369    4371    4377    4378    4380    4386    4387    4389    4395    4396    4398    4404
                         4405    4407    4413    4414    4416    4422    4423    4425    4434    4435    4442    4463    4464
                         4466    4667    4668    4674    4711    4799    4800    4808    4828    4832    4833    4842    4863
                         4867    4868    4875    4944    4966    4967    4969    4974    4991    4997    5039    5045    5049
```

```
F$HARD= 000004          2280#  4985  4991  4996  5019  5039
F$HW  = 000013          2280#  2347  2355
F$INIT= 000006          2280#  4133  4231
F$JMP = 000050          2280#  3024  3044  3053  4118  4228  4253  4274  4300  4466  4711  4828  4863
                        4944   4991  5039
F$MOD = 000000          2280#  2284  2402  2407  4087  4092  4307  4318  4969  4974  5049
F$MSG = 000011          2280#  3019  3031  3034  3049  3051  3058
F$PWR = 000017          2280#
F$RPT = 000012          2280#  4099  4124
F$SEG = 000003          2280#
F$SOFT= 000005          2280#  5009  5019  5039  5044
F$SRV = 000010          2280#  3069  3073  3076  3080  3083  3087  3090  3094
F$SUB = 000002          2280#  4326  4341  4345  4350  4354  4359  4363  4368  4372  4377  4381  4386
                        4390   4395  4399  4404  4408  4413  4417  4422  4426  4434  4443  4463
F$SW  = 000014          2280#  2364  2399
F$TEST= 000001          2280#  4321  4667  4675  4799  4809  4832  4843  4867  4876  4966
GARBAG  041626          5050#
GCMDA   006422 G        3196   3200  3214#  3941  4077
GENPAT  007030 G        3271   3294#
GES   = 100017 G        2654#  2702  2904  4495  4927
GETCHR  040332          5050#
GETCMN  043716          5050#
GETPAR  035410          5050#
GETSWI  042712          5050#
GET.TW  042462          5050#
GIT     007312          3381   3386#
GOWAIT  007600 G        3164   3453#  3696  3718  3757  3913  4926
GOWRTN  007736          3471   3478#
GSCPK   002234 G        2702#  4026  4208
G$EXCP= 000400          2280#
G$HILI= 000002          2280#
G$LOLI= 000001          2280#
G$NO  = 000000          2280#
G$OFFS= 000400          2280#  4081  4988  4989  5013  5014  5015  5016  5017  5018  5020  5021  5022
                        5023   5024  5025  5026  5027  5028  5029  5030  5031  5032  5033  5034  5035
                        5036   5037
G$OFSI  000376          2280#  4081  4988  4989  5013  5014  5015  5016  5017  5018  5020  5021  5022
                        5023   5024  5025  5026  5027  5028  5029  5030  5031  5032  5033  5034  5035
                        5036   5037
G$PRMA  000001          2280#  4988
G$PRMD= 000002          2280#  4989  5021  5022  5023  5024  5025  5026  5027  5028  5029  5030  5031
                        5032   5033  5034  5035  5036  5037
G$PRML= 000000          2280#  4081  5013  5014  5015  5016  5017  5018  5020
G$RADA= 000140          2280#
G$RADB= 000000          2280#
G$RADD= 000040          2280#  5022  5023  5024  5025  5026  5027  5028  5029  5030  5031  5032  5033
                        5034   5035  5036  5037
G$RADF= 000200          2280#
G$RADL= 000120          2280#  4081  5013  5014  5015  5016  5017  5018  5020
G$RADO= 000020          2280#  4988  4989  5021
G$RADT= 000100          2280#
G$XFER= 000004          2280#  4991  5019  5039
G$YES = 000010          2280#  4081  4988  4989  5013  5014  5015  5016  5017  5018  5020  5021  5022
                        5023   5024  5025  5026  5027  5028  5029  5030  5031  5032  5033  5034  5035
                        5036   5037
HAE     002136 G        2369#  4074
```

```
HAEM    020512          5015    5040#
HALTM   003702 G        3007#   4079*   4080*   4081
HCORED  025540          5050#
HCOREQ  025450          5050#
HCORET  021264 G        5050#*
HC.ADR  021034 G        5050#
HC.DEF  021026 G        5050#
HC.DIA  021024 G        5050#
HELP  = 000000          2278#   2280    2292    2328    2338    2350    2367    2483    2688    3002    3003    3020    3026
                        3027    4101    4119    4135    4228    4242    4253    4267    4274    4289    4300    4987    4992
                        5011    5040
HERTZ.  025410          5050#
HOLDSP= 000020          5050#
HRDCNT  002730 G        2794#   3580*   3609*   3651*   3962*   4022*   4114
HW.ADR  021032 G        5050#
H$AAB   045070          5050#
IE.C  = 000200 G        2521#   2595    3434
ININIT  021254 G        5050#*
INITIA  040302          5050#
INIT.M  026366          5050#
INIT.R  021070 G        5050#
INIT10  014142          4135#   4138
INIT15  014336          4157    4169#
INIT16  014356          4171    4174#
INIT20  014700          4218    4219#
INPUTA  041230          5050#
INTFLG  003026 G        2837#   3072*   3079*   3086*   3093*   3428    3434*   3461    4298*
INTFOR  034526          5050#
INTPRI= 000340 G        2577#   3071    3078    3085    3092    4184    4297
INVAL.  025334          5050#
INVINT  034364          5050#
INV.SW  022366          5050#
IN.SUF  027336          5050#
IRE     003043 G        2843#   3579    3641    3752    4879*
IREC    002143 G        2374#   3693    3715    3853    4043
IRECM   020561          5017    5040#
IREM    020626          5020    5040#
I$AU  = 000041          2280#   4287#   4305#
I$CLN   000041          2280#   4240#   4253    4257#
I$DU    000041          2280#   4265#   4278#
I$HRD - 000041          4985#   4997#
I$INIT  000041          2280#   4133#   4228    4232#
I$MOD - 000041          2280#   2284#   2402#   2407#   4087#   4092#   4307#   4318#   4969#   4974#   5049#
I$MSG - 000041          2280#   3019#   3032#   3034#   3050#   3051#   3059#
I$PWR - 000041          2280#
I$RPT   000041          2280#   4099#   4125#
I$SEG   000041          2280#   4320    4325    4344    4353    4362    4371    4380    4389    4398    4407    4416    4425
                        4442    4674    4808    4842    4875
I$SFT   000041          5009#   5045#
I$SRV   000041          2280#   3069#   3074#   3076#   3081#   3083#   3088#   3090#   3095#
I$SUB   000041          2280#   4320    4325#   4341#   4342#   4344#   4350#   4351#   4353#   4359#   4360#   4362#   4368#
                        4369#   4371#   4377#   4378#   4380#   4386#   4387#   4389#   4395#   4396#   4398#   4404#   4405#
                        4407#   4413#   4414#   4416#   4422#   4423#   4425#   4434#   4435#   4442#   4463#   4464#   4674
                        4808    4842    4875
I$TST   000041          2280#   4320#   4325    4344    4353    4362    4371    4380    4389    4398    4407    4416    4425
                        4442    4466    4667#   4668#   4674#   4711    4799#   4800#   4808#   4828    4832#   4833#   4842#
```

```
                        4863    4867#   4868#   4875#   4944    4966#   4967#
JLOC    003006 G        2817#   4893*   4900*
JLOOP   003004 G        2816#   4886*   4895*
JMP   = 000040 G        2670#   2910
JMP.C = 000040 G        2526#   2670    4890
J$JMP = 000167          2280#   3024    3044    3053    4118    4274    4300
KBPTR   021106 G        5050#*
KBUF    021110 G        5050#*
LENMSK  002772 G        2811#   3143    4679*   4813*
LINE.F  021324 G        5050#*
LOAD.F  025764          5050#*
LOG     011254 G        3477    3820#   4033
LOGMSG  040274          5050#
LPBFR   021104 G        5050#*
LPCNTR  021102 G        5050#*
LPT.AD  025426          5050#
LPT.RE  025422          5050#
LSI.RE  025416          5050#
LUP     046370          5050#
LUP.AD  033374          5050#*
L$APT   002036 G        2307#
L$AU    015062 G        2322    4287#
L$AUT   002074 G        2321#
