MXV11-A

MXV11A DIAG
CVMXAA0

AH E657A MC

FICHE 1 OF 1

NOV 1979
MADE IN USA

.REM %

IDENTIFICATION

PRODUCT CODE: AC-E656A-MC

PRODUCT NAME: CVMXAA0 MXV11A DIAG

PRODUCT DATE: JUNE 1979

MAINTAINER: DIAGNOSTIC ENGINEERING

TABLE OF CONTENTS

1.0 GENERAL PROGRAM INFORMATION.

1.1 PROGRAM PURPOSE (ABSTRACT).

THIS DIAGNOSTIC IS A LOGIC TEST TO VERIFY THE OPERATION OF THE
2 SERIAL LINE UNITS, ROM & CLOCK OPTIONS, & RAM ON THE MXV11-A.

SERIAL LINE UNIT TESTING IS DONE IN TWO DISTINCT PHASES:

1. EACH OF THE 2 CHANNELS OF THE MXV11-A IS TESTED INDIVIDUALLY.

2. THE MXV11-A MODULE IS TESTED AS A WHOLE FOR CHANNEL INTERACTION
   PROBLEMS. THIS DIAGNOSTIC IS DESIGNED TO TEST AND DETECT
   ERRORS TO THE LOGIC LEVEL & NOT THE CHIP LEVEL.

THE PROGRAM WILL TEST TO WHATEVER OPTIONS THE DEVICE MAP ($DEVM)
IS SET TO. SEE PROGRAM OPTIONS & DEFAULTS SEC 2.4 .
THE PROGRAM WILL PRINT THE CONTENTS OF $DEVM FOR OPERATOR VERIFIACTION
& A SUMMARY OF SIGNIFICANT DIFFERENCES FROM THE DEFAULT CONDITIONS
I.E: CHANNEL(S) DROPPED FROM TESTING, CHANNEL 1 AS CONSOLE,
ROM/RAM TESTING BYPASSED & CLOCK ENABLED.

THE OPERATOR MUST INSTALL DATA WRAP AROUND CONNECTORS TO DO
DATA TESTING. TO BYPASS DATA TESTS, THE OPERATOR MUST MODIFY $DEVM.
SEE PROGRAM OPTIONS SEC. 2.4

THE ADDRESSES & VECTOR RANGES ARE AS FOLLOWS:

```
        CHANNEL 0: 176500 THRU 176536
        CHANNEL 1: 176500 THRU 176576
                   177500 THRU 177576  ( CAN BE CONSOLE )
        VECTORS  :      0 THRU    374
```

THE DEFAULT ADDRESSES & VECTORS ARE AS FOLLOWS:

```
        CHANNEL 0: 176500 THRU 176506   VECTORS: 300/304
        CHANNEL 1: 177560 THRU 177566   VECTORS:  60/64
```

FOR ANY OTHER DEVICE ADDRESSES THE OPERATOR MUST CHANGE THE
DEFAULT LOCATIONS. SEE PROGRAM OPTIONS & DEFAULTS SEC. 2.4 .

THIS PROGRAM IS DESIGNED TO RUN ON ANY Q-BUS PDP-11 WITH 4K OF
MEMORY AND AN MXV11-A (Q-BUS) MODULE. IT CAN RUN UNDER XXDP &
APT MONITORS, AND ON PROCESSORS WITH NO HARDWARE
SWITCH REGISTER.

1.2 SYSTEM REQUIREMENTS.

HARDWARE REQUIREMENTS:

ANY Q-BUS PDP-11 FAMILY PROCESSOR
4K MEMORY - MINIMUM
A SPECIAL DATA WRAP AROUND CONNECTOR (PN # H3270-A) OR EQUIVALENT
(REQ'D IF DATA WRAP AROUND TESTS DESIRED)

IF CHAN. 1 IS THE CONSOLE, TESTS 11-14, 16-21, 23-24 ARE BYPASSED.

IF DATA WRAP AROUND TESTS ARE BYPASSED, TESTS 12-14, 16-21, 23-24 ARE BYPASSED.

SOFTWARE REQUIREMENTS:

THIS DIAGNOSTIC CAN RUN IN THE FOLLOWING WAYS:

STAND ALONE
WITH APT MONITOR
WITH XXDP MONITOR (CHAINABLE IF RENAMED TO .BIC EXTENSION)

THIS DIAGNOSTIC IS NOT DESIGNED TO RUN WITH THE DIAGNOSTIC SUPERVISOR.

1.3 RELATED DOCUMENTS AND STANDARDS.

DIAGNOSTIC ENGINEERING STANDARDS AND CONVENTIONS	175-003-009-02
APT	MD-11-DZZMA
SYSMAC	MD-11-DZQAC

1.4 DIAGNOSTIC HIERARCHY PREREQUISITES.
NO SPECIAL DIAGNOSTICS ARE REQUIRED TO RUN BEFORE THIS, BUT THE PROCESSOR, MEMORY, AND BUS ARE ASSUMED TO BE FULLY OPERATIONAL.

1.5 ASSUMPTIONS.

THE OPERATOR MUST:

1. SET THE SOFTWARE SWITCH REGISTER (SWR) IF NOT DEFAULTED.(SEC. 2.3)
2. SET THE DEVICE MAP ($DEVM) IF NOT DEFAULTED.(SEC. 2.4)
3. SET THE SERIAL LINE ADDRESSES & VECTORS IF NOT DEFAULTED.(SEC 2.4)
4. SET THE ROM HI & LO ADDR IF NOT DEFAULTED.(SEC 2.4)

1.6 VT-100 CONSOLE SETUP.

IF CHANNEL 1 IS CONFIGURED AS THE CONSOLE & THE VT-100 IS THE CONSOLE DEVICE, "SETUP B" MUST BE SET IN FOR THE FOLLOWING:
A. DISABLE XON/XOFF
B. JUMP SCROLL ON
C. NEW LINE OFF
D. ALL OTHER OPTIONS PER SYSTEM REQUIREMENTS.

2.0 OPERATING INSTRUCTIONS.

2.1 LOADING AND STARTING PROCEDURES.

USE STANDARD PROCEDURE FOR PDP-11 ABSOLUTE BINARY FORMATTED MEDIA.

ALL NORMAL STARTS & RESTARTS ARE FROM LOCATION 200.

THERE ARE 2 STARTING ADDRESSES TO BE USED OFF LINE ONLY FOR INTERRUPT VECTOR TROUBLE SHOOTING:

1310 START: LOADS ADDRESSES 0 TO 400 WITH THE ADDRESS OF AN INTERRUPT ROUTINE THAT JUST DOES RTI'S ALLOWING LOOPING IN THAT PART OF THE TEST WHERE INTERRUPT VECTOR PROBLEMS ARE OCCURING.
NORMAL TESTING WILL THEN BEGIN.

1332 START: LOADS ADDRESSES 0 TO 400 WITH TRAP CATCHER CODE.
ANY INTERRUPT TO THIS REGION WILL HALT.
NORMAL TESTING WILL THEN BEGIN.

AS SOON AS TESTING STARTS, THE OPERATOR CAN CHANGE THE SWITCH REGISTER ONLY BY A 'BREAK' & MANUALLY LOADING LOCATION 176 (SWREG) WITH THE DESIRED CONTENTS (SEE SEC. 2.3) THEN DOING A 'P' TO PROCEED.

THE USER CAN SELECT A SPECIFIC TEST TO BE EXECUTED BY SETTING BIT 8 IN SWREG AND THE TEST NUMBER (IN OCTAL) IN BITS <7:0>.
(NOTE: ALL TESTS PREVIOUS TO THE SELECTED ONE ARE EXECUTED WITHOUT ITERATIONS.)

2.2 SPECIAL ENVIRONMENTS.

THIS DIAGNOSTIC FOLLOWS THE STANDARD PROCEDURE FOR RUNNING UDER APT,XXDP MONITORS, AS DESCRIBED IN THEIR RESPECTIVE PROCEDURES MANUAL AND SYSMAC PACKAGE.

2.3 OPERATIONAL SWITCH SETTINGS

THE SOFTWARE SWITCH REGISTER (LOC. 176) IS USED FOR ALL OPERATIONAL SWITCH SETTINGS.
THIS CAN BE ACCOMPLISHED IN THE FOLLOWING WAY:

1) TYPE CONTROL G <^G>; THIS WILL ALLOW THE TTY TO ENTER DATA INTO LOC. 176 AT SELECTED POINTS WITHIN THE PROGRAM.

2) THE MACHINE WILL THEN TYPE:' SWR=XXXXXX NEW=' (XXXXXX IS THE OCTAL CONTENTS OF THE SOFTWARE SWITCH REGISTER.)

3) AFTER THE 'NEW=' HAS BEEN TYPED THEN THE OPERATOR CAN DO ONE OF THE FOLLOWING AT THE TTY:

   A) TYPE A NUMBER TO BE LOADED INTO LOC. 176 FOLLOWED BY A <CR>. (ONLY NUMBERS BETWEEN 0-7 WILL BE ACCEPTED). LEADING ZEROS NEED NOT BE TYPED, AND IF MORE THAN 6 DIGITS ARE TYPED THE LAST 6 WILL BE USED. IF A <CR> IS THE FIRST KEY DEPRESSED THE SOFTWARE SWITCH REGISTER CONTENTS WILL NOT BE CHANGED.

   B) IF A CONTROL U <^U> IS DEPRESSED THEN THE PROGRAM WILL SEND YOU BACK TO STEP 3.

   C) IF THE INPUT CHARACTER IS NOT ONE OF THE CHARACTERS MENTIONED ABOVE THEN A QUESTION MARK (?) WILL BE TYPED FOLLOWED BY A CARRAGE RETURN AND A LINE FEED SEQUENCE THEN PROCEED FROM STEP 3 (ERASING ALL PREVIOUS INPUT).

4) THE DIAGNOSTIC WILL CONTINUE ON TYPING <CR>.

NOTE: BECAUSE OF THE FREQUENT BUS RESETS IN THE PROGRAM, MULTIPLE CONTROL-G'S MAY BE REQ'D. IF NECESSARY, 'BREAK' INTO THE PROGRAM & LOAD LOCATION 176 (SWREG) BY 'ODT' TO THE DESIRED CONTENTS. DO A 'P' TO PROCEED.

SOFTWARE SWITCH REGISTER OPTIONS (SWREG)

```
BIT 15 SET = 100000 = HALT ON ERROR
    14 SET =  40000 = LOOP ON TEST  (TO BE USED ONLY WHILE TESTING IN PROGRESS)
    13 SET =  20000 = INHIBIT ERROR TYPEOUTS
    12 SET =  10000 = ENABLE PERFORMANCE REPORTS
    11 SET =   4000 = INHIBIT ITERATIONS
    10 SET =   2000 = BELL ON ERROR
     9 SET -   1000 = LOOP ON ERROR
     8 SET -    400 = LOOP ON TEST IN SWR<7:0>
     7:0   =        NUMBER OF TEST TO LOOP ON (USED WITH BIT 8.
                      (ALL TESTS PREVIOIUS TO THE SELECTED TEST
                      ARE EXECUTED FIRST WITH 1 ITERATION ONLY
```

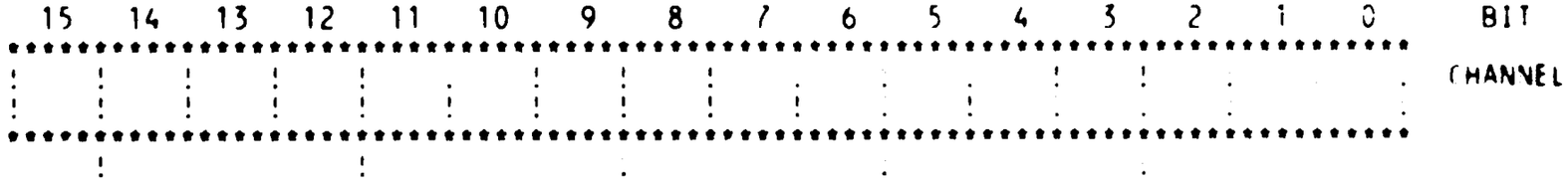
2.4 PROGRAM OPTIONS & DEFAULTS.

THIS PROGRAM REQUIRES THE ADDRESS OF THE FIRST RCSR OF EACH
SERIAL LINE UNIT & ITS INTERRUPT VECTORS TO BE PREVIOUSLY STORED
IF NOT DEFAULTED:

	REGISTER	LOCATION	DEFAULT	
CHANNEL 0	BASE0	1254	176500	RCSR
	VECT0	1256	300	VECTOR
CHANNEL 1	BASE1	1260	177560	RCSR
	VECT1	1262	60	VECTOR

LOCATION '$DEVM' IS USED AS A BIT MAP TO INDICATE WHICH OPTIONS
ARE PRESENT AND TO BE TESTED.
THE OPERATOR IS PROMPTED ON INITIAL PROGRAM STARTUP.
'$DEVM' CAN BE CHANGED ANY TIME BY TYPING 'CONTROL-G' & 'CONTROL-C'.
THE PROGAM WILL RE-SIZE & RESTART AT THE BEGINNING AGAIN.

$DEVM DEFAULT = 000000



CHANNEL 0:

BIT 15: 0 = TEST CHANNEL 0 DEFAULT
1 = BYPASS CHANNEL 0 TEST = 100000

BIT 14: 0 = 8 BITS/WORD (NO PARITY) - DEFAULT
1 = 7 BITS/WORD (WITH PARITY) = 40000

BIT 12: 0 = ODD PARITY DEFAULT
1 = EVEN PARITY = 10000

BIT 11: 0 = BREAK DETECTION DISABLED = DEFAULT
1 - BREAK DETECTION ENABLED - 4000

BIT 10: 0 = DO DATA WRAP AROUND TESTS = DEFAULT
1 - BYPASS DATA WRAP TESTS - 2000

CHANNEL 1:

BIT 8: 0 - TEST CHANNEL 1 = DEFAULT
        1 - BYPASS CHANNEL 1 TEST = 400

BIT 7: 0 = 8 BITS/WORD (NO PARITY) DEFAULT
        1 = 7 BITS/WORD (WITH PARITY) = 200

BIT 5: 0 = ODD PARITY DEFAULT
        1 = EVEN PARITY = 40

BIT 4: 0 = BRFAK DETECTION DISABLED - DEFAULT
        1 = BREAK DETECTION ENABLED 20

BIT 3: 0 = DO DATA WRAP AROUND TESTS - DEFAULT
        1 = BYPASS DATA WRAP TESTS = 10

BIT 2: 0 = TEST RAM = DEFAULT
        1 = BYPASS RAM TESTS = 4

BIT 1: 0 = ROM PRESENT = DEFAULT
        1 = BYPASS ROM TESTING = 2

BIT 0: 0 = CLOCK OPTION DISABLED = DEFAULT
        1 = CLOCK OPTION ENABLED = 1

IMPORTANT:

1. IF RUNNING UNDER APT & THE CONSOLE IS ON THE MXV11-A,
   THE CONSOLE MUST NOT BE TESTED SINCE APT SENDS 'BREAKS'
   TO THE CONSOLE WHICH INTERFERES WITH THE TESTS.

SUMMARY OF USER LOCATIONS & DEFAULTS.

	LOC	DEFAULT	
$DEVM	1252	0	DEVICE MAP
SWREG	176	0	SOFTWARE SWITCH REGISTER
BASE0	1254	176500	CHANNEL 0
VECT0	1256	300	CHANNEL 0
BASE1	1260	177560	CHANNEL 1
VECT1	1262	60	CHANNEL 1
LOROM	1264	173000	LOW ROM ADDRESS
HIROM	1266	173776	HIGH ROM ADDRESS (256 WORDS)

2.5 EXECUTION TIMES.

EXECUTION TIMES FOR AN LSI-11 PROCESSOR WITH THE MXV11-A MODULE AT SHIPMENT CONFIGURATION:

CH. 0 AT 38.4K BAUD.
CH. 1 (CONSOLE) AT 9600 BAUD.

		LSI-11	F-11	
ARE:	FIRST PASS-	25 SEC	15 SEC	FOR SLU TESTS ONLY
	ADDITIONAL PASSES	55 SEC	30 SEC	FOR SLU TESTS ONLY

THE TEST TIME IS BAUD RATE DEPENDENT; HIGHER BAUD RATES RESULT IN SHORTER PASS TIMES.

THE RAM TESTS REQUIRE THE ADDITIONAL TIMES SHOWN BELOW FOR ALL PASSES:

	LSI-11	F-11
4K	15 SEC	10 SEC
8K	40 SEC	15 SEC
12K	1:00 MIN	30 SEC
16K	1:20	40 SEC
20K	1:40	50 SEC
24K	2:00	1:00 MIN
28K	2:20	1:20 MIN

2.6 POWER FAIL.

AUTO START FROM POWER FAIL IS IMPLEMENTED IN THIS PROGRAM.
UPON POWER UP, THE PROGRAM WILL RESTART FROM THE BEGINNING.

3.0 ERROR INFORMATION.

3.1 ERROR REPORTING PROCEDURE.

SINCE THIS DIAGNOSTIC WAS DESIGNED TO FIT IN 4K OF MEMORY THE ERROR TYPEOUT IS VERY BRIEF. THE FORMAT OF THE ERROR TYPEOUT IS AS FOLLOWS:

TEST#_____,ERROR#_____,PC-_____,ADDRESS-_____,VECTOR=_____

WHERE ALL VALUES TYPED ARE OCTAL.
THE ADDRESS AND VECTOR REFER TO THE FAILING CHANNEL.
FOR FURTHER INFORMATION THE LISTING MUST BE CONSULTED.
BITS 15,13,10 AND 9 OF THE SWITCH REGISTER (SWREG) CONTROL THE SEQUENCE OF EVENTS AFTER AN ERROR IS CAUGHT.