L$CCP   002106 G        2326#
L$CLEA  014744 G        2327    4240#
L$CO    002032 G        2305#
L$DEPO  002011 G        2296#
L$DESC  002102 G        2324#
L$DEVP  002064 G        2317#
L$DISP  002112 G        2309    2336#
L$DR    002216 G        2320    2686#
L$DRCT  002070 G        2319#
L$DRS   002072 G        2320#
L$DRST  002222 G        2321    2687#
L$DTP   002040 G        2308#
L$DU    015022 G        2323    4265#
L$DUT   002076 G        2322#
L$DVTY  003606 G        2318    3000#
L$EF    002056 G        2315#
L$EFLG  002034 G        2306#
L$EXP1  002042 G        2309#
L$EXP2  002044 G        2310#
L$EXP3  002046 G        2311#
L$HARD  020042 G        2300    4985#
L$HPCP  002016 G        2299#
L$HPTP  002022 G        2301#
L$HW    002126 G        2302    2347#
L$ICP   002104 G        2325#
L$INIT  014142 G        2326    4133#
L$LADP  002026 G        2303#
L$LAST  020776 G        2304    5047#
L$MREV  002050 G        2312#
L$NAME  002000 G        2294#
L$REPP  002066 G        2318#
L$REV   002010 G        2295#
L$RPT   012742 G        2319    4099#
```

```
L$SOFT  020114 G          2301    5009#
L$SPC   002062 G          2316#
L$SPCP  002020 G          2300#
L$SPTP  002024 G          2302#
L$STA   002030 G          2304#
L$SW    002134 G          2303    2364#
L$TIML  002014 G          2298#
L$TIMU  002054 G          2314#
L$TIM1  002052 G          2313#
L$TSTI  002100 G          2323#
L$UNIT  002012 G          2297#   4164
L.CLK.  025374            5050#
L10000  002132            2347    2355#
L10001  002214            2364    2399#
L10002  004746            3024    3031#
L10003  005604            3044    3049#
L10004  005672            3053    3058#
L10005  005706            3073#
L10006  005722            3080#
L10007  005736            3087#
L10010  005752            3094#
L10011  014140            4118    4124#
L10012  014742            4228    4231#
L10013  015020            4253    4256#
L10014  015060            4274    4277#
L10015  015160            4300    4304#
L10016  016526            4466    4667#
L10017  015310            4341#
L10020  015330            4350#
L10021  015350            4359#
L10022  015370            4368#
L10023  015410            4377#
L10024  015430            4386#
L10025  015450            4395#
L10026  015470            4404#
L10027  015510            4413#
L10030  015530            4422#
L10031  015566            4434#
L10032  015746            4463#
L10033  017154            4711    4799#
L10034  017266            4828    4832#
L10035  017402            4863    4867#
L10036  020036            4944    4966#
L10037  020112            4985    4991    4996#
L10040  020776            5009    5039    5044#
MAJ.IN  021060 G          5050#*
MAJ.LO  046470            5050#*
MAJ.US  021062 G          5050#*
MAN.TI  001244            5050#
MAP16   051176 G          5050#
MASK.B  030100            5050#
MASK.W  030076            5050#
MBR   = 100012 G          2639#   2708    2899
MEM.SI  025436            5050#
MIN.IN  021054 G          5050#*
MIN.US  021056 G          5050#*
```

```
MODR     050540 G  5050#
MOD.C0=  000400 G  2520#  2595  2606  2618  2621  2624  2651  2657  2660  3246  3541  3542  3546
MOD.C1=  001000 G  2519#  2595  2621  2624  2627  2630  2633  2645  2648  2651  2663  3692
MOD.C2=  002000 G  2518#  2595  2636
MOD.C3=  004000 G  2515#  2595
MOVMSG   010020 G  3402   3438  3467  3474  3518#  4027  4204
MSGCNT=  000016 G  2581#  2739  3422  3521
MSGPKA   002416 G  2751#  3418  3420  3519  4333
MSGPKT   002250 G  2721#  3040  3043  3166  3522*  3577  3637  3640  3737  3828  3829  3934  3935
                   4025   4062  4931
MSGPK0   002266 G  2730#  2737  2751
MSGPK1   002304 G  2731#  2752
MSGPK2   002322 G  2732#  2753
MSGPK3   002340 G  2733#  2754
MSG.AD   021022 G  5050#
MSG.TY   020776 G  5050#*
MS.RFC=  000004 G  2546#  3040  3577  3828  3829  3934  3935
MS.XS0=  000006 G  2547#  3043  3166  3637  3640  4062  4931
MS.XS1=  000010 G  2548#  3043  4062
MS.XS2=  000012 G  2549#  3043  4062
MS.XS3=  000014 G  2550#  3043  3737  4025  4062
MUL      050474 G  5050#
NCMD.C=  177740 G  2595#  3232
NCNT     002754 G  2804#  3134  3177*  3264*  3266  3899*  3901  3922*  4915  4932*  4937*
NCNT1    002756 G  2805#  3266*  3899
NEWPRI   050220 G  5050#
NEXTAR   044460    5050#
NEXTU    012326 G  3156   3168  3414  3919  4002#  4114  4187  4212  4248  4338  4922  4934
NINUSE=  177774 G  2594#  2774  2775  2776  2777  3988  4006  4161  4271
NOINTM   004330 G  3007#  3470
NO.CLK   025364    5050#
NO.FLA   044254    5050#
NO.LPT   041572    5050#
NO.PTA   025570    5050#
NR     - 000001    2686#
NSSRM    004133 G  3007#  3405
NUMBIN   034716    5050#
NUMBM    020724    5024   5028  5032  5036  5040#
NUM.LA   035064    5050#
NUM.NO   021040 G  5050#
NUM.UN   021446    5050#
NUNITS   030054    5050#
NURTYM   005606 G  3051#
NURTY1   005612    3054#  3854
NXTFOR   044534    5050#
OCTMSG   040260    5050#
ONEFIL-  000001       1#  2278#  2281  2402#  2405  4087#  4090  4308  4309#  4969  4970#  4972
OPP.C  - 020000 G  2513#  2595  2624  2630  3685
O$APTS=  000001    2280#  2291#  2304
O$AU   - 000001    2280#  2291#  2321
O$BGNR=  000001    2280#  2291#  2318
O$BGNS=  000001    2280#  2291#  2300
O$DU   = 000001    2280#  2291#  2322
O$GNSW-  000001    2280#  2291#  2302
O$POIN   000001    2280#  2291#  2327
O$PWR    000001    2291#
```

```
O.UDT = ****** U          5050
PARSES  043770            5050#
PAR.LA  037756            5050#
PASCNT  002700 G          2791#   3037    4037    4038*   4106    4186*   4336
PASS.C  021012 G          5050#*
PATERN  003010 G          2818#   3266*   3294
PATR0   007104 G          3306    3319#
PATR1   007142 G          3307    3332#
PATR2   007162 G          3308    3341#
PATR3   007172 G          3309    3347#
PATR4   007216 G          3310    3358#
PATR5   007230 G          3311    3365#
PATR6   007242 G          3312    3371#
PATR7   007262 G          3313    3380#   3385
PATR8   007314 G          3314    3390#
PATTBL  007062            3300    3306#
PATTM   020744            5025    5029    5033    5037    5040#
PCMDWD  002766 G          2809#   3178*   3200    3280*   3542    3546    3878*   3882*   3923*   4938*
PIRE    002146 G          2377#   4879
PRINTC  041602            5050#
PRINTF  045110            5050#
PRI00 = 000000 G          2481#
PRI01 = 000040 G          2480#
PRI02 = 000100 G          2479#
PRI03 = 000140 G          2478#
PRI04 = 000200 G          2477#
PRI05 = 000240 G          2476#
PRI06 = 000300 G          2475#
PRI07 = 000340 G          2474#   2577
PRNTST  041472            5050#
PRO.CM  025742            5050#*
PRXST   012610 G          4031    4060#   4929
PTAB.S  021262 G          5050#*
PTCMDS  020014            4882    4883    4884    4885    4886    4957#
PUTCHR  040306            5050#
PWRFLG  003045 G          2850#   4173*   4185    4226*
PWR.FA  051432 G          5050#
PWR.FL  021066 G          5050#*
PWR.MS  051560            5050#
PWR.SA  051554            5050#*
PWR.UP  051556            5050#*
P.CLK.  025402            5050#
RANB    002774 G          2812#   3141*   3142    3382*   3383    4152*   4692    4745*   4746    4791*   4792
RANBC   153624 G          2592#   4152
RANCMD  016762            4693    4715#
RANDOM  003036 G          2838#   3136    3578    3641    4323*   4677*   4811*   4845*   4878*
RANP  - 000007 G          2383    2387    2391    2395    2589#   2863    2867    2871    2875    4689    4748    4752    4794
                          4851    4859
RANRD   017022            4699    4723    4724    4725    4726    4727    4728    4729    4730    4742#
RANS    002776 G          2813#   3139    3141    3142*   3143    3382    3383*   3384    4153*   4692*   4693    4745    4791
RANSC - 032561 G          2593#   4153
RANW    017122            4760    4774    4788#
RANWR   017076            4716    4717    4718    4719    4720    4721    4722    4759#   4817
RANWV   017110            4715    4773#
RDF     104001 G          2603#   2885    3883    4454    4631    4749    4848
RDR     104401 G          2606#   2886    3879    4445    4617    4743    4855
```

```
READ.P  046472 G  5050#
RECCNT  002740 G  2796#  3022   3037   3538*  3543*  3547   3548*  4106   4858
RECLOG  003020 G  2826#  3534   3536*  4033
RECUD   010070 G  3475   3533#
REGBAC  051162 G  5050#
REGSAV  051146 G  5050#
REQN.P  021052 G  5050#*
REQN.T  025744    5050#*
RERM    004433 G  3007#  3689   3712
RETRYC  003016 G  2825#  3684   3688   3691*  3711   3714*  3748   3751*  3797   3806   3854
RE.SET  022534    5050#
RFBC    002560 G  2784#  4109
RFCERM  004116 G  3007#  3581
RFREC   002660 G  2789#  4111
RFUNR   002670 G  2790#  4112
RLEXM   004152 G  3007#  3800   3808
RNF   = 125401 G  2624#  2894   4625
RNOPSC= 177700 G  2588#  4687   4701   4746   4792
RNR   = 105401 G  2621#  2893   4621
RNYM    004413 G  3007#  4030
RPF   = 105001 G  2627#  2895   4635
RPR   = 125001 G  2630#  2896   4639
RPTFLG  003041 G  2841#  3159   3160*  4705*
RPT1A   013360    4106   4120#
RPT1B   013435    4107   4120#
RPT1C   013510    4108   4120#
RPT1D   013563    4109   4120#
RPT1E   013636    4110   4120#
RPT1F   013672    4111   4120#
RPT1G   013745    4112   4120#
RPT1H   014022    4113   4120#
RPT1I   014110    4114   4120#
RRANV   002135 G  2368#  4151
RRBC    002520 G  2783#  4108
RRECL = 000020 G  2590#  3683   3806
RRREC   002640 G  2787#  4111
RRUNR   002650 G  2788#  4112
RRVM    020463    5014   5040#
RSTACK  050422 G  5050#
RTLE    011122 G  3680   3709   3746   3787#
RTLRTN  011252    3792   3802   3809   3812#
RWCPK   002244 G  2715#  3754
RWD   = 102010 G  2636#  2715   2898   3119   3457   3537   4505   4581   4603   4649
RWERR   003022 G  2828#  3587   3740*  3795*  3846
R5SAVE  003014 G  2820#  3411*  3417   4103*  4117
SAVEDO= 022732    5050#
SCCNT   002710 G  2792#  3569*  3649*  4114
SCERM   004062 G  3007#  3610
SCH   = 140004 G  2666#  2856   2908   3103   3410   4483   4491   4499
SCHBK   002356 G  2737#  3255   3257*  3418*
SCHCNT= 000010 G  2579#  3255
SEARCH  042430    5050#
SEGSTA  021276 G  5050#*
SEQEND  003126 G  2877#  4691   4817
SETCH   005754 G  3102#  4679   4813   4845   4879
SETRW   006000 G  3118#  4681   4706   4814   4823   4846
```

```
SETUP   006450 G   3132  3227#  4913
SET.MA  026154     5050#
SFF   = 105010 G   2648#  2902   4567   4575
SFPTBL  002134 G   2365#
SFR   = 105410 G   2651#  2903   4563   4571
SHIFT   051260 G   5050#
SPEC.U  025670     5050#*
SPV.SE  000400     5050#
SRF   = 104010 G   2615#  2891   4585   4593
SRR   = 104410 G   2618#  2892   4589   4597
STAERM  004750 G   3034#  3581   3610   3652   3689   3712   3749   3808   4024   4030
STAER0  005510     3042   3045#  4061
STAER1  005230     3037   3045#  3197*  3198*
STAER2  005355     3039   3045#
STAER3  005432     3040   3045#
STAER4  005470     3041   3045#
STAER6  005554     3043   3045#  4062
STAER7  005322     3038   3045#  3202*  3203*
STAFLG  003044 G   2849#  4045*  4158*  4172*  4681   4683*
STARTC  050150 G   5050#
STRCHR  041162     5050#
STRT.T  025746     5050#*
ST.SET  022600     5050#
SUNIT.  025752     5050#*
SUPERV  023634     5050#
SUPFLA  021242 G   5050#*
SUPV.T  021414 G   5050#*
SUP.PR  022352     5050#
SVCCNT- 177777     2280#  2284   2347   2355   2364   2399   2402   2407   3019   3031   3034   3049   3051
                   3058   3069   3073   3076   3080   3083   3087   3090   3094   4082   4087   4092   4099
                   4124   4133   4231   4240   4256   4265   4277   4287   4304   4307   4318   4320   4321
                   4325   4326   4341   4344   4345   4350   4353   4354   4359   4362   4363   4368   4371
                   4372   4377   4380   4381   4386   4389   4390   4395   4398   4399   4404   4407   4408
                   4413   4416   4417   4422   4425   4426   4434   4442   4443   4463   4667   4674   4675
                   4799   4808   4809   4832   4842   4843   4867   4875   4876   4966   4969   4974   4985
                   4996   5009   5044   5049
SVCGBL= 000000     2280#  2294   2295   2296   2297   2298   2299   2300   2301   2302   2303   2304   2305
                   2306   2307   2308   2309   2310   2311   2312   2313   2314   2315   2316   2317   2318
                   2319   2320   2321   2322   2323   2324   2325   2326   2327   2336   2337   2347   2348
                   2349   2364   2365   2366   2686   2687   2688   3000   3001   3019   3020   3034   3035
                   3051   3052   3069   3070   3076   3077   3083   3084   3090   3091   4099   4100   4133
                   4134   4240   4241   4265   4266   4287   4288   4985   4986   5009   5010   5047#  5048
SVCHAN  030270     5050#
SVCINS= 177777     2280#  2295   2296   2297   2298   2299   2300   2301   2302   2303   2304   2305   2306
                   2307   2308   2309   2310   2311   2312   2313   2314   2315   2316   2317   2318   2319
                   2320   2321   2322   2323   2324   2325   2326   2327   2336   2337   2347   2364   2686
                   2687   2688   3001   3022   3024   3032   3037   3038   3039   3040   3041   3042   3043
                   3044   3050   3053   3059   3071   3074   3078   3081   3085   3088   3092   3095   3153
                   3161   3456   3458   3504   3581   3610   3652   3689   3712   3749   3808   3854   3905
                   3969   4024   4027   4030   4036   4041   4042   4046   4050   4061   4062   4075   4076
                   4081   4106   4107   4108   4109   4110   4111   4112   4113   4114   4118   4125   4137
                   4138   4156   4157   4170   4171   4180   4184   4192   4193   4194   4195   4202   4209
                   4217   4218   4219   4228   4232   4248   4251   4253   4257   4272   4274   4278   4293
                   4297   4300   4305   4326   4337   4342   4345   4351   4354   4360   4363   4369   4372
                   4378   4381   4387   4390   4396   4399   4405   4408   4414   4417   4423   4426   4435
                   4443   4464   4466   4668   4711   4800   4828   4833   4863   4868   4909   4919   4944
```

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                    4967   4985   4988   4989   4991   4996   5009   5013   5014   5015   5016   5017   5018
                    5019   5020   5021   5022   5023   5024   5025   5026   5027   5028   5029   5030   5031
                    5032   5033   5034   5035   5036   5037   5039   5044   5047
SVCSTK= 177777      2280#  2284   2347   2355   2364   2399   2402   2407   3019   3031   3034   3049   3051
                    3058   3069   3073   3076   3080   3083   3087   3090   3094   4087   4092   4099   4124
                    4133   4231   4240   4256   4265   4277   4287   4304   4307   4318   4321   4326   4341
                    4345   4350   4354   4359   4363   4368   4372   4377   4381   4386   4390   4395   4399
                    4404   4408   4413   4417   4422   4426   4434   4443   4463   4667   4675   4799   4809
                    4832   4843   4867   4876   4966   4969   4974   4985   4991   4996   5009   5019   5039
                    5044   5049
SVCSUB= 000000      2280#  4325   4326   4344   4345   4353   4354   4362   4363   4371   4372   4380   4381