BIT 15 SET: CAUSES THE PROGRAM TO HALT IN THE ERROR ROUTINE. IF THE PROGRAM IS CONTINUED, IT WILL PROCEED FROM WHERE IT HALTED.

BIT 13 SET: DISABLES THE PRINTING OF THE ERROR MESSAGE.

BIT 10 SET: CAUSES THE BELL TO RING ON ERROR.

BIT 9 SET: CAUSES THE DIAGNOSTIC TO LOOP FROM BEGINNING OF TEST TO ERROR.

THE ERROR ROUTINE SUPPORTS THE CONTROL G <^G> FUNCTION.
REFER TO SECTION 2.3 FOR DETAILS.

3.2 ERROR HALTS.

THE ONLY HALT IN THIS DIAGNOSTIC IS IN THE ERROR ROUTINE, AND IS EXECUTED ONLY IF BIT 15 OF THE SWITCH REGISTER (SWREG) IS SET WHEN AN ERROR OCCURS.

4.0 PERFORMANCE AND PROGRESS REPORTS.

4.1 PERFORMANCE REPORTS. (BIT 12 SET IN THE SWITCH REGISTER 'SWREG')

AS EACH CHANNEL COMPLETES ONE PASS OF THE DIAGNOSTIC,
THE FOLLOWING ITEMS ARE TYPED:

'CSR:____' : THE BASE ADDRESS OF THE LINE UNDER TEST
'VECTOR:__' : THE ASSOCIATED VECTOR
'ERRORS:__' : THE TOTAL NUMBER OF ERRORS ON THIS DEVICE
ON THIS PASS.

AFTER ALL MODULES & CHANNELS TO BE TESTED HAVE BEEN EXERCISED,
AN END PASS STATEMENT IS TYPED:

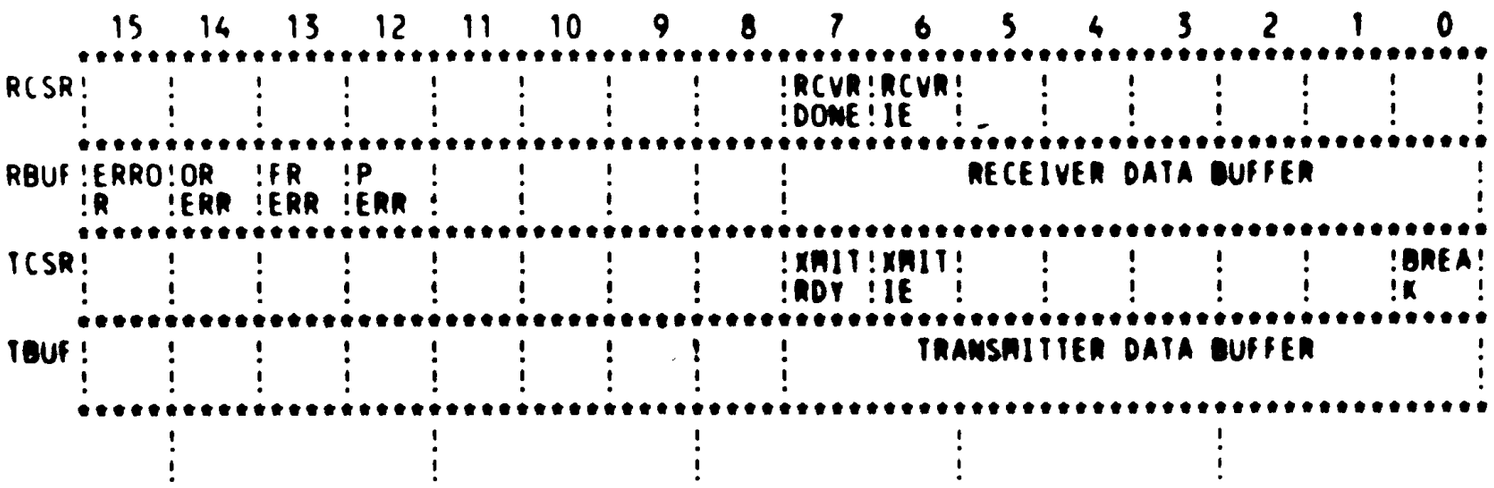
"END PASS#_____."

EXAMPLE OF PRINTOUT ASSUMING: SEPERATE CONSOLE DEVICE
16K RAM
CLOCK ENABLED
NO ERRORS

```
CVMXAA0 MXV11A DIAGNOSTIC

SWR- 000000     NEW- 10000<CR>                  (ENABLE PERFORMANCE REPORTS)

DEVM = 000000   NEW - 201<CR>                   (CH.1 =  7 BITS/WORD (WITH PARITY), CLOCK ENABLED)

16K MEMORY
CLOCK ENABLED

        ** PHASE 1 SUMMARY **
CSR: 176500, VECTOR: 000760, ERRORS: 0          (CHANNEL 0)
CSR: 177500, VECTOR: 000770, ERRORS: 0          (CHANNEL 1)

        ** PHASE 2 SUMMARY **
CSR: 176500, VECTOR: 000760, ERRORS: 0          (INTERACTION TESTS STARTING
                                                WITH CH 0)

END PASS #      1
```

NOTE: THE DEVICE MAP '$DEVM' CAN BE CHANGED AT ANY TIME BY TYPING
'CONTROL-G' & 'CONTROL-C'. SEE SEC. 2.4.
THE PROGRAM WILL RE-SIZE & RESTART AT THE BEGINNING AGAIN.

5.0 DEVICE REGISTERS.



NOTES:

1. RCSR AT BASE ADDRESS ($BASE)
   RBUF AT $BASE+2
   TCSR AT $BASE+4
   TBUF AT $BASE+6

2. BLANK BITS INDICATE UNUSED AND RESERVED BIT POSITIONS. SEE THE LISTING FOR AN EXPLANATION OF THE BITS.

3. ORERR = OVERRUN ERROR
   FRERR = FRAMING ERROR
   PERR = PARITY ERROR

6.0 SUMMARY OF TESTS AND SPECIAL SUBROUTINES.

PHASE 1 TESTS

TEST 1 RAM ADDRESS TEST

WRITE ENTIRE MEMORY WITH ADDRESS AS DATA. READ MEMORY TO VERIFY.

TEST 2 RAM DATA & VOLITILITY TEST

WRITE ALL MEMORY TO BACKGROUND OF ALL 1'S.
TEST LOCATION FOR CORRECT BACKGROUND.
FLOAT 0'S & COMPLEMENT THRU WORD. RESET LOCATION TO BACKGROUND.
REPEAT ABOVE 3 STEPS FOR EACH LOCATION.
WHEN ALL LOCATIONS TESTED, CHECK ENTIRE MEMORY FOR BACKGROUND PATTERN.
CHECK VOLITILITY BY WAITING MORE THAN 5 SEC & RECHECKING BACKGROUND PATT.
REPEAT ALL THE ABOVE FOR BACKGROUND PATTERN OF ALL 0'S & FLOATING 1'S.

TEST 3 ROM TESTS

TEST 4 CLOCK TESTS

TEST 5 ADDRESSABILITY

THIS TEST VERIFIES THAT ALL 4 REGISTERS OF THE CHANNEL
UNDER TEST RESPOND TO THEIR ADDRESSES.

THE FOLLOWING 3 TESTS TEST ALL 'READ WRITE' BITS

TEST 6 BREAK - TCSR 0 SET, CLEAR, RESET

TEST 7 XMITIE - TCSR 6 SET, CLEAR, RESET

TEST 10 RCVRIE - RCSR 6 SET, CLEAR, RESET

TEST 11 XMIT RDY - TCSR 7 - CLEARS WHEN TBUF IS LOADED
WITH A CHARACTER AND THAT IT SETS WITHIN A
REASONABLE AMOUNT OF TIME.

TEST 12 OUTPUTTING A CHAR FROM TBUF (WITH WRAP AROUND CONNECTED)
---- -- RESULTS IN RCVRDONE SETTING WITHIN A
REASONABLE AMOUNT OF TIME AND THAT RESET
CLEARS THE BIT.

TEST 13 RCVRDONE IS CLEARED BY READING RBUF
---- --

TEST 14 OVERRUN & ERROR BIT - RBUF 14
---- --

TEST 15 TRANSMITTER INTERRUPT LOGIC TEST
---- --

LOGICALLLY THIS IS 4 SEPARATE TESTS
A) DOES TRANSMITTER INTERRUPT LOGIC WORK
B) AT PRIORITY OF 0
C) AND ONLY ONCE
D) BUT NOT WITH INTERRUPT ENABLE CLEAR

TEST 16 RECEIVER INTERRUPT LOGIC TEST THIS TEST COVERS ALL
---- -- OF THE RECEIVER SIDE OF THE INTERRUPT LOGIC IN
CHARACTER MODE.

TEST 17 TEST DATA WRAP AROUND BINARY COUNT: FLAG MODE.
---- --

TEST 20 TEST DATA WRAP AROUND BINARY COUNT: INTERRUPT MODE.
---- --

TEST 21 TEST BREAK LOGIC: TRANSMIT KNOWN CHAR
---- --

A) TRANSMIT KNOWN CHAR WITH BREAK SET
AND COMPARE RECEIVED WITH 0
B) TEST FOR FRAMING ERROR ON BREAK
C) IF PARITY IS ENABLED AND ODD PARITY IS SELECTED,
CHECK TO BE SURE PARITY ERROR WAS GENERATED
D) IF PARITY IS ENABLED AND EVEN PARITY IS SELECTED,
CHECK TO BE SURE NO PARITY ERROR OCCURRED

TEST 22 NOT A TEST SEND BACK TO LOOP

****** PHASE 2 TESTS *****

TEST 23 TEST THAT CHANNELS INTERRUPT AT ASSIGNED PRIORITY
---- --

TEST 24 TEST DATA TRANSFERS WITH ALL ACTIVE LINES INTERRUPTING.
---- --
%

```
                        .TITLE  CVMXAA0 MXV11A DIAG
                        ;*COPYRIGHT (C) 1978
                        ;*DIGITAL EQUIPMENT CORP.
                        ;*MAYNARD, MASS. 01754
                        ;*
                        ;*PROGRAM BY GARY PAPAZIAN
                        ;*
                        ;*THIS PROGRAM WAS ASSEMBLED USING THE PDP-11 MAINDEC SYSMAC
                        ;*PACKAGE (MAINDEC-11-DZQAC-C3), JAN 19, 1977.
                        ;*

                        .SBTTL  OPERATIONAL SWITCH SETTINGS
                        ;*
                        ;*      SWITCH                  USE
                        ;*      ------          --------------------
                        ;*        15            HALT ON ERROR
                        ;*        14            LOOP ON TEST
                        ;*        13            INHIBIT ERROR TYPEOUTS
                        ;*        11            INHIBIT ITERATIONS
                        ;*        10            BELL ON ERROR
                        ;*         9            LOOP ON ERROR
                        ;*         8            LOOP ON TEST IN SWR<7:0>
                        .SBTTL  BASIC DEFINITIONS

                        ;*INITIAL ADDRESS OF THE STACK POINTER *** 1100 ***
001100                  STACK=  1100
                        .EQUIV  EMT,ERROR       ;;BASIC DEFINITION OF ERROR CALL
                        .EQUIV  IOT,SCOPE       ;;BASIC DEFINITION OF SCOPE CALL

                        ;*MISCELLANEOUS DEFINITIONS
000011                  HT=     11              ;;CODE FOR HORIZONTAL TAB
000012                  LF=     12              ;;CODE FOR LINE FEED
000015                  CR=     15              ;;CODE FOR CARRIAGE RETURN
000200                  CRLF=   200             ;;CODE FOR CARRIAGE RETURN-LINE FEED
177776                  PS=     177776          ;;PROCESSOR STATUS WORD
                        .EQUIV  PS,PSW
177774                  STKLMT= 177774          ;;STACK LIMIT REGISTER
177772                  PIRQ=   177772          ;;PROGRAM INTERRUPT REQUEST REGISTER
177570                  DSWR=   177570          ;;HARDWARE SWITCH REGISTER
177570                  DDISP=  177570          ;;HARDWARE DISPLAY REGISTER

                        ;*GENERAL PURPOSE REGISTER DEFINITIONS
000000                  R0=     %0              ;;GENERAL REGISTER
000001                  R1=     %1              ;;GENERAL REGISTER
000002                  R2=     %2              ;;GENERAL REGISTER
000003                  R3=     %3              ;;GENERAL REGISTER
000004                  R4=     %4              ;;GENERAL REGISTER
000005                  R5=     %5              ;;GENERAL REGISTER
000006                  R6=     %6              ;;GENERAL REGISTER
000007                  R7=     %7              ;;GENERAL REGISTER
000006                  SP=     %6              ;;STACK POINTER
000007                  PC=     %7              ;;PROGRAM COUNTER

                        ;*PRIORITY LEVEL DEFINITIONS
000000                  PR0=    0               ;;PRIORITY LEVEL 0
```

```
                        PR1=    40              ;;PRIORITY LEVEL 1
                        PR2=    100             ;;PRIORITY LEVEL 2
                        PR3=    140             ;;PRIORITY LEVEL 3
                        PR4=    200             ;;PRIORITY LEVEL 4
                        PR5=    240             ;;PRIORITY LEVEL 5
                        PR6=    300             ;;PRIORITY LEVEL 6
                        PR7=    340             ;;PRIORITY LEVEL 7

                        ;*"SWITCH REGISTER" SWITCH DEFINITIONS
                        SW15=   100000
                        SW14=   40000
                        SW13=   20000
                        SW12=   10000
                        SW11=   4000
                        SW10=   2000
                        SW09    1000
                        SW08=   400
                        SW07=   200
                        SW06=   100
                        SW05=   40
                        SW04=   20
                        SW03=   10
                        SW02=   4
                        SW01=   2
                        SW00=   1
                        .EQUIV  SW09,SW9
                        .EQUIV  SW08,SW8
                        .EQUIV  SW07,SW7
                        .EQUIV  SW06,SW6
                        .EQUIV  SW05,SW5
                        .EQUIV  SW04,SW4
                        .EQUIV  SW03,SW3
                        .EQUIV  SW02,SW2
                        .EQUIV  SW01,SW1
                        .EQUIV  SW00,SW0

                        ;*DATA BIT DEFINITIONS (BIT00 TO BIT15)
                        BIT15=  100000
                        BIT14=  40000
                        BIT13=  20000
                        BIT12=  10000
                        BIT11=  4000
                        BIT10=  2000
                        BIT09=  1000
                        BIT08=  400
                        BIT07=  200
                        BIT06=  100
                        BIT05=  40
                        BIT04=  20
                        BIT03=  10
                        BIT02=  4
                        BIT01=  2
                        BIT00=  1
                        .EQUIV  BIT09,BIT9
                        .EQUIV  BIT08,BIT8
                        .EQUIV  BIT07,BIT7
```

```
                        .EQUIV  BIT06,BIT6
                        .EQUIV  BIT05,BIT5
                        .EQUIV  BIT04,BIT4
                        .EQUIV  BIT03,BIT3
                        .EQUIV  BIT02,BIT2
                        .EQUIV  BIT01,BIT1
                        .EQUIV  BIT00,BIT0

                        ;*BASIC "CPU" TRAP VECTOR ADDRESSES
000004                  ERRVEC= 4               ;;TIME OUT AND OTHER ERRORS
000010                  RESVEC= 10              ;;RESERVED AND ILLEGAL INSTRUCTIONS
000014                  TBITVEC=14              ;;"T" BIT
000014                  TRTVEC= 14              ;;TRACE TRAP
000014                  BPTVEC= 14              ;;BREAKPOINT TRAP (BPT)
000020                  IOTVEC= 20              ;;INPUT/OUTPUT TRAP (IOT) **SCOPE**
000024                  PWRVEC= 24              ;;POWER FAIL
000030                  EMTVEC= 30              ;;EMULATOR TRAP (EMT) **ERROR**
000034                  TRAPVEC=34              ;;"TRAP" TRAP
000060                  TKVEC=  60              ;;TTY KEYBOARD VECTOR
000064                  TPVEC=  64              ;;TTY PRINTER VECTOR
000240                  PIRQVEC=240             ;;PROGRAM INTERRUPT REQUEST VECTOR

                        ; THE FOLLOWING DEFINITIONS APPLY TO THE GLOBAL SUBS
177777                  SET= -1
000000                  CLR=  0
000001                  TRUE= 1

                        ; RCSR REGISTER BIT NAMES

000200                  DONE=       BIT07       ; RECEIVER DONE
000100                  IE-         BIT06       ; RECEIVER INTERRUPT ENABLE

                        ; RBUF REGISTER BIT NAMES

100000                  ERROR=      BIT15       ; ERROR INDICATOR
040000                  ORERR=      BIT14       ; OVERRUN ERROR
020000                  FRERR=      BIT13       ; FRAMING ERROR
010000                  PERR=       BIT12       ; PARITY ERROR

                        ; TCSR REGISTER BIT NAMES

000200                  RDY-        BIT07       ; TRANSMITTER READY
000100                  IE-         BIT06       ; TRANSMITTER INTERRUPT ENABLE
000001                  BREAK       BIT00       ; SEND BREAK (CONTINUOUS SPACE)
```

```
                        ;;*****************************************************************
                        .SBTTL  TRAP CATCHER

        000000                  .=0
                        ;*ALL UNUSED LOCATIONS FROM 4 - 776 CONTAIN A ".+2,HALT"
                        ;*SEQUENCE TO CATCH ILLEGAL TRAPS AND INTERRUPTS
                        ;*LOCATION 0 CONTAINS 0 TO CATCH IMPROPERLY LOADED VECTORS
        000174                  .=174
000174  000000          DISPREG: .WORD  0               ;;SOFTWARE DISPLAY REGISTER
000176  000000          SWREG:   .WORD  0               ;;SOFTWARE SWITCH REGISTER
                        .SBTTL  STARTING ADDRESS(ES)
000200  000137  001570          JMP     @#START ;;JUMP TO STARTING ADDRESS OF PROGRAM

        000100                  .=100
000100  000102                  102             ;RETURN FROM ANY CLOCK INTERRUPTS
000102  000002                  RTI

                        .SBTTL  ACT11 HOOKS

                        ;;*****************************************************************
                        ;HOOKS REQUIRED BY ACT11
        000104                  $SVPC=.                 ;SAVE PC
        000046                  .=46
000046  013422                  $ENDAD                  ;;1)SET LOC.46 TO ADDRESS OF $ENDAD IN .$EOP
        000052                  .=52
000052  000000                  .WORD   0               ;;2)SET LOC.52 TO ZERO
        000104                  .=$SVPC                 ;; RESTORE PC
                        .=1000
                        .SBTTL  APT PARAMETER BLOCK

                        ;;*****************************************************************
                        ;SET LOCATIONS 24 AND 44 AS REQUIRED FOR APT
                        ;;*****************************************************************
        001000                  .$X=.   ;;SAVE CURRENT LOCATION
        000024                  .=24    ;;SET POWER FAIL TO POINT TO START OF PROGRAM
000024  000200                  200     ;;FOR APT START UP
        000044                  .=44    ;;POINT TO APT INDIRECT ADDRESS PNTR.
000044  001000                  $APTHDR ;;POINT TO APT HEADER BLOCK
        001000                  .=.$X   ;;RESET LOCATION COUNTER
                        ;;*****************************************************************
                        ;SETUP APT PARAMETER BLOCK AS DEFINED IN THE APT-PDP11 DIAGNOSTIC
                        ;INTERFACE SPEC.

001000                  $APTHD:
001000  000000          $HIBTS: .WORD   0       ;;TWO HIGH BITS OF 18 BIT MAILBOX ADDR.
001002  001174          $MBADR: .WORD   $MAIL   ;;ADDRESS OF APT MAILBOX (BITS 0-15)
001004  000202          $TSTM:  .WORD   130.    ;;RUN TIM OF LONGEST TEST
001006  000214          $PASTM: .WORD   140.    ;;RUN TIME IN SECS. OF 1ST PASS ON 1 UNIT (QUICK VERIFY)
001010  000175          $UNITM: .WORD   125.    ;;ADDITIONAL RUN TIME (SECS) OF A PASS FOR EACH ADDITIONAL UNIT
001012  000030                  .WORD   $ETEND-$MAIL/2 ;;LENGTH MAILBOX-ETABLE(WORDS)
```

```
                        .SBTTL  COMMON TAGS

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

            001100              .=1100
001100                  $CMTAG:                     ;;START OF COMMON TAGS
001100  000000                  .WORD   0
001102     000          $TSTNM: .BYTE   0           ;;CONTAINS THE TEST NUMBER
001103     000          $ERFLG: .BYTE   0           ;;CONTAINS ERROR FLAG
001104  000000          $ICNT:  .WORD   0           ;;CONTAINS SUBTEST ITERATION COUNT
001106  000000          $LPADR: .WORD   0           ;;CONTAINS SCOPE LOOP ADDRESS
001110  000000          $LPERR: .WORD   0           ;;CONTAINS SCOPE RETURN FOR ERRORS
001112  000000          $ERTTL: .WORD   0           ;;CONTAINS TOTAL ERRORS DETECTED
00111,     000          $ITEMB: .BYTE   0           ;;CONTAINS ITEM CONTROL BYTE
0011 5     001          $ERMAX: .BYTE   1           ;;CONTAINS MAX. ERRORS PER TEST
001 16  000000          $ERRPC: .WORD   0           ;;CONTAINS PC OF LAST ERROR INSTRUCTION
00 120  000000          $GDADR: .WORD   0           ;;CONTAINS ADDRESS OF 'GOOD' DATA
00 122  000000          $BDADR: .WORD   0           ;;CONTAINS ADDRESS OF 'BAD' DATA
001124  000000          $GDDAT: .WORD   0           ;;CONTAINS 'GOOD' DATA
001126  000000          $BDDAT: .WORD   0           ;;CONTAINS 'BAD' DATA
001130  000000                  .WORD   0           ;;RESERVED--NOT TO BE USED
001132  000000                  .WORD   0
001134     000          $AUTOB: .BYTE   0           ;;AUTOMATIC MODE INDICATOR
001135     000          $INTAG: .BYTE   0           ;;INTERRUPT MODE INDICATOR
001136  000000                  .WORD   0
001140  177570          SWR:    .WORD   DSWR        ;;ADDRESS OF SWITCH REGISTER
001142  177570          DISPLAY: .WORD  DDISP       ;;ADDRESS OF DISPLAY REGISTER
001144  177560          $TKS:   177560              ;;TTY KBD STATUS
001146  177562          $TKB:   177562              ;;TTY KBD BUFFER
001150  177564          $TPS:   177564              ;;TTY PRINTER STATUS REG. ADDRESS
001152  177566          $TPB:   177566              ;;TTY PRINTER BUFFER REG. ADDRESS
001154     000          $NULL:  .BYTE   0           ;;CONTAINS NULL CHARACTER FOR FILLS
001155     002          $FILLS: .BYTE   2           ;;CONTAINS # OF FILLER CHARACTERS REQUIRED
001156     012          $FILLC: .BYTE   12          ;;INSERT FILL CHARS. AFTER A "LINE FEED"
001157     000          $TPFLG: .BYTE   0           ;;"TERMINAL AVAILABLE" FLAG (BIT<07>=0 YES)
001160  000000          $TIMES: 0                   ;;MAX. NUMBER OF ITERATIONS
001162  000000          $ESCAPE:0                   ;;ESCAPE ON ERROR ADDRESS
001164  177607  000377  $BELL:  .ASCIZ  <207><377><377> ;;CODE FOR BELL
001170     077          $QUES:  .ASCII  /?/         ;;QUESTION MARK
001171     015          $CRLF:  .ASCII  <15>        ;;CARRIAGE RETURN
001172  000012          $LF:    .ASCIZ  <12>        ;;LINE FEED
                        ;;*****************************************************************
                        .SBTTL  APT MAILBOX-ETABLE

                        ;;*****************************************************************
                        .EVEN
001174                  $MAIL:                      ;;APT MAILBOX
001174  000000          $MSGTY: .WORD   AMSGTY      ;;MESSAGE TYPE CODE
001176  000000          $FATAL: .WORD   AFATAL      ;;FATAL ERROR NUMBER
001200  000000          $TESTN: .WORD   ATESTN      ;;TEST NUMBER
001202  000000          $PASS:  .WORD   APASS       ;;PASS COUNT
001204  000000          $DEVCT: .WORD   ADEVCT      ;;DEVICE COUNT
001206  000000          $UNIT:  .WORD   AUNIT       ;;I/O UNIT NUMBER
001210  000000          $MSGAD: .WORD   AMSGAD      ;;MESSAGE ADDRESS
```

```
   899  001212  000000                $MSGLG: .WORD   AMSGLG  ;;MESSAGE LENGTH
   900  001214                        $ETABLE:                 ;;APT ENVIRONMENT TABLE
   901  001214      000               $ENV:   .BYTE   AENV     ;;ENVIRONMENT BYTE
   902  001215      000               $ENVM:  .BYTE   AENVM    ;;ENVIRONMENT MODE BITS
   903  001216  000000                $SWREG: .WORD   ASWREG   ;;APT SWITCH REGISTER
   904  001220  000000                $USWR:  .WORD   AUSWR    ;;USER SWITCHES
   905  001222  000000                $CPUOP: .WORD   ACPUOP   ;;CPU TYPE,OPTIONS
   906                                ;*                       BITS 15-11=CPU TYPE
   907                                ;*                              11/04=01,11/05=02,11/20=03,11/40-04,11/45 05
   908                                ;*                              11/70=06,PDQ-07,Q-10
   909                                ;*                       BIT 10=REAL TIME CLOCK
   910                                ;*                       BIT  9=FLOATING POINT PROCESSOR
   911                                ;*                       BIT  8=MEMORY MANAGEMENT
   912  001224      000               $MAMS1. .BYTE   AMAMS1   ;;HIGH ADDRESS,M.S. BYTE
   913  001225      000               $MTYP1: .BYTE   AMTYP1   ;;MEM. TYPE,BLK#1
   914                                ;*                       MEM.TYPE BYTE   --  (HIGH BYTE)
   915                                ;*                              900 NSEC CORE=001
   916                                ;*                              300 NSEC BIPOLAR-002
   917                                ;*                              500 NSEC MOS=003
   918  001226  000000                $MADR1: .WORD   AMADR1   ;;HIGH ADDRESS,BLK#1
   919                                ;*                         MEM.LAST ADDR.=3 BYTES,THIS WORD AND LOW OF "TYPE" AB
   920  001230      000               $MAMS2: .BYTE   AMAMS2   ;;HIGH ADDRESS,M.S. BYTE
   921  001231      000               $MTYP2: .BYTE   AMTYP2   ;;MEM.TYPE,BLK#2
   922  001232  000000                $MADR2: .WORD   AMADR2   ;;MEM.LAST ADDRESS,BLK#2
   923  001234      000               $MAMS3: .BYTE   AMAMS3   ;;HIGH ADDRESS,M.S.BYTE
   924  001235      000               $MTYP3: .BYTE   AMTYP3   ;;MEM.TYPE,BLK#3
   925  001236  000000                $MADR3: .WORD   AMADR3   ;;MEM.LAST ADDRESS,BLK#3
   926  001240      000               $MAMS4: .BYTE   AMAMS4   ;;HIGH ADDRESS,M.S.BYTE
   927  001241      000               $MTYP4: .BYTE   AMTYP4   ;;MEM.TYPE,BLK#4
   928  001242  000000                $MADR4: .WORD   AMADR4   ;;MEM.LAST ADDRESS,BLK#4
   929  001244  000000                $VECT1: .WORD   AVECT1   ;;INTERRUPT VECTOR#1,BUS PRIORITY#1
   930  001246  000000                $VECT2: .WORD   AVECT2   ;;INTERRUPT VECTOR#2BUS PRIORITY#2
   931  001250  000000                $BASE:  .WORD   ABASE    ;;BASE ADDRESS OF EQUIPMENT UNDER TEST
   932  001252  000000                $DEVM:  .WORD   ADEVM    ;;DEVICE MAP
   933  001254                        $ETEND:
   934                                .MEXIT
```

```
                                .SBTTL  ERROR POINTER TABLE

                                ;*THIS TABLE CONTAINS THE INFORMATION FOR EACH ERROR THAT CAN OCCUR.
                                ;*THE INFORMATION IS OBTAINED BY USING THE INDEX NUMBER FOUND IN
                                ;*LOCATION $ITEMB. THIS NUMBER INDICATES WHICH ITEM IN THE TAP E IS PERTINENT.
                                ;*NOTE1:        IF $ITEMB IS 0 THE ONLY PERTINENT DATA IS ($ERRPC).
                                ;*NOTE2:        EACH ITEM IN THE TABLE CONTAINS 4 POINTERS EXPLAINED AS FOLLOWS:

                                ;*      EM              ;;POINTS TO THE ERROR MESSAGE
                                ;*      DH              ;;POINTS TO THE DATA HEADER
                                ;*      DT              ;;POINTS TO THE DATA
                                ;*      DF              ;;POINTS TO THE DATA FORMA

001254                          $ERRTB:

001254  176500                  BASE0:  176500          ;DEFAULT CH 0 BASE ADDR
001256  000300                  VECT0:  300             ;DEFAULT CH 0 VECTOR
001260  177560                  BASE1:  177560          ;DEFAULT CH 1 BASE ADDR (CONSOLE)
001262  000060                  VECT1:  60              ;DEFAULT CH 1 VECTOR
001264  173000                  LOROM:  173000          ;DEFAULT LO ROM ADDR
001266  173776                  HIROM:  173776          ;DEFAULT HI ROM ADDR (256 WORDS)
                                                        ;OPTION 1: 4K   000000 - 017776
                                                        ;OPTION 2: 4K   020000 - 037776
001270  000000                  DLADD:  0               ;CH ADDR UNDER TEST...LOADED BY 'CYCLE'
001272  000000                  RCSR:   0               ;CH REGS UNDER TEST...LOADED BY 'LOOP'
001274  000000                  RBUF:   0
001276  000000                  TCSR:   0
001300  000000                  TBUF:   0
001302  000000                  DLVEC:  0               ;CH RECVR VECTOR UNDER TEST...LOADED BY 'CYCLE'
        000100                  CLKVEC= 100             ;LINE CLOCK INTR VECTOR
001304  000000                  TMP1:   0               ;TEMPORARY REGS
001306  000000                  TMP2:   0
001310  000015                  CARR:   .ASCIZ  <15>

                                ;;*****************************************************************
                                ;TRAP CATCHER FOR OFF LINE USE ONLY. BEGIN PROGRAM WITH FRESH LOAD
                                ;;*****************************************************************

001312  005000                  TRPCAT: CLR R0
001314  012720  011636          1$:     MOV     #INTSRV,(R0)+
001320  012720  000340          2$:     MOV     #PR7,(R0)+
001324  020027  001000                  CMP     R0,#1000
001330  001371                          BNE     1$
001332  000412                          BR      3$

001334  005000                          CLR     R0
001336  012701  000002                  MOV     #2,R1
001342  010120                  2$:     MOV     R1,(R0)+
001344  005020                          CLR     (R0)+
001346  062701  000004                  ADD     #4,R1
001352  020027  001000                  CMP     R0,#1000
001356  001371                          BNE     2$
001360  005037  000176          3$:     CLR     176
001364  000137  001370                  JMP     START
```

```
  991  001370                          START:
  992                                  .SBTTL  INITIALIZE THE COMMON TAGS
  993                                  ;;CLEAR THE COMMON TAGS ($CMTAG) AREA
  994  001370  012706  001100                 MOV     #$CMTAG,R6      ;;FIRST LOCATION TO BE CLEARED
  995  001374  005026                         CLR     (R6)+           ;;CLEAR MEMORY LOCATION
  996  001376  022706  001140                 CMP     #SWR,R6 ;;DONE?
  997  001402  001374                         BNE     .-6             ;;LOOP BACK IF NO
  998  001404  012706  001100                 MOV     #STACK,SP       ;;SETUP THE STACK POINTER
  999                                  ;;INITIALIZE A FEW VECTORS
 1000  001410  012737  015432  000020         MOV     #$SCOPE,@#IOTVEC ;;IOT VECTOR FOR SCOPE ROUTINE
 1001  001416  012737  000340  000022         MOV     #340,@#IOTVEC+2 ;;LEVEL 7
 1002  001424  012737  015232  000030         MOV     #$ERROR,@#EMTVEC ;;EMT VECTOR FOR ERROR ROUTINE
 1003  001432  012737  000340  000032         MOV     #340,@#EMTVEC+2 ;;LEVEL 7
 1004  001440  012737  016364  000034         MOV     #$TRAP,@#TRAPVEC ;;TRAP VECTOR FOR TRAP CALLS
 1005  001446  012737  000340  000036         MOV     #340,@#TRAPVEC+2;LEVEL 7
 1006  001454  012737  013456  000024         MOV     #$PWRDN,@#PWRVEC ;;POWER FAILURE VECTOR
 1007  001462  012737  000340  000026         MOV     #340,@#PWRVEC+2 ;;LEVEL 7
 1008  001470  013737  013370  013362         MOV     $ENDCT,$EOPCT   ;;SETUP END-OF-PROGRAM COUNTER
 1009  001476  005037  001160                 CLR     $TIMES          ;;INITIALIZE NUMBER OF ITERATIONS
 1010  001502  005037  001162                 CLR     $ESCAPE         ;;CLEAR THE ESCAPE ON ERROR ADDRESS
 1011  001506  112737  000001  001115         MOVB    #1,$ERMAX       ;;ALLOW ONE ERROR PER TEST
 1012  001514  012737  001514  001106         MOV     #.,$LPADR       ;;INITIALIZE THE LOOP ADDRESS FOR SCOPE
 1013  001522  012737  001522  001110         MOV     #.,$LPERR       ;;SETUP THE ERROR LOOP ADDRESS
 1014                                  ;;SIZE FOR A HARDWARE SWITCH REGISTER. IF NOT FOUND OR IT IS
 1015                                  ;;EQUAL TO A "-1", SETUP FOR A SOFTWARE SWITCH REGISTER.
 1016  001530  013746  000004                 MOV     @#ERRVEC,-(SP)  ;;SAVE ERROR VECTOR
 1017  001534  012737  001570  000004         MOV     #64$,@#ERRVEC   ;;SET UP ERROR VECTOR
 1018  001542  012737  177570  001140         MOV     #DSWR,SWR       ;;SETUP FOR A HARDWARE SWICH REGISTER
 1019  001550  012737  177570  001142         MOV     #DDISP,DISPLAY  ;;AND A HARDWARE DISPLAY REGISTER
 1020  001556  022777  177777  177354         CMP     #-1,@SWR        ;;TRY TO REFERENCE HARDWARE SWR
 1021  001564  001012                         BNE     66$             ;;BRANCH IF NO TIMEOUT TRAP OCCURRED
 1022                                                                 ;;AND  THE HARDWARE SWR IS NOT   -1
 1023  001566  000403                         BR      65$             ;;BRANCH IF NO TIMEOUT
 1024  001570  012716  001576          64$:   MOV     #65$,(SP)       ;;SET UP FOR TRAP RETURN
 1025  001574  000002                         RTI
 1026  001576  012737  000176  001140  65$:   MOV     #SWREG,SWR      ;;POINT TO SOFTWARE SWR
 1027  001604  012737  000174  001142         MOV     #DISPREG,DISPLAY
 1028  001612  012637  000004          66$:   MOV     (SP)+,@#ERRVEC  ;;RESTORE ERROR VECTOR
 1029
 1030  001616  005037  001202                 CLR     $PASS           ;;CLEAR PASS COUNT
 1031  001622  132737  000200  001215         BITB    #APTSIZE,$ENVM  ;;TEST USER SIZE UNDER APT
 1032  001630  001403                         BEQ     67$             ;;YES,USE NON-APT SWITCH
 1033  001632  012737  001216  001140         MOV     #$SWREG,SWR     ;;NO,USE APT SWITCH REGISTER
 1034  001640                          67$:
 1035                                  .SBTTL  TYPE PROGRAM NAME
 1036                                  ;;TYPE THE NAME OF THE PROGRAM IF FIRST PASS
 1037  001640  005227  177777                 INC     #-1             ;;FIRST TIME?
 1038  001644  001045                         BNE     68$             ;;BRANCH IF NO
 1039  001646  022737  013422  000042         CMP     #$ENDAD,@#42    ;;ACT-11?
 1040  001654  001441                         BEQ     68$             ;;BRANCH IF YES
 1041  001656  104401  001724                 TYPE    ,69$            ;;TYPE ASCIZ STRING
 1042                                  .SBTTL  GET VALUE FOR SOFTWARE SWITCH REGISTER
 1043  001662  005737  000042                 TST     @#42            ;;ARE WE RUNNING UNDER XXDP/A T?
 1044  001666  001012                         BNE     70$             ;;BRANCH IF YES
 1045  001670  123727  001214  000001         CMPB    $ENV,#1         ;;ARE WE RUNNING UNDER APT?
 1046  001676  001406                         BEQ     70$             ;;BRANCH IF YES
```

```
1047  001700  023727  001140  000176          CMP     SWR,#SWREG      ;;SOFTWARE SWITCH REG SELECTED?
1048  001706  001005                          BNE     71$             ;;BRANCH IF NO
1049  001710  104406                          GTSWR                   ;;GET SOFT-SWR SETTINGS
1050  001712  000403                          BR      71$
1051  001714  112737  000001  001134  70$:    MOVB    #1,$AUTOB       ;;SET AUTO-MODE INDICATOR
1052  001722                          71$:
1053  001722  000416                          BR      68$             ;;GET OVER THE ASCIZ
1054                                  ;;69$:   .ASCIZ  <CRLF>*CVMXAA0 MXV11A DIAGNOSTIC*<CRLF>
1055  001760                          68$:
1056  001760  005227  177777                  INC     #-1             ;1'ST TIME?
1057  001764  001005                          BNE     1$              ;BR IF NO
1058  001766  123727  001214  000001          CMPB    $ENV,#1         ;APT?
1059  001774  001401                          BEQ     1$              ;BR IF YES
1060  001776  104412                          GTDEVM                  ;ELSE SHOW CURRENT DEVM & GET NEW
1061
1062  002000  004737  011334          1$:     JSR     PC,SIZE         ;SIZE THE MXV11-A
1063
1064  002004  012706  001100          RAMPOM: MOV     #STACK,SP       ;RESET STACK PTR
1065
1066
1067
1068                                  ;;*****************************************************************
1069                                  ;*TEST 1        RAM ADDRESS TEST
1070                                  ;*
1071                                  ;*      WRITE ENTIRE MEMORY WITH ADDRESS AS DATA.
1072                                  ;*      READ ENTIRE MEMORY TO VERIFY.
1073                                  ;*
1074                                  ;*****************************************************************
1075  002010  000004          TST1:   SCOPE
1076  002012  012737  000001  001160          MOV     #1,$TIMES       ;;DO 1 ITERATION
1077  002020  012737  000001  001200          MOV     #1,$TESTN       ;;SET TEST NUMBER IN APT MAIL BOX
1078
1079  002026  032737  000004  001252          BIT     #BIT2,$DEVM             ;BYPASS RAM TESTS?
1080  002034  001022                          BNE     TST2            ;;EXIT IF YES
1081
1082  002036  012700  017776                  MOV     #17776,R0               ;ADDRESS REG
1083
1084  002042  010010          1$:     MOV     R0,(R0)                 ;LOAD ADDRESS AS DATA
1085  002044  020037  011634                  CMP     R0,MAXMEM               ;LAST ADDR?
1086  002050  001402                          BEQ     2$              ;BR IF YES
1087  002052  005720                          TST     (R0)+                   ;ELSE BUMP ADDR REG
1088  002054  000772                          BR      1$
1089
1090  002056  012700  017776          2$:     MOV     #17776,R0               ;VERIFY
1091  002062  020010          3$:     CMP     R0,(R0)                 ;READ & CHECK
1092  002064  001401                          BEQ     4$
1093  002066  104010                          ERROR   10                      ;DATA NOT - ADDRESS
1094
1095  002070  020037  011634          4$:     CMP     R0,MAXMEM               ;LAST ADDR?
1096  002074  001402                          BEQ     TST2            ;;EXIT IF YES
1097  002076  005720                          TST     (R0)+                   ;ELSE BUMP ADDR
1098  002100  000770                          BR      3$
```

```
1099
1100                                    ;;*****************************************************************
1101                                    ;*TEST 2        RAM DATA & VOLITILITY TEST
1102                                    ;*
1103                                    ;* WRITE ALL MEMORY TO BACKGROUND OF ALL 1'S.
1104                                    ;* TEST LOCATION FOR CORRECT BACKGROUND.
1105                                    ;* FLOAT 0'S & COMPLEMENT THRU WORD.
1106                                    ;* RESET LOCATION TO BACKGROUND.
1107                                    ;* REPEAT ABOVE 3 STEPS FOR EACH LOCATION.
1108                                    ;* WHEN ALL LOCATIONS TESTED, CHECK ENTIRE MEMORY FOR BACKGROUND PATTERN.
1109                                    ;* CHECK VOLITILITY BY WAITING MORE THAN 5 SEC & RECHECKING BACKGROUND PATT.
1110                                    ;* REPEAT ALL THE ABOVE FOR BACKGROUND PATTERN OF ALL 0'S & FLOATING 1'S.
1111                                    ;*
1112                                    ;;*****************************************************************
1113  002102  000004                   TST2:   SCOPE
1114  002104  012737  000001  001160           MOV     #1,$TIMES       ;;DO 1 ITERATION
1115  002112  012737  000002  001200           MOV     #2,$TESTN       ;;SET TEST NUMBER IN APT MAIL BOX
1116
1117  002120  032737  000004  001252           BIT     #BIT2,$DEVM             ;BYPASS RAM TESTS?
1118  002126  001145                           BNE     25$                     ;BR IF YES
1119
1120  002130  012737  177777  002554           MOV     #-1,BKGND               ;BACKGROUND = 1'S
1121  002136  012700  017776          21$:     MOV     #17776,R0               ;ADDRESS
1122
1123  002142  013710  002554          1$:      MOV     BKGND,(R0)              ;WRITE BACKGROUND
1124  002146  020037  011634                   CMP     R0,MAXMEM               ;LAST ADDR?
1125  002152  001402                           BEQ     2$
1126  002154  005720                           TST     (R0)+                   ;ELSE BUMP ADDR
1127  002156  000771                           BR      1$
1128
1129  002160  012700  017776          2$:      MOV     #17776,R0               ;RESET ADDR
1130  002164  021037  002554          3$:      CMP     (R0),BKGND              ;READ & CHECK
1131  002170  001401                           BEQ     4$
1132  002172  104011                           ERROR   11                      ;LOC DOES NOT   BACKGROUND
1133
1134  002174  005737  002554          4$:      TST     BKGND                   ;IF BKGND = 1'S, FLOAT 0'S
1135  002200  001002                           BNE     5$
1136  002202  000261                           SEC                             ;ELSE SET CARRY TO FLOAT 1'S
1137  002204  000401                           BR      6$
1138  002206  000241                  5$:      CLC                             ;FLOAT 0'S
1139
1140  002210  013737  002554  002560  6$:      MOV     BKGND,SAVBK             ;SAVE
1141  002216  006037  002560          7$:      ROR     SAVBK                   ;BEGIN ROTATE
1142  002222  013710  002560                   MOV     SAVBK,(R0)              ,WRITE IT
1143  002226  021037  002560                   CMP     (R0),SAVBK              ;READ & CHECK
1144  002232  001401                           BEQ     8$
1145  002234  104022                           ERROR   22                      ;NO COMPARE
```

```
 1146
 1147  002236  005137  002560          8$:     COM     SAVBK                   ;DO COMPLEMEMT
 1148  002242  013710  002560                  MOV     SAVBK,(R0)              ;WRITE IT
 1149  002246  011037  002556                  MOV     (R0),RDWRD              ;READ IT
 1150  002252  023737  002556  002560          CMP     RDWRD,SAVBK             ;SAME?
 1151  002260  001401                          BEQ     9$
 1152  002262  104023                          ERROR   23                      ;NO COMPARE OF COMPLEMENT
 1153
 1154  002264  005137  002560          9$:     COM     SAVBK                   ;RESTORE BACKGROUND
 1155  002270  023737  002560  002554          CMP     SAVBK,BKGND             ;BACK TO ORIG. BACKGROUND?
 1156  002276  001407                          BEQ     23$                     ;BR IF YES
 1157
 1158  002300  005737  002554                  TST     BKGND                   ;IF BKGND = 1, SET CARRY
 1159  002304  001002                          BNE     22$
 1160  002306  000241                          CLC                             ;ELSE CLEAR IT
 1161  002310  000742                          BR      7$                      ;DO NEXT BIT
 1162  002312  000261                  22$:    SEC
 1163  002314  000740                          BR      7$
 1164
 1165  002316  013710  002554          23$:    MOV     BKGND,(R0)              ;RESTORE ORIG BACKGROUND
 1166  002322  020037  011634                  CMP     R0,MAXMEM               ;LAST ADDR?
 1167  002326  001402                          BEQ     10$                     ;BR IF YES
 1168  002330  005720                          TST     (R0)+                   ;ELSE BUMP ADDR
 1169  002332  000714                          BR      3$                      ;& REPEAT
 1170
 1171  002334  104407                  10$:    CKSWR
 1172  002336  012700  017776                  MOV     #17776,R0               ;SEE IF ENTIRE MEM STILL SAME BACKGROUND
 1173  002342  011037  002556          11$:    MOV     (R0),RDWRD              ;READ
 1174  002346  023737  002556  002554          CMP     RDWRD,BKGND             ;SAME?
 1175  002354  001401                          BEQ     12$
 1176  002356  104025                          ERROR   25                      ;CHANGE IN BACKGROUND
 1177
 1178  002360  020037  011634          12$:    CMP     R0,MAXMEM               ;LAST ADDR?
 1179  002364  001402                          BEQ     13$
 1180  002366  005720                          TST     (R0)+                   ;ELSE BUMP ADDR
 1181  002370  000764                          BR      11$                     ;& DO ANOTHER
 1182
 1183  002372  012737  002444  000004  13$:    MOV     #16$,ERRVEC             ;WAIT > 5 SEC TO TEST FOR VOLITILITY
 1184  002400  012737  000200  000006          MOV     #200,ERRVEC+2           ;SET UP TIMEOUT TRAP ADDR
 1185
 1186  002406  013700  011634                  MOV     MAXMEM,R0
 1187  002412  062700  000002                  ADD     #2,R0                   ;THIS ADDR SHOULD GIVE TIMEOUT
 1188
 1189  002416  012701  000002                  MOV     #2,R1                   ;ITERATION CTR
 1190  002422  012702  177777          14$:    MOV     #-1,R2
 1191  002426  011010                  15$:    MOV     (R0),(R0)               ;SHOULD TIMEOUT (DO MOV INSTEAD OF TST)
 1192  002430  005720                          TST     (R0)+           ;COME HERE IF NO TIMEOUT & BUMP ADDR
 1193  002432  020027  177776                  CMP     R0,#177776              ;REACHED 32K?
 1194  002436  001373                          BNE     15$                     ;BR IF NO
 1195  002440  104042                          ERROR   42                      ;CANNOT FIND ADDR TO TIMEOUT
 1196
 1197  002442                          25$:
 1198  002442  000447                          BR      TST3            ;;EXIT TEST
```

```
 1199
 1200  002444  022626                  16$:    CMP     (SP)+,(SP)+             ;CLEAR STACK FROM TRAP
 1201  002446  005302                          DEC     R2
 1202  002450  001366                          BNE     15$
 1203  002452  005301                          DEC     R1
 1204  002454  001362                          BNE     14$
 1205
 1206  002456  104407                          CKSWR
 1207  002460  012737  000006  000004          MOV     #ERRVEC+2,ERRVEC        ;5 SEC UP.  RESET TIMEOUT TRAP ADDR.
 1208  002466  005037  000006                  CLR     ERRVEC+2
 1209
 1210  002472  012700  017776                  MOV     #17776,R0               ;TEST MEMORY FOR VOLITILITY
 1211
 1212  002476  021037  002554          17$:    CMP     (R0),BKGND              ;READ & CHECK
 1213  002502  001401                          BEQ     18$
 1214  002504  104026                          ERROR   26                      ;BACKGROUND CHANGE AFTER 5 SEC
 1215
 1216  002506  020037  011634          18$:    CMP     R0,MAXMEM               ;LAST ADDR?
 1217  002512  001402                          BEQ     19$
 1218  002514  005720                          TST     (R0)+                   ;E SE BUMP ADDR
 1219  002516  000767                          BR      17$                     ;& DO ANOTHER
 1220
 1221  002520  005737  002554          19$:    TST     BKGND                   ;BACKGROUND ALL 0'S?
 1222  002524  001404                          BEQ     20$                     ;BR IF YES
 1223  002526  005037  002554                  CLR     BKGND                   ;ELSE DO OPPOSITE BACKGROUND
 1224  002532  000137  002136                  JMP     21$
 1225
 1226  002536  005737  011614          20$:    TST     NOCHAN                  ;ANY CHANNELS TO BE TESTED?
 1227  002542  001407                          BEQ     TST3            ;;BR IF YES
 1228  002544  104401  001310                  TYPE    ,CARR
 1229  002550  000137  013334                  JMP     $EOP                    ;ELSE ALL DONE
 1230
 1231  002554  000000          BKGND:  0                                       ;BACKGROUND
 1232  002556  000000          RDWRD:  0                                       ;STORE READ WORD HERE
 1233  002560  000000          SAVBK:  0                                       ;ROTATE BACKGROUND HERE
 1234
```

```
                                ;;*****************************************************************
                                ;*TEST 3        ROM TESTS
                                ;;*****************************************************************
002562  000004                  ST3:    SCOPE
002564  012737  000010  001160          MOV     #10,$TIMES      ;;DO 10 ITERATIONS
002572  012737  000003  001200          MOV     #3,$TESTN       ;;SET TEST NUMBER IN APT MAIL BOX

002600  032737  000002  001252          BIT     #BIT1,$DEVM     ;BYPASS ROM TEST?
002606  001057                        BNE     TST4            ;;EXIT IF YES
002610  012737  011636  000004          MOV     #INTSRV,ERRVEC  ;SETUP TIMEOUT TRAP ADDR
002616  012737  000200  000006          MOV     #200,ERRVEC+2

                                ;;*****************************************************************
                                ;TEST 'LOROM' TO 'HIROM' PRESENT
                                ;;*****************************************************************

002624  013703  001264          3$:     MOV     LOROM,R3
002630  005037  011644                  CLR     INTFLG
002634  005713                        TST     (R3)            ;ACCESS
002636  005737  011644                  TST     INTFLG          ;TIMEOUT?
002642  001403                        BEQ     4$              ;BR IF NO
002644  010337  002744                  MOV     R3,ADDR         ;FOR ERROR ANALYSIS
002650  104007                        ERROR   7

002652  020337  001266          4$:     CMP     R3,HIROM        ;;ALL DONE?
002656  001403                        BEQ     5$              ;BR IF YES
002660  062703  000002                  ADD     #2,R3           ;ELSE BUMP ADDR
002664  000761                        BR      3$

                                ;;*****************************************************************
                                ;TEST THAT ROM CANNOT BE WRITTEN INTO
                                ;;*****************************************************************

002666  013703  001264          5$:     MOV     LOROM,R3
002672  005037  011644          6$:     CLR     INTFLG
002676  010013                        MOV     R0,(R3)         ;TRY TO WRITE INTO ROM
002700  005737  011644                  TST     INTFLG          ;TIMEOUT?
002704  001003                        BNE     7$              ;BR IF YES
002706  010337  002744                  MOV     R3,ADDR         ;FOR ERROR ANALYSIS
002712  104035                        ERROR   35

002714  020337  001266          7$:     CMP     R3,HIROM        ;ALL DONE?
002720  001403                        BEQ     8$              ;BR IF YES
002722  062703  000002                  ADD     #2,R3           ;ELSE BUMP ADDR
002726  000761                        BR      6$

002730  012737  000006  000004  8$      MOV     #ERRVEC+2,ERRVEC ;RESTORE TIMEOUT VECTOR
002736  005037  000006                  CLR     ERRVEC+2
002742  000401                        BR      TST4            ;;EXIT TEST

002744  000000                  ADDR:   .WORD 0                 ;ROM ADDRESS WHERE ERROR OCCURED
```

```
1287