                    4389   4390   4398   4399   4407   4408   4416   4417   4425   4426   4442   4443
SVCTAG= 000000      2280#  2355   2356   2399   2400   3031   3032   3049   3050   3058   3059   3073   3074
                    3080   3081   3087   3088   3094   3095   4081   4082   4124   4125   4231   4232   4256
                    4257   4277   4278   4304   4305   4341   4342   4350   4351   4359   4360   4368   4369
                    4377   4378   4386   4387   4395   4396   4404   4405   4413   4414   4422   4423   4434
                    4435   4463   4464   4667   4668   4799   4800   4832   4833   4867   4868   4966   4967
                    4996   4997   5044   5045
SVCTST= 000000      2280#  4320   4321   4674   4675   4808   4809   4842   4843   4875   4876
SWBFLG  003042 G    2842#  3282   3895   3951   4431*  4433*  4449*  4458*
SWB.C = 010000 G    2514#  2595   3283   3896
SWCHAN  025562       5050#
SWITCH  044434       5050#
SW.ADR  021036 G     5050#
SW.PTA  025546       5050#
SYS.FT  034314       5050#
S$LSYM= 010000      2280#  2356#  2400#  3032#  3050#  3059#  3074#  3081#  3088#  3095#  4081   4082#  4125#
                    4232#  4257#  4278#  4305#  4342#  4351#  4360#  4369#  4378#  4387#  4396#  4405#  4414#
                    4423#  4435#  4464#  4668#  4800#  4833#  4868#  4967#  4997#  5045#
TCCRA   010344       3573   3593#
TCCO    010364 G     3593   3608#
TCC1    010402 G     3594   3624#  4205
TCC2    010420 G     3595   3636#
TCC3    010514 G     3596   3667#
TCC4    010532 G     3597   3680#
TCC5    010656 G     3598   3709#
TCC6    010742 G     3599   3736#
TCC7    011104 G     3600   3773#
TC2RTN  010512       3642   3653#
TERMI   046460       5050#
TERMLI  044262       5050#
TERMTA  040244       5050#
TEST.M  025702       5050#*
TIME1   003000 G    2814#  3022   3399*  3401*  3402   3454*  3466*  3467   3502*  3505*  3506   3964*  3965*
                    4081   4200*  4203*  4204   4211
TIME2   003002 G    2815#  3022   3966*  3967*  4908*  4909*
TIMFLG  021232 G     5050#*
TIM.CO  021064 G     5050#*
TIM.OP  034670       5050#*
TOERM   004041 G     3007#  3441
TOOMM   004367 G     3007#  3430
TOO.MA  040224       5050#
TSAM    004345 G     3007#  3652
TSBA  - 002366 G     2578#
TSC.FC= 177717 G     2507#
TSC.TC- 177761 G     2508#  3525
```

```
TSDB    002366 G        2578    2745#   3040    3435*   3754*   4026*   4181*   4208*   4247*   4270*   4294*
TSSR    002376 G        2746#   3040    3409    3438    3464    3506    3525    3567    4044*   4182*   4211    4295*
TST.AB  030212          5050#
TST.TO  022414          5050#
TSVCT   002406 G        2747#   4183*   4184    4248    4272    4296*   4297
TS.A16= 000400 G        2504#
TS.A17= 001000 G        2503#
TS.NBA= 002000 G        2502#
TS.NXM= 004000 G        2501#
TS.OFL= 000100 G        2506#   4211
TS.RMR= 010000 G        2500#
TS.SC = 100000 G        2497#   3567
TS.SPE= 020000 G        2499#
TS.SSR= 000200 G        2505#   3409    3438    3463    3506
TS.UPE= 040000 G        2498#
TS4ADR  020066          4988    4992#
TS4CL   002436 G        2765#   4335*   4337
TS4INT  002426 G        2758#   4184    4297
TS4IN0  005674 G        2758    3069#
TS4IN1  005710 G        2759    3076#
TS4IN2  005724 G        2760    3083#
TS4IN3  005740 G        2761    3090#
TS4VCT  020103          4989    4992#
TYPEC   040620          5050#
TYPEPC  034514          5050#
TYPFLA  044136          5050#
TYPLIN  040516          5050#
TYPNUM  040100          5050#
TYPSTR  040536          5050#
TYP.ER  034344          5050#
TY.UNI  027356          5050#
T$ARGC- 000003          2295#   3022#   3037#   3038#   3039#   3040#   3041#   3042#   3043#   3854#   4050#   4061#   4062#
                        4106#   4107#   4108#   4109#   4110#   4111#   4112#   4113#   4114#   4192#   4337#
T$CODE- 156004          4081#   4988#   4989#   4991#   5013#   5014#   5015#   5016#   5017#   5018#   5019#   5020#   5021#
                        5022#   5023#   5024#   5025#   5026#   5027#   5028#   5029#   5030#   5031#   5032#   5033#   5034#
                        5035#   5036#   5037#   5039#
T$ERCO= 000021          3581#   3610#   3652#   3689#   3712#   3749#   3808#   3969#   4024#   4030#   4137#
T$ERRN= 000001          2280#   3581#   3610#   3652#   3689#   3712#   3749#   3808#   3969#   4024#   4030    4137#
T$EXCP- 000000          4988#   4989#   5021#   5022#   5023#   5024#   5025#   5026#   5027#   5028#   5029#   5030#   5031#
                        5032#   5033#   5034#   5035#   5036#   5037#
T$FLAG- 000041          3024#   3044#   3053#   4118#   4228#   4253#   4274#   4300#   4466#   4711#   4828#   4863#   4944#
                        4991#   5039#
T$HILI= 000010          4988#   4989#   5021#   5022#   5023#   5024#   5025#   5026#   5027#   5028#   5029#   5030#   5031#
                        5032#   5033#   5034#   5035#   5036#   5037#
T$LOLI= 000000          4988#   4989#   5021#   5022#   5023#   5024#   5025#   5026#   5027#   5028#   5029#   5030#   5031#
                        5032#   5033#   5034#   5035#   5036#   5037#
T$LSYM- 010000          2280#   2356    2400    3032    3050    3059    3074    3081    3088    3095    4125    4232    4257
                        4278    4305    4342    4351    4360    4369    4378    4387    4396    4405    4414    4423    4435
                        4464    4668    4800    4833    4868    4967    4997    5045
T$MCAL= 177777            1#    2280
T$NEST= 177777          2280#   2284#   2347#   2355#   2364#   2399#   2402#   2407#   3019#   3031#   3034#   3049#   3051#
                        3058#   3069#   3073#   3076#   3080#   3083#   3087#   3090#   3094#   4087#   4092#   4099#   4124#
                        4133#   4231#   4240#   4256#   4265#   4277#   4287#   4304#   4307#   4318#   4321#   4326#   4341#
                        4345#   4350#   4354#   4359#   4363#   4368#   4372#   4377#   4381#   4386#   4390#   4395#   4399#
                        4404#   4408#   4413#   4417#   4422#   4426#   4434#   4443#   4463#   4667#   4675#   4799#   4809#
                        4832#   4843#   4867#   4876#   4966#   4969#   4974#   4985#   4991    4996#   5009#   5019    5039
```

```
                    5044#  5049#
T$NSK0= 000000      2284#  2402   2407#  4087   4092#  4307   4318#  4969   4974#  5049
T$NSK1= 000005      2347#  2355   2364#  2399   3019#  3031   3034#  3049   3051#  3058   3069#  3073   3076#
                    3080   3083#  3087   3090#  3094   4099#  4124   4133#  4231   4240#  4256   4265#  4277
                    4287#  4304   4321#  4667   4675#  4799   4809#  4832   4843#  4867   4876#  4966   4985#
                    4991   4996   5009#  5019   5039   5044
T$NSK2= 000002      4326#  4341   4345#  4350   4354#  4359   4363#  4368   4372#  4377   4381#  4386   4390#
                    4395   4399#  4404   4408#  4413   4417#  4422   4426#  4434   4443#  4463
T$SAVL= 177777      2280#
T$SEGL= 177777      2280#
T$SUBN= 000000      2280#  4320#  4325#  4344#  4353#  4362#  4371#  4380#  4389#  4398#  4407#  4416#  4425#
                    4442#  4674#  4808#  4842#  4875#
T$TAGL= 177777      2280#
T$TAGN= 010041      2280#  2347#  2364#  3019#  3034#  3051#  3069#  3076#  3083#  3090#  4099#  4133#  4240#
                    4265#  4287#  4321#  4326#  4345#  4354#  4363#  4372#  4381#  4390#  4399#  4408#  4417#
                    4426#  4443#  4675#  4809#  4843#  4876#  4985#  5009#
T$TEMP= 000000      2337#  2355#  2399#  2402#  3024#  3031#  3044#  3049#  3053#  3058#  3073#  3080#  3087#