1288                                    ;;*****************************************************************
1289                                    ;*TEST 4          CLOCK TESTS
1290                                    ;;*****************************************************************
1291  002746  000004                    TST4:   SCOPE
1292  002750  012737  000010  001160            MOV     #10,$TIMES      ;;DO 10 ITERATIONS
1293  002756  012737  000004  001200            MOV     #4,$TESTN       ;;SET TEST NUMBER IN APT MAIL BOX
1294
1295  002764  106427                            .WORD   106427          ; MTPS
1296  002766  000200                            .WORD   200             ;DISABLE INTERRUPTS
1297
1298  002770  012737  011636  000100            MOV     #INTSRV,CLKVEC  ;SETUP VECTOR AREA
1299  002776  012737  000200  000102            MOV     #200,CLKVEC+2   ;LOCKOUT OTHER INTERR
1300  003004  005037  011644                    CLR     INTFLG
1301
1302  003010  106427                            .WORD   106427          ;MTPS
1303  003012  000000                            .WORD   0               ;ALLOW CLOCK TO INTERR THRU INTSRV
1304
1305  003014  032737  000001  001252            BIT     #BIT0,$DEVM     ;CLOCK OPTION DISABLED?
1306  003022  001411                            BEQ     2$              ;BR IF YES
1307
1308  003024  012700  177777                    MOV     #-1,R0          ;TIMER
1309  003030  005300                    1$:     DEC     R0
1310  003032  001376                            BNE     1$
1311  003034  005737  011644                    TST     INTFLG          ;GOT INTERRUPT?
1312  003040  001012                            BNE     4$              ;BR IF YES
1313  003042  104006                            ERROR   6               ;NO CLOCK INTERRUPT
1314  003044  000410                            BR      4$
1315
1316  003046  012700  177777            2$:     MOV     #-1,R0          ;TIMER
1317  003052  005300                    3$:     DEC     R0
1318  003054  001376                            BNE     3$
1319  003056  005737  011644                    TST     INTFLG          ;GOT INTERRUPT?
1320  003062  001401                            BEQ     4$              ;BR IF NO
1321  003064  104034                            ERROR   34              ;UNEXP. CLOCK INTERRUPT
1322
1323  003066  106427                    4$:     .WORD   106427          ;MTPS
1324  003070  000200                            .WORD   200             ;DISABLE INTERR
1325
1326  003072  012737  000102  000100            MOV     #102,CLKVEC     ;RESTORE CLOCK VECTOR AREA
1327  003100  012737  000002  000102            MOV     #RTI,CLKVEC+2
1328
1329  003106  106427                            .WORD   106427          ;MTPS
1330  003110  000000                            .WORD   0               ;ENABLE INTERRUPTS
```

```
1331
1332  003112  005037  012312          SLU:    CLR     PHASE2          ;INIT FOR TESTS
1333  003116  005037  001206                  CLR     $UNIT           ;CONTAINS CHAN # UNDER TEST ( 0 OR 1 )
1334  003122  005037  012314                  CLR     P1CNT
1335
1336  003126  012706  001100          LOOP:   MOV     #STACK,SP       ;RESET STACK POINTER
1337  003132  005737  011614                  TST     NOCHAN          ;ANY CHANNELS TO TEST?
1338  003136  001404                          BEQ     1$              ;BR IF YES
1339  003140  104401  001310                  TYPE    ,CARR
1340  003144  000137  013334                  JMP     $EOP            ;ELSE ALL DONE
1341
1342  003150  004737  011646          1$:     JSR     PC,CYCLE        ;ELSE SETUP MODULE AND CHANNEL
1343
1344  003154  013737  001270  001272          MOV     DLADD,RCSR
1345
1346  003162  013737  001270  001274          MOV     DLADD,RBUF
1347  003170  062737  000002  001274          ADD     #2,RBUF
1348
1349  003176  013737  001270  001276          MOV     DLADD,TCSR
1350  003204  062737  000004  001276          ADD     #4,TCSR
1351
1352  003212  013737  001270  001300          MOV     DLADD,TBUF
1353  003220  062737  000006  001300          ADD     #6,TBUF
1354
1355  003226  012700  177777                  MOV     #-1,R0          ;DELAY TO ALLOW ANY PREVIOUS XMIT TO
1356  003232  077001                          SOB     R0,.            ;FINISH BEFORE RESET
1357  003234  000005                          RESET
1358
1359  003236  005237  001204                  INC     $DEVCT
1360  003242  123727  012312  000001          CMPB    PHASE2,#TRUE    ;DOING PHASE 2?
1361  003250  001002                          BNE     2$              ;BR IF NO
1362  003252  000137  007264                  JMP     MODTST
1363  003256                          2$:
1364
```

```
                                        ;;*****************************************************************
                                        ;*TEST 5        ADDRESSABILITY
                                        ;*
                                        ;*      THIS TEST VERIFIES THAT ALL 4 REGISTERS OF THE CHANNEL UNDER TEST
                                        ;*      RESPOND TO THEIR ADDRESSES.
                                        ;*
                                        ;;*****************************************************************
003256  000004                  TST5:   SCOPE
003260  012737  000002  001160          MOV     #2,$TIMES       ;;DO 2 ITERATIONS
003266  012737  000005  001200          MOV     #5,$TESTN       ;;SET TEST NUMBER IN APT MAIL BOX

003274  012737  011636  000004          MOV     #INTSRV,ERRVEC  ;SETUP TIMEOUT VECTOR
003302  012737  000340  000006          MOV     #PR7,ERRVEC+2

003310  005000                          CLR     R0
003312  013701  001272                  MOV     RCSR,R1

003316  005037  011644          1$:     CLR     INTFLG
003322  005721                          TST     (R1)+           ;DARE TO TIMEOUT
003324  005737  011644                  TST     INTFLG          ;DID IT?
003330  001401                          BEQ     2$              ;BR IF NO
003332  104001                          ERROR   1               ;TIMEOUT ON CHANNEL ADDRESS

003334  005200                  2$:     INC     R0
003336  020027  000004                  CMP     R0,#4           ;ALL DONE?
003342  001365                          BNE     1$              ;BR IF NO

003344  012737  000006  000004          MOV     #6,ERRVEC       ;RESTORE TIMEOUT VECTOR
003352  005037  000006                  CLR     ERRVEC+2

003356  032777  177477  175706          BIT     #177477,@RCSR   ;CHECK THAT ALL UNUSED BITS ARE 0
003364  001401                          BEQ     3$
003366  104027                          ERROR   27              ;RCSR HAS UNUSED BITS SET

003370  032777  007400  175676  3$:     BIT     #7400,@RBUF
003376  001401                          BEQ     4$
003400  104030                          ERROR   30              ;RBUF HAS UNUSED BITS SET

003402  032777  177476  175666  4$:     BIT     #177476,@TCSR
003410  001401                          BEQ     5$
003412  104031                          ERROR   31              ;TCSR HAS UNUSED BITS SET

003414  032777  177400  175656  5$:     BIT     #177400,@TBUF
003422  001401                          BEQ     .+4             ;EXIT IF OK
003424  104032                          ERROR   32              ;TBUF HAS ;UNUSED BITS SET
```

```
                                ;;*****************************************************************
                                ;* THE FOLLOWING 3 TESTS  TEST ALL 'READ WRITE' BITS
                                ;;*****************************************************************


                                ;;*****************************************************************
                                ;*TEST 6        BREAK - TCSR 0 SET, CLEAR, RESET
                                ;*               THIS BIT IS THE ONLY ONE IN THIS POSITION
                                ;*               THAT IS READ AND WRITE.
                                ;;*****************************************************************
003426  000004                  TST6:   SCOPE
003430  012737  000010  001160          MOV     #10,$TIMES      ;;DO 10 ITERATIONS
003436  012737  000006  001200          MOV     #6,$TESTN       ;;SET TEST NUMBER IN APT MAIL BOX

003444  005737  012304                  TST     BRK             ;BREAK DETECTION ENABLED?
003450  001403                          BEQ     1$              ;BR IF NO
003452  005737  012310                  TST     CONSOLE         ;ELSE ARE WE ON CONSOLE?
003456  001055                          BNE     TST7            ;;EXIT IF YES
003460                          1$:
                                                        ; SEE IF IT IS CLEAR
                                                                LPADR
003460
003460  012737  003466  001110          MOV     #64$,$LPERR
003466                          64$:

003466                                                          IF      #BREAK SETIN @TCSR THEN
003466  032777  000001  175602          BIT     #BREAK,@TCSR
003474  001401                          BEQ     $1

                                                                ; BREAK DID NOT RESET IN TCSR
003476  104002                          ERROR 2
003500                                                          ENDIF
003500                          $1:

                                                ; TRY TO SET BREAK BIT
                                                        LPADR
003500
003500  012737  003506  001110          MOV     #64$,$LPERR
003506                          64$:
003506                                                          LET     @TCSR := @TCSR SET.BY #BREAK
003506  052777  000001  175562          BIS     #BREAK,@TCSR

                                                                ; STUCK TO 0
003514                                                          IF      #BREAK NOTSETIN @TCSR THEN
003514  032777  000001  175554          BIT     #BREAK,@TCSR
003522  001001                          BNE     $2

                                                                ; BREAK DID NOT SET IN TCSR
003524  104003                          ERROR 3
003526                                                          ENDIF
003526                          $2:

                                                ; TRY TO CLEAR A SET BIT
                                                        LPADR
003526
003526  012737  003534  001110          MOV     #64$,$LPERR
003534                          64$:

003534                                                          LET     @TCSR := @TCSR CLR.BY #BREAK
003534  042777  000001  175534          BIC     #BREAK,@TCSR

                                                                ; SHOULD HAVE CLEARED
003542                                                          IF      #BREAK SETIN @TCSR THEN
```

```
 1467  003542  032777  000001  175526          BIT     #BREAK,@TCSR
  468  003550  001401                          BEQ     $3
  469                                                                  ; BREAK  DID NOT CLEAR IN TCSR
 1470  003552  104004                          ERROR 4
 1471  003554                                                        ENDIF
 1472  003554                          $3:
 1473
 1474                                                  ; NOW SEE IF RESET CLEARS IT
 1475  003554                                                          LPADR
 1476  003554  012737  003562  001110          MOV     #64$,$LPERR
 1477  003562                          64$:
 1478
 1479  003562                                                        LET    @TCSR := @TCSR SET.BY #BREAK
 1480  003562  052777  000001  175506          BIS     #BREAK,@TCSR
 1481                                                                 ; ISSUE BUS RESET
 1482  003570  012700  177777                  MOV     #-1,R0          ;DELAY TO ALLOW ANY PREVIOUS XMIT TO
 1483  003574  077001                          SOB     R0,.            ;FINISH BEFORE RESET
 1484  003576  000005                          RESET
 1485  003600                                                        IF     #BREAK SETIN @TCSR THEN
 1486  003600  032777  000001  175470          BIT     #BREAK,@TCSR
 1487  003606  001401                          BEQ     $4
 1488                                                                 ; BREAK DID NOT RESET IN TCSR
 1489  003610  104005                          ERROR 5
 1490  003612                                                        ENDIF
 1491  003612                          $4:
```

```
1492
1493                                    ;;*****************************************************************
1494                                    ;*TEST 7          IE - TCSR 6    SET, CLEAR, RESET
1495                                    ;;*****************************************************************
1496  003612  000004                    TST7:   SCOPE
1497  003614  012737  000010  001160            MOV     #10,$TIMES      ;;DO 10 ITERATIONS
1498  003622  012737  000007  001200            MOV     #7,$TESTN       ;;SET TEST NUMBER IN APT MAIL BOX
1499                                                                            ; USE PRIORITY OF 7
1500  003630                                    SETPRI #PR7
1501
1502                                                    ; SEE IF IT IS CLEAR
1503  003642                                                                LPADR
1504  003642  012737  003650  001110            MOV     #65$,$LPERR
1505  003650                            65$:
1506
1507  003650                                                                IF      #IE SETIN @TCSR THEN
1508  003650  032777  000100  175420            BIT     #IE,@TCSR
1509  003656  001401                            BEQ     $5
1510                                                                            ; IE DID NOT RESET IN TCSR
1511  003660  104012                            ERROR 12
1512  003662                                                                ENDIF
1513  003662                            $5:
1514
1515                                                    ; TRY TO SET IE BIT
1516  003662                                                                LPADR
1517  003662  012737  003670  001110            MOV     #64$,$LPERR
1518  003670                            64$:
1519  003670                                                                LET     @TCSR : @TCSR SET.BY #IE
1520  003670  052777  000100  175400            BIS     #IE,@TCSR
1521                                                                            ; STUCK TO 0
1522  003676                                                                IF      #IE NOTSETIN @TCSR THEN
1523  003676  032777  000100  175372            BIT     #IE,@TCSR
1524  003704  001001                            BNE     $6
1525                                                                            ; XMIT DID NOT SET IN TCSR
1526  003706  104013                            ERROR 13
1527  003710                                                                ENDIF
1528  003710                            $6:
1529
1530                                                    ; TRY TO CLEAR A SET BIT
1531  003710                                                                LPADR
1532  003710  012737  003716  001110            MOV     #64$,$LPERR
1533  003716                            64$:
1534
1535  003716                                                                LET     @TCSR := @TCSR CLR.BY #IE
1536  003716  042777  000100  175352            BIC     #IE,@TCSR
1537                                                                            ; SHOULD HAVE CLEARED
1538  003724                                                                IF      #IE SETIN @TCSR THEN
1539  003724  032777  000100  175344            BIT     #IE,@TCSR
1540  003732  001401                            BEQ     $7
1541                                                                            ;  XMIT DID NOT CLEAR IN TCSR
1542  003734  104014                            ERROR 14
1543  003736                                                                ENDIF
1544  003736                            $7:
1545
1546                                                    ; NOW SEE IF RESET CLEARS IT
1547  003736                                                                LPADR
```

```
1548  003736  012737  003744  001110          MOV     #64$,$LPERR
1549  003744                          64$:
1550
1551  003744                                                          LET     @TCSR := @TCSR SET.BY #IE
1552  003744  052777  000100  175324          BIS     #IE,@TCSR
1553                                                                      ; ISSUE BUS RESET
1554  003752  000005                          RESET
1555  003754                                                          IF      #IE SETIN @TCSR THEN
1556  003754  032777  000100  175314          BIT     #IE,@TCSR
1557  003762  001401                          BEQ     $10
1558                                                                      ; XMIT DID NOT RESET IN TCSR
1559  003764  104015                          ERROR 15
1560  003766                                                          ENDIF
1561  003766                          $10:
```

```
1562
1563                                    ;;*****************************************************************
1564                                    ;*TEST 10        IE - RCSR 6    SET, CLEAR, RESET
1565                                    ;*              THIS BIT IS THE ONLY ONE IN THIS POSITION
1566                                    ;*              THAT IS READ AND WRITE.
1567                                    ;;*****************************************************************
1568  003766  000004                    TST10:  SCOPE
1569  003770  012737  000010  001160            MOV     #10,$TIMES      ;;DO 10 ITERATIONS
1570  003776  012737  000010  001200            MOV     #10,$TESTN      ;;SET TEST NUMBER IN APT MAIL BOX
1571                                                    ; SEE IF IT IS CLEAR
1572  004004                                                            LPADR
1573  004004  012737  004012  001110            MOV     #64$,$LPERR
1574  004012                            64$:
1575
1576  004012                                                                IF      #IE SETIN @RCSR THEN
1577  004012  032777  000100  175252            BIT     #IE,@RCSR
1578  004020  001401                            BEQ     $11
1579                                                                        ; IE DID NOT RESET IN RCSR
1580  004022  104035                            ERROR 35
1581  004024                                                                ENDIF
1582  004024                            $11:
1583
1584                                                    ; TRY TO SET IE BIT
1585  004024                                                            LPADR
1586  004024  012737  004032  001110            MOV     #64$,$LPERR
1587  004032                            64$:
1588  004032                                                            LET     @RCSR := @RCSR SET.BY #IE
1589  004032  052777  000100  175232            BIS     #IE,@RCSR
1590                                                                    ; STUCK TO 0
1591  004040                                                            IF      #IE NOTSETIN @RCSR THEN
1592  004040  032777  000100  175224            BIT     #IE,@RCSR
1593  004046  001001                            BNE     $12
1594                                                                    ; IE DID NOT SET IN RCSR
1595  004050  104036                            ERROR 36
1596  004052                                                            ENDIF
1597  004052                            $12:
1598
1599                                                    ; TRY TO CLEAR A SET BIT
1600  004052                                                            LPADR
1601  004052  012737  004060  001110            MOV     #64$,$LPERR
1602  004060                            64$:
1603
1604  004060                                                            LET     @RCSR := @RCSR CLR.BY #IE
1605  004060  042777  000100  175204            BIC     #IE,@RCSR
1606                                                                    ; SHOULD HAVE CLEARED
1607  004066                                                            IF      #IE SETIN @RCSR THEN
1608  004066  032777  000100  175176            BIT     #IE,@RCSR
1609  004074  001401                            BEQ     $13
1610                                                                    ; IE DID NOT CLEAR IN RCSR
1611  004076  104037                            ERROR 37
1612  004100                                                            ENDIF
1613  004100                            $13:
1614
1615                                                    ; NOW SEE IF RESET CLEARS IT
1616  004100                                                            LPADR