                    3094#  4081#  4087#  4118#  4124#  4228#  4231#  4253#  4256#  4274#  4277#  4300#  4304#
                    4307#  4341#  4350#  4359#  4368#  4377#  4386#  4395#  4404#  4413#  4422#  4434#  4463#
                    4466#  4667#  4711#  4799#  4828#  4832#  4863#  4867#  4944#  4966#  4969#  4988#  4989#
                    4991#  4996#  5013#  5014#  5015#  5016#  5017#  5018#  5020#  5021#  5022#  5023#  5024#
                    5025#  5026#  5027#  5028#  5029#  5030#  5031#  5032#  5033#  5034#  5035#  5036#  5037#
                    5039#  5044#  5049#
T$TEST= 000005      2280#  4320#  4325   4344   4353   4362   4371   4380   4389   4398   4407   4416   4425
                    4442   4674#  4808#  4842#  4875#
T$TSTM= 177777      2280#  3022   3032   3037   3038   3039   3040   3041   3042   3043   3050   3059   3071
                    3078   3085   3092   3153   3161   3456   3458   3504   3581   3610   3652   3689   3712
                    3749   3808   3854   3905   3969   4024   4027   4030   4036   4041   4046   4050   4061
                    4062   4075   4081   4106   4107   4108   4109   4110   4111   4112   4113   4114   4125
                    4137   4138   4156   4170   4180   4184   4192   4193   4194   4195   4202   4209   4217
                    4219   4228   4232   4248   4251   4253   4257   4272   4278   4293   4297   4305   4326
                    4337   4342   4345   4351   4354   4360   4363   4369   4372   4378   4381   4387   4390
                    4396   4399   4405   4408   4414   4417   4423   4426   4435   4443   4464   4466   4668
                    4711   4800   4828   4833   4863   4868   4909   4919   4944   4967
T$TSTS= 000001      2280#  4321#  4675#  4809#  4843#  4876#
T$$AU = 010015      4287#  4300   4304
T$$CLE= 010013      4240#  4253   4256
T$$DU = 010014      4265#  4274   4277
T$$HAR= 010037      4985#  4991   4996
T$$HW = 010000      2347#  2355
T$$INI= 010012      4133#  4228   4231
T$$MSG= 010004      3019#  3024   3031   3034#  3044   3049   3051#  3053   3058
T$$RPT= 010011      4099#  4118   4124
T$$SOF= 010040      5009#  5039   5044
T$$SRV= 010010      3069#  3073   3076#  3080   3083#  3087   3090#  3094
T$$SUB= 010032      4326#  4341   4345#  4350   4354#  4359   4363#  4368   4372#  4377   4381#  4386   4390#
                    4395   4399#  4404   4408#  4413   4417#  4422   4426#  4434   4443#  4463
T$$SW = 010001      2364#  2399
T$$TES= 010036      4321#  4466   4667   4675#  4711   4799   4809#  4828   4832   4843#  4863   4867   4876#
                    4944   4966
T1      015162 G    2337   4320#
T1.1    015166      4325#
T1.10   015512      4416#
T1.11   015532      4425#
T1.12   015612      4442#
T1.2    015312      4344#
```

```
T1.3    015332          4353#
T1.4    015352          4362#
T1.5    015372          4371#
T1.6    015412          4380#
T1.7    015432          4389#
T1.8    015452          4398#
T1.9    015472          4407#
T2      016530 G        2337    4674#
T3      017156 G        2337    4808#
T4      017270 G        2337    4842#
T5      017404 G        2337    4875#
UNIT.D  021014 G        5050#*
UNI.MA  025672          5050#*
UNL   = 100412 G        2660#   2906
UNREC   003023 G        2829#   3647*   3699*   3721*   3741*   3760*   3798*   3807*   3848
URERM   004455 G        3007#   3744    3749    3790
USER.P  021256 G        5050#*
USER.T  021260 G        5050#*
VALID.  021516          5050#
VAL.LA  022336          5050#
VAL.SW  026002          5050#
VFEXC   011624 G        3880    3884    3893#   4445    4447    4450    4452    4454    4456    4459    4461
VFYCNT  002720 G        2793#   3961*   4114
VFYDAT  011540 G        3179    3876#   4939
VFYFLG  003037 G        2839#   3138    3275*   3278*   3877
VFY.C = 000100 G        2523#   2612    3274    3275
WIDTH   035264          5050#
WLKZRO  007176          3348#   3353    3359
WRBC    002460 G        2782#   4107    4146*
WRECL = 000020 G        2591#   3797
WRR   = 105005 G        2633#   2897    4611
WRREC   002620 G        2785#   3847    4111
WRT   = 104005 G        2609#   2887    3137    4545    4607    4760
WRUNR   002630 G        2786#   4112
WSSR    007764 G        3413    3501#   3754    4245    4268
WTM   = 100011 G        2642#   2900    3239    4541    4553
WTR   = 101011 G        2645#   2901    4557
WTV   - 104105 G        2612#   2860    2864    2868    2872    2888    4511    4515    4519    4523    4527    4531    4535
                        4655    4659    4685    4774
WTVERM  004012 G        3007#   3943*   3944*   3969
XEQDIA  050306 G        5050#
XEQSUB  050274 G        5050#
XEQ.CL  030016          5050#
XEQ.CM  025326          5050#
XEQ.IN  027500          5050#
XEQ.LA  023570          5050#
XEQ.OP  027572          5050#
XEQ.PR  022772          5050#
XEQ.TE  027636          5050#
XTIME   047160 G        5050#
XTIMEN  050004          5050#
XTIMST  047202          5050#*
XXDP.D  025346          5050#
X$ALWA= 000000          2280#   4991    5039
X$FALS  000040          2280#   5019
X$OFFS  000400          2280#   4991    5019    5039
```

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X$TRUE= 000020          2280#
XO.BOT= 000002 G        2559#   4931
XO.EOT= 000001 G        2560#   3166    4931
XO.LET= 020000 G        2556#   3637    3640
XO.ONL= 000100 G        2558#
XO.RLL= 010000 G        2557#   3637
XO.RLS= 040000 G        2555#   3637
XO.TMK= 100000 G        2554#   3637    3640
X3.DCK= 000010 G        2564#   3737
X3.RNY= 000337 G        2565#   4029
ZROPAT  007146          3333#   3336    3342    3366
$BGNLE= 177777          2280#
$BREG   026042          5050#*
$ENDAD  050260 G        5050#
$ERFLG= 000400          2280#   3072#   3079#   3086#   3093#   3103#   3119#   3120#   3121#   3131#   3139#   3141#   3142#
                        3143#   3146#   3148#   3160#   3167#   3173#   3174#   3177#   3178#   3183#   3196#   3200#   3202#
                        3203#   3215#   3217#   3219#   3228#   3240#   3247#   3249#   3255#   3257#   3266#   3273#   3275#
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                        3828    3832    3837    3842    3846    3848    3853    3877    3895    3901    3904    3907    3909
                        3913    3916    3934    3939    3950    3951    3952    3988    4029    4033    4037    4043    4074
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                        3164    3166    3167    3172    3173    3174    3177    3178    3183    3196    3200    3202    3203
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$F$DEC- 000220       2280#
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$F$GOO- 000400       2280#  3072  3079  3086  3093  3103  3119  3120  3121  3131  3132  3134  3136
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		4199	4200	4203	4204	4208	4216	4220	4221	4223	4224	4226	4245	4247
		4268	4270	4271	4291	4292	4294	4295	4296	4298	4323	4328	4332	4333
		4334	4355	4336	4347	4356	4365	4374	4383	4392	4401	4410	4419	4428
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		4688	4689	4691	4692	4693	4696	4698	4701	4702	4703	4705	4706	4708
		4743	4744	4745	4746	4747	4748	4749	4750	4751	4752	4760	4774	4789
		4791	4792	4793	4794	4811	4812	4813	4817	4820	4822	4825	4845	4848
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$SAV3   051340 G    5050#
$SAV4   051356 G    5050#
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                        3857#   3858#   3859#   3878#   3879#   3880#   3882#   3883#   3884#   3886#   3894#   3896#   3897#
```

```
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                    4689#  4692#  4693#  4695#  4696#  4698#  4699#  4701#  4702#  4703#  4705#  4706#  4708#
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                    4881#  4882#  4888#  4889#  4893#  4895#  4898#  4900#  4903#  4907#  4908#  4912#  4920#
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                    3284   3325#  3327   3400#  3409   3410#  3419   3422#  3425   3428#  3433   3438#  3443
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                    3715#  3720#  3722   3737#  3746#  3762   3788#  3794   3796#  3805#  3812   3821#  3859
                    3877#  3886   3895#  3897   3901#  3924   3934#  3936#  3938   3939#  3974   3988#  3990
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                    4189   4191#  4196   4199#  4214   4245#  4250   4332#  4340   4438#  4440   4474#  4476
                    4681#  4684   4690#  4699   4816#  4823   4890#  4942
$TSK1 = 050245      3132#  3182   3216#  3218   3402#  3408   3413#  3416   3422#  3425   3457#  3459   3460#
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                    3797#  3804   3806#  3811   3824#  3858   3901#  3924   3949#  3973   3988#  3990   4105#
                    4116   4145#  4148   4177#  4189   4199#  4214   4245#  4250   4332#  4340   4438#  4440
                    4474#  4476   4691#  4695   4817#  4819   4890#  4942
$TSK2 = 050246      3134#  3179   3413#  3416   3537#  3539#  3553   3569#  3571   3577#  3584   3641#  3644
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                    3921   3950#  3957   4145#  4148   4185#  4187   4201#  4211   4336#  4338   4691#  4695
                    4817#  4819   4915#  4939
$TSK3 = 050247      3134#  3179   3540#  3552   3578#  3583   3832#  3835   3837#  3840   3842#  3845   3848#
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$TSK4 = 050253      3136#  3150   3152#  3154   3155#  3158   3159#  3162   3164#  3170   3172#  3176   3541#
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                    3955   4918#  4920   4921#  4924   4926#  4936
$TSK5 = 050254      3137#  3149   3155#  3158   3164#  3170   3542#  3544   3546#  3550   3909#  3911   4921#
                    4924   4926#  4936
$TSK6 = 050256      3138#  3140#  3144   3145#  3147   3166#  3168   3547#  3549   4931#  4933
$$ARGC= 000000      2280#
$$BYTE= 000403      2280#  3132#  3134#  3136#  3137#  3138#  3145#  3152#  3155#  3159#  3164#  3166#  3172#
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                    3569#  3576#  3577#  3578#  3579#  3587#  3637#  3640#  3641#  3646#  3682#  3684#  3688#
                    3693#  3711#  3715#  3737#  3739#  3748#  3752#  3788#  3796#  3797#  3806#  3821#  3824#
                    3828#  3832#  3837#  3842#  3846#  3848#  3853#  3877#  3895#  3901#  3904#  3907#  3909#
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                    4105#  4136#  4142#  4145#  4151#  4177#  4185#  4191#  4199#  4204#  4245#  4332#  4336#
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```

```
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$$DST = 000000          2280#
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                        3282#  3284#  3325#  3327#  3402#  3408#  3410#  3419#  3428#  3433#  3438#  3443#  3457#
                        3459#  3460#  3462   3465#  3467#  3473#  3534#  3535#  3537#  3539   3540#  3541#  3542#
                        3544#  3545   3546#  3547#  3549#  3550#  3551#  3552#  3553#  3554#  3555#  3567#  3568#
                        3569#  3571#  3572#  3575   3576#  3577#  3578#  3579#  3582#  3583#  3584#  3585#  3586#
                        3587#  3589#  3637#  3640#  3641#  3644#  3645#  3646#  3648   3650#  3653#  3682#  3684#
                        3686#  3687#  3688#  3690#  3693#  3698   3700#  3711#  3713#  3715#  3720   3722#  3737#
                        3739#  3742#  3746   3748#  3750#  3752#  3759   3761#  3762#  3788#  3794#  3796#  3797#
                        3804#  3805   3806#  3811#  3812#  3821#  3824#  3828#  3830#  3846#  3848#  3851   3853#
                        3855#  3856#  3857#  3858#  3859#  3877#  3886#  3895#  3897#  3904#  3906#  3913#  3915#
                        3916#  3918#  3934#  3936   3938#  3939#  3950#  3951#  3952#  3955#  3956#  3957#  3974#
                        4029#  4031#  4033#  4035#  4037#  4039#  4043#  4047   4049#  4074#  4083#  4136#  4140#
                        4142#  4149#  4151#  4154#  4185#  4187#  4191#  4196#  4204#  4207   4210#  4336#  4338#
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$$FLAG= 000001          2280#  3132#  3134#  3136#  3137#  3138#  3144#  3145#  3147#  3149#  3150#  3152#  3154#
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                        3567#  3568#  3569#  3571#  3572#  3576#  3577#  3578#  3579#  3582#  3583#  3584#  3585#
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                        3858#  3859#  3877#  3886#  3895#  3897#  3901#  3904#  3906#  3907#  3909#  3913#  3915#
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                        4142#  4145#  4149#  4151#  4154#  4177#  4185#  4187#  4191#  4196#  4199#  4204#  4210#
                        4245#  4332#  4336#  4338#  4438#  4474#  4681#  4684#  4691#  4817#  4890#  4915#  4918#
                        4920#  4921#  4926#  4931#  4933#
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$$LOC - 017744          2280#  3132#  3134#  3136#  3137#  3138#  3145#  3152#  3155#  3159#  3164#  3166#  3172#
                        3216#  3239#  3246#  3274#  3282#  3325#  3402#  3409#  3410#  3413#  3422#  3428#  3438#
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                        3797#  3806#  3821#  3824#  3828#  3832#  3837#  3842#  3846#  3848#  3853#  3877#  3895#
                        3901#  3904#  3907#  3909#  3913#  3916#  3934#  3939#  3950#  3951#  3952#  3973#  3988#
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                        4177#  4185#  4191#  4199#  4204#  4211#  4245#  4332#  4336#  4438#  4474#  4681#  4691#
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$$LOCN- 000000          2280#
$$REG = 177777          2280#
$$RETU= 000000          2280#
$$RTN1= 000000          2280#
$$RTN2= 000000          2280#
$$SRC = 000000          2280#
$$TGSV= 000000          2280#
$$TGS1= 000000          2280#
$$TGS2= 000000          2280#
$$TO  = 000000          2280#
$$$TAG  050000          2280#
```

```
.     = 051602   2282#  2688#  2692#  2701#  2707#  2714#  2721#  2730#  2731#  2732#  2733#  2745#  2746#
                 2747#  2781   2782#  2783#  2784#  2785#  2786#  2787#  2788#  2789#  2790#  2791#  2792#
                 2793#  2794#  2795   2796#  2824   2833   2837#  2845   2876#  2917#  2919#  2921#  2923#
                 2926#  2928#  2930#  2932#  2934#  2936#  2938#  2940#  2942#  2944#  2946#  2948#  2950#
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                 3159   3164   3166   3172   3216   3239   3246   3274   3282   3325   3402   3409   3410
                 3413   3422   3428   3438   3457   3460   3467   3474   3491   3506   3521   3534   3535
                 3537   3540   3541   3542   3546   3547   3567   3568   3569   3576   3577   3578   3579
                 3587   3637   3640   3641   3646   3682   3684   3688   3693   3711   3715   3737   3739
                 3748   3752   3788   3796   3797   3806   3821   3824   3828   3832   3837   3842   3846