1617  004100  012737  004106  001110            MOV     #64$,$LPERR
```

```
 1618  004106                          64$:
 1619
 1620  004106                                                                  LET     @RCSR := @RCSR SET.BY #IE
 1621  004106  052777  000100  175156          BIS     #IE,@RCSR
 1622                                                                              ; ISSUE BUS RESET
 1623  004114  000005                          RESET
 1624  004116                                                                  IF      #IE SETIN @RCSR THEN
 1625  004116  032777  000100  175146          BIT     #IE,@RCSR
 1626  004124  001401                          BEQ     $14
 1627                                                                              ; IE DID NOT RESET IN RCSR
 1628  004126  104040                          ERROR 40
 1629  004130                                                                  ENDIF
 1630  004130                          $14:
 1631
 1632  004130  012737  004136  001110          MOV     #1$,$LPERR
 1633                                                          ;XMIT RDY SHOULD BE SET BY RESET ABOVE
 1634  004136  032777  000200  175132  1$:     BIT     #RDY,@TCSR
 1635  004144  001002                          BNE     TST11           ;;EXIT IF SET
 1636  004146  104042                          ERROR   42
 1637
 1638  004150  000005                          RESET                           ;ALLOW LOOPING ON ERROR
 1639
```

```
1640
1641                                    ;;*****************************************************************
1642                                    ;*TEST 11        TEST THAT XMIT RDY - TCSR 7 - CLEARS
1643                                    ;*              WHEN TBUF IS LOADED WITH A CHARACTER
1644                                    ;*              AND THAT IT SETS WITHIN A REASONABLE AMOUNT OF TIME.
1645                                    ;;*****************************************************************
1646  004152  000004                   TST11:  SCOPE
1647  004154  012737  000010  001160           MOV     #10,$TIMES      ;;DO 10 ITERATIONS
1648  004162  012737  000011  001200           MOV     #11,$TESTN      ;;SET TEST NUMBER IN APT MAIL BOX
1649
1650  004170  005737  012310                   TST     CONSOLE         ;ARE WE ON CONSOLE?
1651  004174  001077                           BNE     TST12           ;;EXIT IF YES
1652  004176                                                           LET PASS :- #0  ;INIT COUNT OF TIMES THRU
1653  004176  005037  004366                   CLR     PASS
1654  0042C2                                                           LOOP            ; START OF LOOP
1655  004202                           $15:
1656                                                                                   ;  MAX OF 2 TIMES THRU
1657  004202                                                              LET ERRFLG :  #0
1658  004202  005037  004370                   CLR     ERRFLG
1659  004206                                                               LET EXFLG :  #0
1660  004206  005037  004372                   CLR     EXFLG
1661                                                        ; LOAD TBUF WITH ONE CHARACTER
1662                                                        ; WAIT FOR READY TO SET
1663                                                        ; (SHOULD BE VERY SHORT WAIT
1664                                                        ; SINCE UART DOUBLE BUFFERS ITS INPUT)
1665
1666                                                                                   ;SEND A CHARACTER
1667  004212                                                                        LET @TBUF :B- #0
1668  004212  105077  175062                           CLRB    @TBUF
1669
1670  004216  004537  012512                           JSR     R5,TIMER                ;WAIT FOR XMIT READY
1671  004222  001276                                      TCSR
1672  004224  000200                                      RDY
1673  004226  104066                                   ERROR   66                      ;XMIT RDY DID NOT SET IN TCSR
1674  004230  000461                                   BR      TST12           ;;EXIT TEST
1675
1676  004232  105077  175042                           CLRB    @TBUF   ;SHIP 1ST CHAR
1677  004236  105777  175034           1$:             TSTB    @TCSR   ;WAIT FOR RDY
1678  004242  100375                                   BPL     1$
1679                                                        ; LOAD TBUF WITH A SECOND CHARACTER (TO DOUBLE BUFFER)
1680                                                        ; CHECK IMMEDIATELY THAT RDY IS CLEAR
1681                                                        ; AND THEN WAIT FOR IT TO SET
1682
1683                                                                                   ;SEND SECOND CHARACTER
1684  004244                                                                        LET @TBUF :B  #0
1685  004244  105077  175030                           CLRB    @TBUF
1686  004250  000240                                                  NOP             ; GIVE IT TIME TO CLEAR
1687                                                                                   ; RDY SHOULD HAVE CLEARED UPON
1688                                                                                   ; RECEIPT OF A CHARACTER
1689  004252                                                                        IF #RDY SETIN @TCSR THEN
1690  004252  032777  000200  175016           BIT     #RDY,@TCSR
1691  004260  001404                           BEQ     $17
1692                                                                                   ; RDY DID NOT CLEAR IN TCSR
1693                                                                                   ;WILL RESULT IN ERR 67 IF FAILS 2X
1694  004262                                                                           LET ERRFLG :- #SET
1695  004262  012737  177777  004370           MOV     #SET,ERRFLG
```

```
                                                                          ; DEFER ERROR TYPEOUT

004270                                                      ELSE
004270  000406                           BR      $20
004272                          $17:
004272  004537  012512                   JSR     R5,TIMER                   ;WAIT FOR XMIT READY
004276  001276                             TCSR
004300  000200                             RDY
004302  104070                           ERROR   70                         ;XMIT RDY DID NOT SET IN TCSR
004304  000433                           BR      TST12              ;;EXIT TEST

004306                                                         ENDIF ; OF DEFERED ERROR CALL
004306                          $20:
004306                                                      IF ERRFLG EQ #SET THEN
004306  023727  004370  177777           CMP     ERRFLG,#SET
004314  001013                           BNE     $21
004316                                                        LET PASS := PASS + #1
004316  005237  004366                   INC     PASS
004322                                                          IF PASS GT #1 THEN
004322  023727  004366  000001           CMP     PASS,#1
004330  003404                           BLE     $22

                                                                   ; CALL ERROR IF 2ND TRY
                                                                   ;ON XMIT RDY NOT CLEARING
004332  104067                           ERROR 67
004334                                                             LET EXFLG := #SET
004334  012737  177777  004372           MOV     #SET,EXFLG
004342                                                          ENDIF
004342                          $22:
004342                                                      ELSE             ; NO ERROR
004342  000403                           BR      $23
004344                          $21:
004344                                                          LET EXFLG := #SET
004344  012737  177777  004372           MOV     #SET,EXFLG
004352                                                      ENDIF
004352                          $23:
004352                                                   EXIT        EXFLG EQ #SET
004352  023727  004372  177777           CMP     EXFLG,#SET
004360  001401                           BEQ     $16
004362                                                   ENDLOOP
004362  000707                           BR      $15
004364                          $16:
004364  000403                           BR      .+10                       ;EXIT TEST

004366  000000                  PASS:       0
004370  000000                  ERRFLG:  0
004372  000000                  EXFLG:   0
```

```
                                ;;*****************************************************************
                                ;*TEST 12        TEST THAT OUTPUTTING A CHAR FROM TBUF (WITH WRAP CONNECTED)
                                ;*              RESULTS IN DONE SETTING WITHIN A REASONABLE AMOUNT OF TIME
                                ;*              AND THAT RESET CLEARS THE BIT.
                                ;;*****************************************************************
004374  000004                  TST12:  SCOPE
004376  012737  000010  001160          MOV     #10,$TIMES      ;;DO 10 ITERATIONS
004404  012737  000012  001200          MOV     #12,$TESTN      ;;SET TEST NUMBER IN APT MAIL BOX

004412  005737  012306                  TST     WRAP                    ;DOING DATA WRAP TESTS?
004416  001027                          BNE     TST13           ;;EXIT IF NO
004420  005737  012310                  TST     CONSOLE                 ;ARE WE ON CONSOLE?
004424  001024                          BNE     TST13           ;;EXIT IF YES
004426                                                                  LPADR
004426  012737  004434  001110          MOV     #64$,$LPERR
004434                          64$:
                                            ; SEND A CHARACTER AND LET IT WRAP AROUND
004434                                                                  LET @TBUF :B- #0
004434  105077  174640                  CLRB    @TBUF

004440  004537  012512                  JSR     R5,TIMER                ;WAIT FOR RECV DONE
004444  001272                             RCSR
004446  000200                             DONE
004450  104071                          ERROR   71                      ;RECV DONE DID NOT SET IN RCSR
004452  000411                          BR      TST13           ;;EXIT TEST                     .*

004454                                                                  LPADR
004454  012737  004462  001110          MOV     #65$,$LPERR
004462                          65$:
                                            ; NOW THAT IT IS SET SEE IF IT CAN BE RESET
004462  000005                          RESET
004464                                                                  IF #DONE SETIN @RCSR THEN
004464  032777  000200  174600          BIT     #DONE,@RCSR
004472  001401                          BEQ     $24

                                                                            ; DONE DID NOT RESET IN RCSR.
004474  104072                          ERROR 72
004476                                                                  ENDIF
004476                          $24:
```

```
1781
1782                                    ;;*****************************************************************
1783                                    ;*TEST 13        TEST THAT DONE IS CLEARED BY READING RBUF
1784                                    ;;*****************************************************************
1785  004476  000004                    TST13:  SCOPE
1786  004500  012737  000010  001160            MOV     #10,$TIMES      ;;DO 10 ITERATIONS
1787  004506  012737  000013  001200            MOV     #13,$TESTN      ;;SET TEST NUMBER IN APT MAIL BOX
1788
1789  004514  005737  012306                    TST     WRAP                    ;DOING DATA WRAP TESTS?
1790  004520  001025                            BNE     TST14           ;;EXIT IF NO
1791  004522  005737  012310                    TST     CONSOLE                 ;ARE WE ON CONSOLE?
1792  004526  001022                            BNE     TST14           ;;EXIT IF YES
1793  004530                                                            LPADR
1794  004530  012737  004536  001110            MOV     #64$,$LPERR
1795  004536                            64$:
1796                                              ; OUTPUT A CHARACTER AND WAIT FOR DONE TO SET.
1797                                                                    ; OUTPUT A CHARACTER
1798  004536                                                          LET @TBUF :B  #0
1799  004536  105077  174536                    CLRB    @TBUF
1800
1801  004542  004537  012512                    JSR     R5,TIMER                ;WAIT FOR RECV DONE
1802  004546  001272                               RCSR
1803  004550  000200                               DONE
1804  004552  104073                            ERROR   73                      ;RECV DONE DID NOT SET IN RCSR
1805  004554  000407                            BR      TST14           ;;EXIT TEST
1806
1807                                              ; NOW THAT IT IS SET LETS SEE IF READING THE
1808                                              ; BUFFER CLEARS DONE.
1809                                                                        ;READ BUFFER
1810  004556                                                              LET R0 .B- @RBUF
1811  004556  117700  174512                    MOVB    @RBUF,R0
1812
1813  004562                                                              IF #DONE SETIN @RCSR THEN
1814  004562  032777  000200  174502            BIT     #DONE,@RCSR
1815  004570  001401                            BEQ     $25
1816
1817  004572  104074                            ERROR 74                    ;DONE DID NOT CLEAR IN RCSR
1818                                                                        ; SET IT BACK TO CONTINUE
1819  004574                                                              ENDIF
1820  004574                            $25:
```

```
                                        ;;*******************************************************************
                                        ;;*TEST 14       TEST THE OVERRUN & ERROR BITS - RBUF 14
                                        ;;*******************************************************************
004574  000004                          TST14:  SCOPE
004576  012737  000010  001160                  MOV     #10,$TIMES      ;;DO 10 ITERATIONS
004604  012737  000014  001200                  MOV     #14,$TESTN      ;;SET TEST NUMBER IN APT MAIL BOX

004612  005737  012306                          TST     WRAP                    ;DOING DATA WRAP TESTS?
004616  001100                                  BNE     TST15           ;;EXIT IF NO
004620  005737  012310                          TST     CONSOLE                 ;ARE WE ON CONSOLE?
004624  001075                                  BNE     TST15           ;;EXIT IF YES

004626                                                                          LPADR
004626  012737  004634  001110                  MOV     #64$,$LPERR
004634                                  64$:
                                                                ;OUTPUT 2 CHARACTERS
                                                                ;THIS SHOULD AN CAUSE OVERRUN ERROR.

                                                                                        ;OUTPUT 1 CHARACTER
004634                                                                              LET @TBUF :B  #0
004634  105077  174440                          CLRB    @TBUF

004640  004537  012512                          JSR     R5,TIMER                ;WAIT FOR RECV DONE
004644  001272                                     RCSR
004646  000200                                     DONE
004650  104016                                  ERROR   16                      ;RECV DONE DID NOT SET IN RCSR
004652  000462                                  BR      TST15           ;;EXIT TEST

                                                                                        ;OUTPUT 2ND CHARACTER
004654                                                                              LET @TBUF :B- #0
004654  105077  174420                          CLRB    @TBUF
004660  004737  012630                          JSR     PC,WAIT         ;LET OVERRUN HAPPEN

                                                                                        ;READ BUFFER AND ERROR BITS
004664                                                                              LET R4 := @RBUF
004664  017704  174404                          MOV     @RBUF,R4

                                                                                        ;IT DIDN'T SET
004670                                                                              IF #ORERR NOTSETIN R4 THEN
004670  032704  040000                          BIT     #ORERR,R4
004674  001002                                  BNE     $26
                                                                                        ;ORERR DID NOT SET IN RBUF
004676  104101                                  ERROR 101

                                                                                        ;NO USE COMPOUNDING ERRORS
004700  000447                                  BR      TST15           ;;EXIT TEST
004702                                                                                  ENDIF
004702                                  $26:

                                                        ;NOW SEE IF ERROR BIT SET WITH OVERRUN  ERROR.
004702                                                                          LPADR
004702  012737  004710  001110                  MOV     #64$,$LPERR
004710                                  64$:
004710                                                                              IF #ERROR NOTSETIN R4 THEN
004710  032704  100000                          BIT     #ERROR,R4
```

```
1877  004714  C01302                  BNE     $27
1878
1879                                                        ;ERROR DID NOT SET IN RBUF
1880  004716  104102                  ERROR 102
1881
1882                                                        ;-WHEN ORERR SET.
1883                                                        ;GET OUT NOW.
1884  004720  000437                  BR      TST15       ;;EXIT TEST
1885  004722                                                ENDIF
1886  004722                      $27:
1887
1888  004722                                                LPADR
1889  004722  012737  004730  001110  MOV     #64$,$LPERR
1890  004730                      64$:
1891                                      ;CHECK REAL RBUF TO SEE IF ORERR IS STILL SET.
1892
1893  004730                                                IF #ORERR NOTSETIN @RBUF THEN
1894  004730  032777  040000  174336  BIT     #ORERR,@RBUF
1895  004736  001002                  BNE     $30
1896
1897                                                        ;READING RBUF CLEARED ORERR.
1898  004740  104103                  ERROR 103
1899                                                        ;SKIP REST OF TEST
1900  004742  C00426                  BR      TST15       ;;EXIT TEST
1901  004744                                                ENDIF
1902  004744                      $30:
1903
1904  004744                                                LPADR
1905  004744  012737  004752  001110  MOV     #64$,$LPERR
1906  004752                      64$:
1907                                      ;READING RBUF ABOVE SHOULD ENABLE ERROR TO BE CLEARED
1908                                      ;BY NEXT TRANSFER.
1909                                      ;NOW SEE IF THEY CLEAR WHEN ANOTHER CHAR. IS RECEIVED
1910
1911                                                        ;SEND A CHARACTER AROUND.
1912  004752                                                LET @TBUF :B= #0
1913  004752  105077  174322          CLRB    @TBUF
1914
1915  004756  004537  012512          JSR     R5,TIMER            ;WAIT FOR RECV DONE
1916  004762  001272                      RCSR
1917  004764  000200                      DONE
1918  004766  104020                  ERROR   20                  ;RECV DONE DID NOT SET IN RCSR
1919  004770  000413                  BR      TST15       ;;EXIT TEST
1920
1921  004772                                                IF #ORERR SETIN @RBUF THEN
1922  004772  032777  040000  174274  BIT     #ORERR,@RBUF
1923  005000  001402                  BEQ     $31
1924                                                        ;ORERR DID NOT CLEAR IN RBUF
1925  005002  104104                  ERROR 104
1926
1927                                                        ;-AFTER RECEIVING ANOTHER CHAR
1928                                                        ;SKIP AROUND REST
1929  005004  000405                  BR      TST15       ;;EXIT TEST
1930  005006                                                ENDIF
1931  005006                      $31:
1932
```

```
                                                                        IF #ERROR SETIN @RBUF THEN
005006  032777  100000  174260          BIT     #ERROR,@RBUF
005014  001401                        BEQ     $32
                                                                            ;ERROR DID NOT CLEAR IN RBUF
005016  104105                        ERROR 105
                                                                        ENDIF
005020                          $32:
```

```
                                ;;*****************************************************************
                                ;*TEST 15        TRANSMITTER INTERRUPT LOGIC TEST
                                ;*              LOGICALLY THIS IS 4 SEPARATE TESTS
                                ;*              A) DOES TRANSMITTER INTERRUPT LOGIC WORK
                                ;*              B) AT PRIORITY OF 0
                                ;*              C) AND ONLY ONCE
                                ;*              D) BUT NOT WITH INTERRUPT ENABLE CLEAR
                                ;;*****************************************************************
005020  000004                  TST15:  SCOPE
005022  012737  000010  001160          MOV     #10,$TIMES      ;;DO 10 ITERATIONS
005030  012737  000015  001200          MOV     #15,$TESTN      ;;SET TEST NUMBER IN APT MAIL BOX

005036  005037  011644                  CLR     INTFLG

005042  013703  001302                  MOV     DLVEC,R3
005046  062703  000004                  ADD     #4,R3                   ;GET XMIT VECT ADDR
005052  012723  011636                  MOV     #INTSRV,(R3)+
005056  012713  000340                  MOV     #PR7,(R3)
005062                                                                  LPADR
005062  012737  005070  001110          MOV     #64$,$LPERR
005070                          64$:
005070  004537  012512                  JSR     R5,TIMER                ;WAIT FOR XMIT READY
005074  001276                              TCSR
005076  000200                              RDY
005100  104066                          ERROR   66                      ;XMIT RDY DID NOT SET IN TCSR
005102  000453                          BR      TST16           ;;EXIT TEST

005104                                                                      ;CLEAR INTERRUPT ENABLE
                                                                        LET @TCSR := @TCSR CLR.BY #IE
005104  042777  000100  174164          BIC     #IE,@TCSR
005112                          SETPRI #PRO             ;SET IT TO 0

005124                                                                      ;NOW SET I.E. BIT
                                                                        LET @TCSR := @TCSR SET.BY #IE
005124  052777  000100  174144          BIS     #IE,@TCSR
005132  004537  012566                  JSR     R5,TIMER1               ;SEE IF FLAG SETS
005136  011644                              INTFLG
005140  104106                          ERROR   106                     ;INTERR FLAG DID NOT SET
005142  000433                          BR      TST16           ;;EXIT TEST

                                                                ;BYPASS THIS PART IF CONSOLE
                                                                        IF CONSOLE EQ 0 THEN
005144
005144  023737  012310  000000          CMP     CONSOLE,0
005152  001007                          BNE     $33

005154  004737  012630                  JSR     PC,WAIT         ;LET POSSIBLE 2'ND INTERR OCCUR

005160                                                                      ;DID EXACTLY 1 INTERRUPT OCCUR
                                                                        IF INTFLG GT #1 THEN
005160  023727  011644  000001          CMP     INTFLG,#1
005166  003401                          BLE     $34

005170  104107                          ERROR   107                     ;TRANSMITTER INTERRUPTED TWICE
005172                                                                  ENDIF
005172                          $34:
005172                                                                ENDIF
005172                          $33:
```

```
1997
1998  005172
1999  005172  012737  005200  001110          MOV     #64$,$LPERR
2000  005200                          64$:
2001                                                    ;INTERRUPT WITHOUT INTERRUPT ENABLE SET
                                                              LPADR
2002  005200                                                    ;CLEAR INTERRUPT ENABLE
2003  005200  042777  000100  174070          BIC     #IE,@TCSR       LET @TCSR := @TCSR.CLR.BY #IE
2004                                                    ;CLEAR 'INTERRUPT OCCURED' FLAG
2005  005206                                            LET INTFLG := #0
2006  005206  005037  011644                  CLR     INTFLG
2007                                                    ;NO INTERRUPTS SHOULD OCCUR, PSW STILL AT 0.
2008                                                    ;DARE IT TO HAPPEN
2009  005212                                                    LET @TBUF := #0
2010  005212  005077  174062                  CLR     @TBUF
2011
2012  005216  004737  012630                  JSR     PC,WAIT         ;SEE IF INTERR FLAG EVER SETS
2013  005222  005737  011644                  TST     INTFLG
2014  005226  001401                          BEQ     .+4             ;BR IF NO
2015  005230  104110                          ERROR   110             ;INTERR FLAG OCCURED WITH IE DISABLED
2016
2017
```

```
                                ;;*****************************************************************
                                ;*TEST 16        RECEIVER INTERRUPT LOGIC TEST
                                ;*              THIS TEST COVERS ALL OF THE RECEIVER
                                ;*              SIDE OF THE INTERRUPT LOGIC IN
                                ;*              CHARACTER MODE.
                                ;;*****************************************************************
005232  000004                TST16:  SCOPE
005234  012737  000010  001160        MOV     #10,$TIMES      ;;DO 10 ITERATIONS
005242  012737  000016  001200        MOV     #16,$TESTN      ;;SET TEST NUMBER IN APT MAIL BOX

005250  005737  012306                TST     WRAP                    ;DOING DATA WRAP TESTS?
005254  001103                        BNE     TST17           ;;EXIT IF NO
005256  005737  012310                TST     CONSOLE                 ;ARE WE ON CONSOLE?
005262  001100                        BNE     TST17           ;;EXIT IF YES
                                                                        ;CLEAR INTERRUPT OCCURED FLAG
                                                                        ;SET UP RECEIVER INTER.VECTOR
005264  013701  001302                MOV     DLVEC,R1
005270  012721  011636                MOV     #INTSRV,(R1)+
005274  012711  000340                MOV     #PR7,(R1)

                                        ;PRIORITY 0 AND MULTIPLE INTERRUPT TEST.-IE
005300                                                          LPADR
005300  012737  005306  001110        MOV     #64$,$LPERR
005306                          64$:
005306                                                          LET INTFLG := #0
005306  005037  011644                CLR     INTFLG
                                                                        ;CLEAR INTERRUPTS
005312                                                          LET @RCSR := @RCSR CLR.BY #IE
005312  042777  000100  173752        BIC     #IE,@RCSR
                                                                        ;CHANGE PRIORITY
                                                                        ;..TO 0
005320                          SETPRI #PR0

                                                                        ;SEND A CHARACTER
005332                                                          LET @TBUF :B- #0
005332  105077  173742                CLRB    @TBUF

005336  004537  012512                JSR     R5,TIMER                ;WAIT FOR XMIT READY
005342  001276                          TCSR
005344  000200                          RDY
005346  104066                        ERROR   66                      ;XMIT RDY DID NOT SET IN TCSR
005350  000445                        BR      TST17           ;;EXIT TEST

                                                                        ;SET INTERRUPT ENABLE
005352                                                          LET @RCSR := @RCSR SET.BY #IE
005352  052777  000100  173712        BIS     #IE,@RCSR

005360  004537  012566                JSR     R5,TIMER1               ;SEE IF FLAG SETS
005364  011644                          INTFLG
005366  104111                        ERROR   111                     ;INTERR FLAG DID NOT SET
005370  000435                        BR      TST17           ;;EXIT TEST

005372  004737  012630                JSR     PC,WAIT     ;LET POSSIBLE 2'ND INTERR OCCUR
                                                                        ;EXACTLY 1 INTERRUPT
005376                                                          IF INTFLG GT #1 THEN
```

```
2074  005376  023727  011644  000001          CMP     INTFLG,#1
2075  005404  003401                          BEQ     $35
2076                                                                ;RECEIVER INTERRUPTED TWICE
2077  005406  104112                          ERROR   112
2078  005410                                                      ENDIF
2079  005410                          $35:
2080
2081                                          ;INTERRUPT WITHOUT IE SET.
2082  005410                                                    LPADR
2083  005410  012737  005416  001110          MOV     #64$,$LPERR
2084  005416                          64$:
2085                                                                ;CLEAR INTERRUPT
2086  005416                                                    LET @RCSR := @RCSR CLR.BY #IE
2087  005416  042777  000100  173646          BIC     #IE,@RCSR
2088                                                                ;CLEAR INTERRUPT FLAG
2089  005424                                                    LET INTFLG := #0
2090  005424  005037  011644                  CLR     INTFLG
2091                                                                ; SEND A CHARACTER
2092  005430                                                    LET @TBUF :B- #0
2093  005430  105077  173644                  CLRB    @TBUF
2094                                                                ; DARE IT
2095  005434  004737  012630                  JSR     PC,WAIT                 ;SEE IF INTERR FLAG EVER SETS
2096  005440  005737  011644                  TST     INTFLG
2097  005444  001401                          BEQ     .+4                     ;BR IF NO
2098  005446  104113                          ERROR   113                     ;INTERR FLAG OCCURED WITH IE DISABLED
2099
2100  005450                                  SETPRI  #PR7    ;RAISE CPU PRIORITY
2101  005462  000005                          RESET                           ;CLEAR THE WORLD
2102
```

```
                                ;;*****************************************************************
                                ;*TEST 17       TEST DATA  WRAP AROUND  BINARY COUNT: FLAG MODE
                                ;;*****************************************************************
005464  000004                  TST17:  SCOPE
005466  012737  000001  001160          MOV     #1,$TIMES       ;;DO 1 ITERATION
005474  012737  000017  001200          MOV     #17,$TESTN      ;;SET TEST NUMBER IN APT MAIL BOX

005502  005737  012306                  TST     WRAP                    ;DOING DATA WRAP TESTS?
005506  001062                          BNE     TST20           ;;EXIT IF NO
005510  005737  012310                  TST     CONSOLE                 ;ARE WE ON CONSOLE?
005514  001057                          BNE     TST20           ;;EXIT IF YES
                                                                        ;BINARY COUNT PATTERN
005516                                                                  INCR R2 FROM #0 TO #377 BY #1
005516  005002                          CLR     R2
005520  000401                          BR      $36
005522                          $37:
005522  005202                          INC     R2
005524                          $36:
005524  020227  000377                  CMP     R2,#377
005530  003051                          BGT     $40

005532  004537  012512                  JSR     R5,TIMER                ;WAIT FOR XMIT READY
005536  001276                             TCSR
005540  000200                             RDY
005542  104123                          ERROR   123                     ;XMIT RDY DID NOT SET IN TCSR
005544  000443                          BR      TST20           ;;EXIT TEST

                                                                    ;START IT ON ITS WAY
005546                                                            LET @TBUF :B- R2
005546  110277  173526                  MOVB    R2,@TBUF

005552  004537  012512                  JSR     R5,TIMER                ;WAIT FOR RECV DONE
005556  001272                             RCSR
005560  000200                             DONE
005562  104124                          ERROR   124                     ;RECV DONE DID NOT SET IN RCSR
005564  000433                          BR      TST20           ;;EXIT TEST

                                                                    ;RETRIEVE
005566                                                            LET R3 := @RBUF
005566  017703  173502                  MOV     @RBUF,R3

                                                                    ;CHECK FOR ERROR DURING TRANSFER
005572                                                            IF #ERROR SETIN R3 THEN
005572  032703  100000                  BIT     #ERROR,R3
005576  001401                          BEQ     $41

                                                                     ;ERROR BIT SET IN HIGH BYTE OF RBUF
005600  104200                          ERROR   200
005602                                                             ENDIF
005602                          $41:
005602  020302                          CMP     R3,R2                   ;COMPARE DATA
005604  001412                          BEQ     3$                      ;BR IF OK
005606  005737  012300                  TST     WORD8                   ;8 BITS/WORD?
005612  001002                          BNE     2$                      ;BR IF NO
005614  104017                          ERROR   17                      ;DATA COMPARE ERR IN 8 BIT WORD
005616  000416                          BR      TST20           ;;EXIT TEST
```

```
 2159  005620  020227  000200          2$:     CMP     R2,#200                 ;200 OR MORE?
 2160  005624  002012                          BGE     4$                      ;BR IF YES
 2161  005626  104117                          ERROR   117                     ;DATA COMPARE ERR IN 7 BIT WORD
 2162  005630  000411                          BR      TS120           ;;EXIT TEST
 2163
 2164  005632  005737  012300          3$:     TST     WORDL                   ;8 BITS/WORD?
 2165  005636  001405                          BEQ     4$                      ;BR IF YES
 2166  005640  020227  000177                  CMP     R2,#177                 ;MORE THAN 177?
 2167  005644  003402                          BLE     4$                      ;BR IF NO
 2168  005646  104022                          ERROR   22                      ;GETTING 8 BITS ON 7 BIT XMIT
 2169                                                                          ;IS $DEVM SETUP OK?
 2170  005650  000401                          BR      .+4                     ;EXIT
 2171
 2172  005652                          4$:                             ENDINC  ;R2
 2173  005652  000723                          BR      $37
 2174  005654                          $40:
```

```
2175
2176                                    ;;*****************************************************************
2177                                    ;*TEST 20       TEST DATA WRAP AROUND  BINARY COUNT: INTERRUPT MODE
2178                                    ;;*****************************************************************
2179  005654  000004                   TST20:  SCOPE
2180  005656  012737  000001  001160           MOV     #1,$TIMES       ;;DO 1 ITERATION
2181  005664  012737  000020  001200           MOV     #20,$TESTN      ;;SET TEST NUMBER IN APT MAIL BOX
2182
2183  005672  005737  012306                   TST     WRAP                    ;DOING DATA WRAP TESTS?
2184  005676  001003                           BNE     1$                      ;BR IF NO
2185  005700  005737  012310                   TST     CONSOLE                 ;ARE WE ON CONSOLE?
2186  005704  001402                           BEQ     2$                      ;BR IF NO
2187  005706  000137  006176           1$:     JMP     EX1                     ;EXIT TEST
2188  005712                           2$:
2189                                                   ; THIS TEST WILL RUN BOTH TRANSMITTER AND
2190                                                   ; RECIEVER AT FULL SPEED TESTING
2191                                                   ; THE ABILITY OF THE MODULE
2192                                                   ; TO HANDLE INTERRUPTS FROM BOTH SIDES AT ONCE.
2193                                                   ;
2194                                                   ;DOUBLE BUFFERING IS NOT FULLY TESTED BECAUSE OF
2195                                                   ;APT CONSIDERATIONS. I.E. 'BREAK' FROM APT
2196                                                   ;CAUSES OVERRUN ERRORS. THEREFORE TRANSMIT INTR IS
2197                                                   ;ENABLED ONLY AFTER THE RECVR HAS OBTAINED THE LAST WORD
2198
2199                                                   ;  THIS TEST WILL TRANSFER A MAXIMUM OF 400(8)
2200                                                   ; CHARACTERS THROUGH THE MODULE, BUT IF AN ERROR
2201                                                   ; IS DETECTED BY THE TEST A PREMATURE SHUTDOWN OCCURS.
2202
2203                                                           ;CHANGE PRIORITY
2204                                                           ;..TO 0
2205  005712                           SETPRI #PR0
2206                                                           ;GET VECTOR ADDRESS
2207  005724                                           LET R1 := DLVEC
2208  005724  013701  001302                   MOV     DLVEC,R1
2209                                                           ;RCVR VECTOR
2210  005730                                           LET (R1)+ := #REC
2211  005730  012721  006242                   MOV     #REC,(R1)+
2212  005734                                           LET (R1)+ := #PR7
2213  005734  012721  000340                   MOV     #PR7,(R1)+
2214                                                           ;POINT TO TRANSMITTER VECTOR
2215                                                           ;AND SET IT UP ALSO
2216  005740                                           LET (R1)+ := #TRAN
2217  005740  012721  006204                   MOV     #TRAN,(R1)+
2218  005744                                           LET (R1)  :  #PR7
2219  005744  012711  000340                   MOV     #PR7,(R1)
2220
2221                                                           ; CLEAR ERROR COUNTER
2222  005750                                           LET ERRCNT :- #0
2223  005750  005037  006200                   CLR     ERRCNT
2224  005754                                           LET DATA :  #0  ;XMIT DATA
2225  005754  005037  006240                   CLR     DATA
2226
2227  005760  005737  012300                   TST     WORDL                   ;8 BITS/WORD?
2228  005764  001004                           BNE     3$                      ;BR IF NO
2229  005766  012737  000400  006202           MOV     #400,NUMBER
2230  005774  000403                           BR      4$
```

```
 2231  005776  012737  000200  006202  3$:     MOV     #200,NUMBER
 2232
 2233  006004                          4$:                             ;SET I.E. IN TRANSMITTER
 2234  006004                                                          LET @TCSR := @TCSR SET.BY #IE
 2235  006004  052777  000100  173264          BIS     #IE,@TCSR
 2236                                                                          ;AND RECEIVER
 2237  006012                                                          LET @RCSR := @RCSR SET.BY #IE