                 3848   3853   3877   3895   3901   3904   3907   3909   3913   3916   3934   3939   3950
                 3951   3952   3973   3978#  3988   4006   4029   4033   4037   4043   4074   4105   4118
                 4136   4142   4145   4151   4163   4168   4177   4185   4191   4199   4204   4211   4228
                 4245   4253   4274   4300   4332   4336   4438   4466   4474   4681   4691   4699   4711
                 4817   4823   4828   4863   4890   4915   4918   4921   4926   4931   4944   4991   5019
                 5039   5050#
```

ABORTW	1#													
ALLOCA	1#													
BCOMPL	1#	4041	4217											
BEGIN	1#													
BERROR	1#													
BGNAU	1#	4286												
BGNCLN	1#	4239												
BGNDU	1#	4264												
BGNHRD	1#	4984												
BGNHW	1#	2346												
BGNINI	1#	4132												
BGNMOD	1#	2283	2406	4091	4317	4973								
BGNMSG	1#	3018	3033	3050										
BGNRPT	1#	4098												
BGNSEG	1#													
BGNSFT	1#	5008												
BGNSRV	1#	3068	3075	3082	3089									
BGNSUB	1#	4324	4343	4352	4361	4370	4379	4388	4397	4406	4415	4424	4441	
BGNSW	1#	2363												
BGNTST	1#	4319	4673	4807	4841	4874								
BNCOMP	1#	4075	4156	4170										
BNERRO	1#													
BREAK	1#	3455	3503	4193	4201									
BRESET	1#													
BUFFER	1#	4216												
CALL	1#													
CASE	1#													
CKLOOP	1#													
CLKOFF	1#													
CLKON	1#													
CLREF	1#													
CLRVEC	1#	4247	4271											
COMMEN	1#													
DEALLO	1#													
DECLAR	1#													
DECR	1#													
DECRU	1#													
DEFAUL	1#													
DEVREG	1#	2685												
DEVTYP	1#	2999												
DISPAT	1#	2335												
DOCLN	1#	3152	3904	4045	4194	4218	4918							
DODU	1#	4040												
DORPT	1#	3160	4035											
ELSE	1#	3139	3247	3276	3461	3538	3544	3574	3647	3697	3719	3745	3758	3804	3850
	3935	4046	4206												
END	1#													
ENDAU	1#	4303												
ENDCLN	1#	4255												
ENDCOM	1#													
ENDDEC	1#													
ENDDO	1#	3157	3169	3178	3181	3217	3415	3424	3523	3834	3839	3844	3910	3920	3923
	3989	4115	4147	4188	4213	4249	4339	4439	4475	4694	4818	4923	4935	4938	4941
ENDDU	1#	4276													
ENDHRD	1#	4995													
ENDHW	1#	2354													

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ENDIF      1#  3143  3146  3148  3149  3153  3161  3167  3175  3240  3249  3278  3283  3326  3407
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            3571  3581  3582  3583  3584  3585  3588  3643  3644  3649  3652  3685  3686  3689  3699
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            3858  3885  3896  3905  3914  3917  3937  3954  3955  3956  3973  4030  4034  4038  4048
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ENDINC     1#
ENDINI     1#  4230
ENDLOO     1#
ENDMOD     1#  2401  4086  4306  4968  5048
ENDMSG     1#  3030  3048  3057
ENDRPT     1#  4123
ENDRTN     1#
ENDSEG     1#
ENDSEL     1#
ENDSFT     1#  5043
ENDSRV     1#  3072  3079  3086  3093
ENDSUB     1#  4340  4349  4358  4367  4376  4385  4394  4403  4412  4421  4433  4462
ENDSW      1#  2398
ENDTST     1#  4666  4798  4831  4866  4965
EQUALS     1#  2413
ERRDF      1#  4023  4029
ERRHRD     1#  3580  3609  3651  3968
ERRSF      1#  4136
ERRSOF     1#  3688  3711  3748  3807
ESCAPE     1#
EXIF       1#
EXIFB      1#
EXIT       1#  3023  3043  3052  4117  4227  4252  4273  4299  4465  4710  4827  4862  4943  4990
            5038
FEQUAL     1#
GETPRI     1#
GETTIM     1#
GMANIA     1#
GMANID     1#
GMANII     1#  4080
GPHARD     1#  4179  4292
GPRMA      1#  4987
GPRMD      1#  4988  5020  5021  5022  5023  5024  5025  5026  5027  5028  5029  5030  5031  5032
            5033  5034  5035  5036
GPRML      1#  4081  5012  5013  5014  5015  5016  5017  5019
HEADER     1#  2293
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            3710  3736  3738  3747  3787  3795  3796  3805  3823  3827  3903  3933  3938  3949  3951
            4036  4135  4190  4203  4335  4917  4930
IFB        1#  3135  3137  3158  3171  3281  3427  3459  3533  3568  3577  3578  3586  3640  3645
            3692  3714  3751  3820  3845  3847  3852  3876  3894  3912  3915  3950  4028  4032  4042
            4073  4141  4150  4184  4680
IFCOND     1#
IF.ERR     1#
IF.NO.     1#
INCR       1#
INCRU      1#
INLINE     1#
INLOOP     1#
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IOSTAR      1#
LASTAD      1#  5046
LEAVE       1#
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            3147  3159  3166  3172  3173  3176  3177  3182  3195  3199  3201  3202  3214  3216  3218
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            3295  3298  3319  3320  3322  3323  3325  3333  3348  3372  3380  3398  3400  3403  3404
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            3934  3936  3939  3940  3942  3943  3946  3947  3963  3985  3986  3988  4002  4004  4019
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            4175  4177  4178  4180  4181  4182  4185  4199  4202  4207  4215  4219  4220  4222  4223
            4225  4246  4267  4269  4270  4290  4291  4293  4294  4295  4297  4322  4327  4332  4333
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LOCAL       1#
LOOP        1#
MANUAL      1#  4074
M$ASCI      1#  2294#  2295
M$BRAN      1#
M$BYTE      1#  2294#  2295
M$CHEC      1#  3024#  3044#  3053#  4118#  4228#  4253#  4274#  4300#  4466#  4711#  4828#  4863#  4944#  4991#
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M$CKID      1#  2309#
M$COUN      1#  3022#  3037#  3038#  3039#  3040#  3041#  3042#  3043#  3854#  4050#  4061#  4062#  4106#  4107#
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M$ENDE      1#  2355#  2399#  2402#  3031#  3049#  3058#  3073#  3080#  3087#  3094#  4087#  4124#  4231#  4256#
            4277#  4304#  4307#  4341#  4350#  4359#  4368#  4377#  4386#  4395#  4404#  4413#  4422#  4434#  4463#
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M$ERRI      1#  3581#  3610#  3652#  3689#  3712#  3749#  3808#  3969#  4024#  4030#  4137#
M$ERRM      1#
M$ESCA      1#
M$ESCS      1#
M$EXCP      1#  4988#  4989#  5021#  5022#  5023#  5024#  5025#  5026#  5027#  5028#  5029#  5030#  5031#  5032#
            5033#  5034#  5035#  5036#  5037#
M$EXIT      1#  3024#  3044#  3053#  4118#  4228#  4253#  4274#  4300#  4466#  4711#  4828#  4863#  4944#  4991#
```

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M$EXTJ            1#  3024   3044   3053   4118   4274   4300
M$GEN             1#  2294#  2295#  2296#  2297#  2298#  2299#  2300#  2301#  2302#  2303#  2304#  2305#  2306#  2307#
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                4422#  4425#  4434#  4442#  4463#  4667#  4674#  4799#  4808#  4832#  4842#  4867#  4875#  4966#  4985#
                4996#  5009#  5044#  5047#
M$GENB            1#  4081#
M$GETS            1#  2355#  2399#  2402#  3031#  3049#  3058#  3073#  3080#  3087#  3094#  4087#  4124#  4231#  4256#
                4277#  4304#  4307#  4341#  4350#  4359#  4368#  4377#  4386#  4395#  4404#  4413#  4422#  4434#  4463#
                4667#  4799#  4832#  4867#  4966#  4969#  4991#  4996#  5019#  5039#  5044#  5049#
M$GET^            1#  3024#  3044#  3053#  4118#  4228#  4253#  4274#  4300#  4466#  4711#  4828#  4863#  4944#  4991#
                5019#  5039#
M$GNGB            1#  2284#  2294#  2295#  2296#  2297#  2298#  2299#  2300#  2301#  2302#  2303#  2304#  2305#  2306#
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                2322#  2323#  2324#  2325#  2326#  2336#  2347#  2348   2364#  2365   2407#  2686#  2687   2688   3000#
                3019#  3034#  3051#  3069#  3076#  3083#  3090#  4092#  4099#  4133#  4240#  4265#  4287#  4318#  4974#
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M$GNIN            1#  2295#  2296#  2297#  2298#  2299#  2300#  2301#  2302#  2303#  2304#  2305#  2306#  2307#  2308#
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                2324#  2325#  2326#  2327   2336#  2337#  2347#  2364#  2686#  2687#  2688   3000#  3001   3022#  3024#
                3032#  3037#  3038#  3039#  3040#  3041#  3042#  3043#  3044#  3050#  3053#  3059#  3071#  3073#  3074
                3078#  3080#  3081   3085#  3087#  3088   3092#  3094#  3095   3153#  3161#  3456#  3458#  3504#  3581#
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M$GNLS            1#  4081#
M$GNLT            1#
M$GNSU            1#  4325#  4344#  4353#  4362#  4371#  4380#  4389#  4398#  4407#  4416#  4425#  4442#
M$GNTA            1#  2355#  2399#  3031#  3049#  3058#  3073#  3080#  3087#  3094#  4124#  4231#  4256#  4277#  4304#
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                4867#  4966#  4996#  5044#
M$GNTE            1#  4320#  4674#  4808#  4842#  4875#
M$HAPT            1#  2294#
M$HNAP            1#  2294#  2309
M$INCR            1#  2284#  2347#  2364#  2407#  3019#  3034#  3051#  3069#  3076#  3083#  3090#  4081#  4082   4092#
                4099#  4133#  4240#  4265#  4287#  4318#  4320#  4321#  4325#  4326#  4344#  4345#  4353#  4354#  4362#
                4363#  4371#  4372#  4380#  4381#  4389#  4390#  4398#  4399#  4407#  4408#  4416#  4417#  4425#  4426#
                4442#  4443#  4674#  4675#  4808#  4809#  4842#  4843#  4875#  4876#  4974#  4985#  5009#
M$IOSE            1#
M$LDRO            1#  3071#  3078#  3085#  3092#  3458#  4027#  4041#  4138#  4156#  4170#  4180#  4193#  4209#  4217#
                4248#  4251#  4272#  4293#  4909#
M$MASK            1#  2686#  2687
M$MCAL            1#
M$MSK1            1#  2686#
```

```
M$POP      1#  2355#  2399#  2402#  3031#  3049#  3058#  3073   3080   3087   3094   4087#  4124#  4231#  4256#
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        4667#  4799#  4832#  4867#  4966#  4969#  4996#  5044#  5049#
M$PRIN     1#  3022#  3037#  3038#  3039#  3040#  3041#  3042#  3043#  3854#  4050#  4061#  4062#  4106#  4107#
        4108#  4109#  4110#  4111#  4112#  4113#  4114#  4192#  4337#
M$PUSH     1#  2284#  2347#  2364#  2407#  3019#  3034#  3051#  3069#  3076#  3083#  3090#  4092#  4099#  4133#
        4240#  4265#  4287#  4318#  4320#  4321   4325#  4326   4344#  4345   4353#  4354   4362#  4363   4371#
        4372   4380#  4381   4389#  4390   4398#  4399   4407#  4408   4416#  4417   4425#  4426   4442#  4443
        4674#  4675   4808#  4809   4842#  4843   4875#  4876   4974#  4985#  5009#
M$PUT      1#  3022#  3037#  3038#  3039#  3040#  3041#  3042#  3043#  3854#  4050#  4061#  4062#  4106#  4107#
        4108#  4109#  4110#  4111#  4112#  4113#  4114#  4184#  4192#  4297#  4337#
M$PUT1     1#  3022#  3037#  3038#  3039#  3040#  3041#  3042#  3043#  3854#  4050#  4061#  4062#  4106#  4107#
        4108#  4109#  4110#  4111#  4112#  4113#  4114#  4184#  4192#  4297#  4337#
M$RADI     1#  4081#  4988#  4989#  5013#  5014#  5015#  5016#  5017#  5018#  5020#  5021#  5022#  5023#  5024#
        5025#  5026#  5027#  5028#  5029#  5030#  5031#  5032#  5033#  5034#  5035#  5036#  5037#
M$RNRO     1#  4180#  4217#  4293#
M$SETS     1#  2284#  2347#  2364#  2407#  3019#  3034#  3051#  3069#  3076#  3083#  3090#  4092#  4099#  4133#
        4240#  4265#  4287#  4318#  4321#  4326#  4345#  4354#  4363#  4372#  4381#  4390#  4399#  4408#  4417#
        4426#  4443#  4675#  4809#  4843#  4876#  4974#  4985#  5009#
M$SETT     1#
M$SPCL     1#
M$SPSE     1#
M$STAR     1#
M$SVC      1#  3022#  3024#  3031#  3032   3037#  3038#  3039#  3040#  3041#  3042#  3043#  3044#  3049#  3050
        3053#  3058#  3059   3071#  3078#  3085#  3092#  3153#  3161#  3456#  3458#  3504#  3854#  3905#  4027#
        4036#  4041#  4046#  4050#  4061#  4062#  4075#  4081#  4106#  4107#  4108#  4109#  4110#  4111#  4112#
        4113#  4114#  4118#  4124#  4125   4138#  4156#  4170#  4180#  4184#  4192#  4193#  4194#  4195#  4202#
        4209#  4217#  4219#  4228#  4231#  4232   4248#  4251#  4253#  4256#  4257   4272#  4274#  4277#  4278
        4293#  4297#  4300#  4304#  4305   4325#  4326   4337#  4341#  4342   4344#  4345   4350#  4351   4353#
        4354   4359#  4360   4362#  4363   4368#  4369   4371#  4372   4377#  4378   4380#  4381   4386#  4387
        4389#  4390   4395#  4396   4398#  4399   4404#  4405   4407#  4408   4413#  4414   4416#  4417   4422#
        4423   4425#  4426   4434#  4435   4442#  4443   4463#  4464   4466#  4667#  4668   4711#  4799#  4800
        4828#  4832#  4833   4863#  4867#  4868   4909#  4919#  4944#  4966#  4967   4991#  5039#
M$TLAB     1#  3022#  3032#  3037#  3038#  3039#  3040#  3041#  3042#  3043#  3050#  3059#  3071#  3078#  3085#
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        4800#  4828#  4833#  4863#  4868#  4909#  4919#  4944#  4967#
M$TSTL     1#  3022#  3032#  3037#  3038#  3039#  3040#  3041#  3042#  3043#  3050#  3059#  3071#  3078#  3085#
        3092#  3153#  3161#  3456#  3458#  3504#  3581#  3610#  3652#  3689#  3712#  3749#  3808#  3854#  3905#
        3969#  4024#  4027#  4030#  4036#  4041#  4046#  4050#  4061#  4062#  4075#  4081#  4106#  4107#  4108#
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        4800#  4828#  4833#  4863#  4868#  4909#  4919#  4944#  4967#
M$WORD     1#  2316   2336#  2337   2686#  2687#  3024#  3044#  3053#  3581#  3610#  3652#  3689#  3712#  3749#
        3808#  3969#  4024#  4030#  4081#  4118#  4137#  4228#  4253#  4274#  4300#  4466#  4711#  4828#  4863#
        4944#  4988#  4989#  4991#  5013#  5014#  5015#  5016#  5017#  5018#  5019#  5020#  5021#  5022#  5023#
        5024#  5025#  5026#  5027#  5028#  5029#  5030#  5031#  5032#  5033#  5034#  5035#  5036#  5037#  5039#
M$XFER     1#  4991#  5019#  5039#
POINTE     1#  2290
POP        1#  3694   3695   3716   3717   3755   3756   3791   3792   3801   3802   3808   3809
```

```
PRINTB      1#  3021  3036  3853
PRINTF      1#  4049  4191  4336
PRINTS      1#  4105  4106  4107  4108  4109  4110  4111  4112  4113
PRINTX      1#  3037  3038  3039  3040  3041  3042  4060  4061
PUSH        1#
READBU      1#
READEF      1#  4155  4169
REPEAT      1#  3399  3454  3488  3502  3948  4003  4159  4164  4200  4689  4815
REQTIM      1#
RETURN      1#
ROUTIN      1#
SAVR14      1#
SELECT      1#
SETEF       1#
SETPRI      1#  3070  3077  3084  3091
SETVEC      1#  4183  4296
SLASH       1#
STARS       1#
STRUCT      1#  2280#
SVC         1#  2280#
TRAPPR      1#
UNBUFF      1#  4250
UNTIL       1#  3408  3473  3490  3505  3972  4005  4162  4167  4210  4698  4822
UNTILB      1#
WAITMS      1#  4137  4192
WAITUS      1#  3457  4026  4208  4908
WHILE       1#  3131  3133  3154  3163  3215  3412  3421  3520  3831  3836  3841  3900  3906  3908
          3987  4104  4144  4176  4198  4244  4331  4437  4473  4690  4816  4889  4914  4920  4925
WHILEB      1#
XFER        1#  4991  5039
XFERF       1#  5018
XFERT       1#
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 ERRORS DETECTED:  0

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 RUN-TIME:  114 118 8 SECONDS
 RUN-TIME RATIO: 351/241=1.4
 CORE USED:  27K  (53 PAGES)
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