 2238  006012  052777  000100  173252          BIS     #IE,@RCSR
 2239
 2240
 2241                                                                  ;NOW WE WAIT
 2242  006020  012737  000050  001306          MOV     #50,TMP2
 2243  006026  012737  177777  001304  8$:     MOV     #-1,TMP1
 2244  006034  023737  006240  006202  5$:     CMP     DATA,NUMBER     ;ALL DONE?
 2245  006042  001413                          BEQ     7$              ;BR IF YES
 2246  006044  005337  001304                  DEC     TMP1            ;ELSE TIMER DONE?
 2247  006050  001005                          BNE     6$              ;BR IF NO
 2248  006052  005337  001306                  DEC     TMP2
 2249  006056  001363                          BNE     8$
 2250  006060  104066                          ERROR   66              ;HUNG, NO DATA XFERS
 2251  006062  000403                          BR      7$
 2252
 2253  006064  005737  006200          6$:     TST     ERRCNT          ;ANY ERRORS?
 2254  006070  001761                          BEQ     5$              ;BR IF NO & TRY AGAIN
 2255  006072                          7$:                             ;NOW LETS CHECK.
 2256                                                                  ;TURN OFF ALL INTR ENABLE
 2257  006072                                                          LET @TCSR := @TCSR CLR.BY #IE
 2258  006072  042777  000100  173176          BIC     #IE,@TCSR
 2259  006100                                                          LET @RCSR := @RCSR CLR.BY #IE
 2260  006100  042777  000100  173164          BIC     #IE,@RCSR
 2261  006106
 2262  006106  005737  006200                  TST     ERRCNT          LET @RCSR := @RCSR CLR.BY #IE
 2263  006112  001431                          BEQ     $42             IF ERRCNT NE #0 THEN
 2264  006114
 2265  006114  032737  100000  006346          BIT     #ERROR,RHLD       IF #ERROR SETIN RHLD THEN
 2266  006122  001424                          BEQ     $43
 2267  006124
 2268  006124  032737  040000  006346          BIT     #ORERR,RHLD         IF #ORERR SETIN RHLD THEN
 2269  006132  001402                          BEQ     $44
 2270
 2271  006134  104220                          ERROR 220                     ;OVERRUN ERROR
 2272  006136
 2273  006136  000415                          BR      $45                 ELSE IF #FRERR SETIN RHLD THEN
 2274  006140                          $44:
 2275  006140  032737  020000  006346          BIT     #FRERR,RHLD
 2276  006146  001402                          BEQ     $46
 2277
 2278  006150  104221                          ERROR 221                     ;FRAMING ERROR
 2279  006152
 2280  006152  000407                          BR      $47                 ELSE IF #PERR SETIN RHLD THEN
 2281  006154                          $46:
 2282  006154  032737  010000  006346          BIT     #PERR,RHLD
 2283  006162  001402                          BEQ     $50
 2284
 2285  006164  104222                          ERROR 222                     ;PARITY ERROR
 2286  006166                                                                ELSE
```

```
                        BR      $51
$50:
                                                        ;UNKNOWN ERROR
                        ERROR 24
                                                      ENDIF
$51:
$47:
$45:
                                                    ELSE
                        BR      $52
$43:
                                                          ;DATA COMPARE ERROR
                        ERROR   120
                                                    ENDIF
$52:
                                                  ENDIF
$42:
EX1:
                        BR      TST21           ;;EXIT TEST


ERRCNT: 0
NUMBER: 0


;;*****************************************************************
                ;TRANSMIT INTERRUPT HANDLER
;;*****************************************************************

TRAN:                                           IF DATA NE NUMBER AND ERRCNT EQ #0 THEN
                CMP     DATA,NUMBER
                BEQ     $53
                TST     ERRCNT
                BNE     $53

                                                    ;SHIP OUT WORD
                                                    LET @TBUF := DATA
                MOV     DATA,@TBUF
                                                ENDIF
$53:
                                                ;STOP INTERR, NOT EXER DOUBL BUFFER
                                                LET @TCSR := @TCSR CLR.BY #IE
                BIC     #IE,@TCSR
                RTI

DATA:   0
```

```
                        ;;*****************************************************************
                        ;RECEIVER INTERRUPT HANDLER
                        ;;*****************************************************************

006242                  REC:                                    ;GET CHAR
006242                                                          LET RHLD := @RBUF
006242  017737  173026  006346          MOV     @RBUF,RHLD
                                                                ;CHECK ERROR
006250                                                          IF #ERROR SETIN RHLD OR RHLD NE  DATA THEN
006250  032737  100000  006346          BIT     #ERROR,RHLD
006256  001004                         BNE     $54
006260  023737  006346  006240          CMP     RHLD,DATA
006266  001411                         BEQ     $55
006270                  $54:
                                                                   ;STOP ALL INTERR PROC & GET OUT
                                                                   LET DATA := NUMBER
006270  013737  006202  006240          MOV     NUMBER,DATA
006276                                                             LET @RCSR := @RCSR CLR.BY #IE
006276  042777  000100  172766          BIC     #IE,@RCSR
006304                                                             LET ERRCNT := ERRCNT + #1
006304  005237  006200                  INC     ERRCNT
006310                                                          ELSE
006310  000415                         BR      $56
006312                  $55:
                                                                   LET DATA := DATA + #1
006312  005237  006240                  INC     DATA
                                                                      IF DATA EQ NUMBER THEN
006316
006316  023737  006240  006202          CMP     DATA,NUMBER
006324  001004                         BNE     $57
                                                                        LET @RCSR :- @RCSR CLR.BY #IE
006326
006326  042777  000100  172736          BIC     #IE,@RCSR
                                                                      ELSE
006334
006334  000403                         BR      $60
006336                  $57:
                                                                        ;ALLOW NEXT XMIT INTERR
                                                                        LET @TCSR :- @TCSR SET.BY #IE
006336
006336  052777  000100  172732          BIS     #IE,@TCSR
                                                                      ENDIF
006344
006344                  $60:
006344                                                          ENDIF
006344                  $56:
006344  000002                         RTI

006346  000000          RHLD:   0
```

```
                                ;;*****************************************************************
                                ;*TEST 21        TEST BREAK LOGIC
                                ;*              TRANSMIT KNOWN CHAR WITH BREAK SET
                                ;*              AND COMPARE RECEIVED WITH 0.
                                ;*              FRAMING ERROR WILL ALSO BE CHECKED
                                ;*              IF ERROR BITS ARE ENABLED.
                                ;;*****************************************************************
006350  000004                  TST21:  SCOPE
006352  012737  000010  001160          MOV     #10,$TIMES      ;;DO 10 ITERATIONS
006360  012737  000021  001200          MOV     #21,$TESTN      ;;SET TEST NUMBER IN APT MAIL BOX

006366  005737  012306                  TST     WRAP                    ;WRAP TESTS?
006372  001006                          BNE     1$                      ;BR IF NO
006374  005737  012310                  TST     CONSOLE                 ;ELSE ARE WE ON CONSOLE?
006400  001003                          BNE     1$                      ;BR IF YES...DONT TEST
006402  005737  012304                  TST     BRK                     ;ELSE IS BREAK DET ENABLED?
006406  001402                          BEQ     2$                      ;BR IF NO
006410  000137  006744          1$:     JMP     EX2
006414                          2$:
006414                                                  LPADR
006414  012737  006422  001110          MOV     #64$,$LPERR
006422                          64$:

006422                                                  LET ERRCHK :- #0        ; CLEAR ERROR WORD
006422  005037  006746                  CLR     ERRCHK
                                                        ;SET BREAK BIT
006426                                                   LET @TCSR := @TCSR SET.BY #BREAK
006426  052777  000001  172642          BIS     #BREAK,@TCSR
                                                        ;NON-ZERO CHAR. '*'
006434                                                  LET @TBUF :  #125
006434  012777  000125  172636          MOV     #125,@TBUF

006442  004537  012512                  JSR     R5,TIMER                ;WAIT FOR RECV DONE
006446  001272                              RCSR
006450  000200                              DONE
006452  104115                  ERROR   115             ;RECV DONE DID NOT SET IN RCSR
006454  000535                  BR      TST22       ;;EXIT TEST

006456                                                  LET R0 :- @RBUF
006456  017700  172612                  MOV     @RBUF,R0
006462                                                  IFB R0 NE #0 THEN
006462  105700                          TSTB    R0
006464  001403                          BEQ     $61

                                                        ; BREAK DID NOT EQUAL 0
                                                    LET ERRCHK :- ERRCHK SET.BY #BIT0
006466  052737  000001  006746          BIS     #BIT0,ERRCHK
                                                        ENDIF
006474                          $61:
006474                                                  IF #FRERR NOTSETIN R0 THEN
006474  032700  020000                  BIT     #FRERR,R0
006500  001003                          BNE     $62

                                                            LET ERRCHK :  ERRCHK SET.BY #BIT1
006502  052737  000002  006746          BIS     #BIT1,ERRCHK
                                                        ENDIF
006510                          $62:
```

```
2435  006510  005737  012300          TST     WORDL                   ;PARITY ENABLED?
2436  006514  001420                  BEQ     4$                      ;BR IF NO
2437  006516  005737  012302          TST     ODD                     ;ELSE ODD?
2438  006522  001407                  BEQ     3$                      ;BR IF YES
2439  006524  032700  010000          BIT     #PERR,R0                ;DONT EXPECT PARITY ERR
2440  006530  001412                  BEQ     4$                      ;BR IF NONE
2441  006532  052737  000010  006200  BIS     #BIT3,ERRCNT            ;PARITY ERR WHEN NOT EXPECTED
2442  006540  000406                  BR      4$
2443
2444  006542  032700  010000  3$:     BIT     #PERR,R0                ;EXPECT PARITY ERR
2445  006546  001003                  BNE     4$                      ;BR IF THERE
2446  006550  052737  000004  006746  BIS     #BIT2,ERRCHK            ;NO PARITY ERR WHEN EXPECTED
2447
2448  006556  000005          4$:     RESET
2449  006560  032777  170000  172506  BIT     #170000,@RBUF
2450  006566  001401                  BEQ     1$
2451  006570  104033                  ERROR   33              ;RESET DID NOT CLEAR ERROR,FR ERR,OR PERR IN RBUF
2452  006572                  1$:
2453
2454  006572                          .                               IF #BIT0 SETIN ERRCHK THEN
2455  006572  032737  000001  006746  BIT     #BIT0,ERRCHK
2456  006600  001401                  BEQ     $63
2457  006602  104121                  ERROR   121             ;BREAK ERROR
2458  006604                                                          ENDIF
2459  006604                  $63:
2460  006604                                                          IF #BIT1 SETIN ERRCHK THEN
2461  006604  032737  000002  006746  BIT     #BIT1,ERRCHK
2462  006612  001401                  BEQ     $64
2463  006614  104122                  ERROR   122                     ; FRAMING ERROR
2464  006616                                                          ENDIF
2465  006616                  $64:
2466  006616                                                          IF #BIT2 SETIN ERRCHK THEN
2467  006616  032737  000004  006746  BIT     #BIT2,ERRCHK
2468  006624  001401                  BEQ     $65
2469  006626  104235                  ERROR   235             ;NO PARITY ERROR WHEN
2470                                                                          ;THERE SHOULD BE
2471  006630                                                          ENDIF
2472  006630                  $65:
2473  006630                                                          IF #BIT3 SETIN ERRCHK THEN
2474  006630  032737  000010  006746  BIT     #BIT3,ERRCHK
2475  006636  001401                  BEQ     $66
2476  006640  104236                  ERROR   236             ;PARITY ERROR SHOULD NOT HAVE
2477                                                                          ;OCCURED WITH EVEN PARITY
2478                                                                          ;ENABLED AND BREAK SET
2479  006642                                                          ENDIF
2480  006642                  $66:
2481  006642                                                  LPADR
2482  006642  012737  006650  001110  MOV     #64$,$LPERR
2483  006650                  64$:
2484                                                                  ;SET BREAK BIT
2485  006650                                                  LET @TCSR := @TCSR SET .BY #BREAK
2486  006650  052777  000001  172420  BIS     #BREAK,@TCSR
2487
2488  006656  004537  012512          JSR     R5,TIMER                ;WAIT FOR XMIT READY
2489  006662  001276                      TCSR
2490  006664  000001                      BREAK
```

```
2491  006666  104021                    ERROR   21                      ;BREAK DID NOT SET IN TCSR
2492  006670  000427                    BR      TST22           ;;EXIT TEST
2493
2494                                                                      ;CLEAR  BREAK BIT
2495  006672                                                            LET @TCSR := @TCSR CLR.BY #BREAK
2496  006672  042777  000001  172376    BIC     #BREAK,@TCSR
2497
2498  006700  004737  012630            JSR     PC,WAIT
2499                                                                      ;READ RBUF TO CLEAR ERRORS & REC DONE
2500  006704                                                            LET R0 := @RBUF
2501  006704  017700  172364            MOV     @RBUF,R0
2502                                                                      ;SEND CHAR
2503  006710                                                            LET @TBUF := #125
2504  006710  012777  000125  172362    MOV     #125,@TBUF
2505
2506  006716  004537  012512            JSR     R5,TIMER                ;WAIT FOR RECV DONE
2507  006722  001272                       RCSR
2508  006724  000200                       DONE
2509  006726  104230  *                 ERROR   230                     ;RECV DONE DID NOT SET IN RCSR
2510  006730  000407                    BR      TST22           ;;EXIT TEST
2511
2512                                                                      ;WAS CHAR AFTER BREAK RECEIVED
2513  006732                                                            IFB @RBUF NE #125 THEN
2514  006732  127727  172336  000125    CMPB    @RBUF,#125
2515  006740  001401                    BEQ     $67
2516                                                                      ;CHAR AFTER BREAK NOT RECEIVED CORRECTLY
2517  006742  104231                    ERROR 231
2518  006744                                                            ENDIF
2519  006744                          $67:
2520  006744                          EX2:
2521  006744  000401                          BR      TST22           ;;EXIT TEST
2522
2523  006746  000000                  ERRCHK: .WORD 0
```

```
2524
2525  006750                              NOTST:
2526                                      ;;*****************************************************************
2527                                      ;*TEST 22       NOT A TEST - SEND BACK TO LOOP
2528                                      ;;*****************************************************************
2529  006750  000004                      TST22:  SCOPE
2530  006752  012737  000001  001160              MOV     #1,$TIMES       ;;DO 1 ITERATION
2531
2532  006760  032777  010000  172152              BIT     #BIT12,@SWR             ;WANT SUMMARY?
2533  006766  001513                              BEQ     3$                      ;BR IF NO
2534  006770  023727  012312  000001              CMP     PHASE2,#TRUE            ;ELSE IN PHASE 2?
2535  006776  001021                              BNE     1$                      ;BR IF NO
2536  007000                                      TYPTXT  <<CRLF>/        ** PHASE 2 SUMMARY **/<CRLF>>
2537  007040  000425                              BR      2$
2538
2539  007042  005737  012314          1$:         TST     P1CNT
2540  007046  001022                              BNE     2$
2541  007050                                      TYPTXT  <<CRLF>/        ** PHASE 1 SUMMARY **/<CRLF>>
2542  007110  005237  012314                      INC     P1CNT
2543
2544  007114                          2$:         TYPTXT  <*CSR: *>
2545  007130                                      TYPOCT  DLADD
2546  007136                                      TYPTXT  <*,VECTOR: *>
2547  007156                                      TYPOCT  DLVEC
2548  007164                                      TYPTXT  <*,ERRORS: *>
2549  007204                                      TYPDEC  $ERTTL
2550  007212  104401  001171                      TYPE    ,$CRLF
2551
2552  007216  005037  001112          3$:         CLR     $ERTTL          ; RESET FOR NEXT DEVICE/PASS
2553  007222  023727  012312  000001              CMP     PHASE2,#TRUE    ;IN PHASE 2?
2554  007230  001010                              BNE     4$              ;BR IF NO
2555  007232  005037  012312                      CLR     PHASE2
2556  007236  005037  001206                      CLR     $UNIT
2557  007242  104401  001310                      TYPE    ,CARR
2558  007246  000137  013334                      JMP     $EOP
2559
2560  007252  112737  000005  001102  4$:         MOVB    #5,$TSTNM       ;FAKE OUT FOR 2'ND CHANNEL
2561  007260  000137  003126                      JMP     LOOP            ; BACK UP TO THE BEGINNING
2562
```

```
                                ;;*****************************************************************
                                ;*TEST 23       TEST THAT CHANNELS INTR AT ASSIGNED PRIORITY.
                                ;*             INTERRUPTS WILL BE ENABLED ON ALL ACTIVE CHANNELS.
                                ;*             RECEIVER AND TRANSMITTER. THEN WE'LL CHECK TO
                                ;*             SEE IF THEY INTERRUPTED IN THE ASSIGNED SEQUENCE.
                                ;;*****************************************************************
007264  000004                  TST23:  SCOPE
007266  012737  000001  001160          MOV     #1,$TIMES       ;;DO 1 ITERATION
007274  012737  000023  001200          MOV     #23,$TESTN      ;;SET TEST NUMBER IN APT MAIL BOX

007302  005037  010040                  CLR     INTABL                  ;CLEAR OUT INTERRUPT TABLE
007306  005037  010042                  CLR     INTABL+2
007312  005037  010044                  CLR     INTABL+4
007316  005037  010046                  CLR     INTABL+6

007322                                  SETPRI  #PR7

007334  032737  102000  001252          BIT     #<BIT15!BIT10>,$DEVM    ;CH 0 DROPPED OR NO WRAP?
007342  001040                          BNE     1$                      ;BR IF EITHER SET

007344  013700  001256                  MOV     VECT0,R0                ;SETUP CH 0 VECTOR AREA
007350  012720  007742                  MOV     #CH0R,(R0)+             ;RECV
007354  012720  000340                  MOV     #PR7,(R0)+
007360  012720  007756                  MOV     #CH0X,(R0)+             ;XMIT
007364  012710  000340                  MOV     #PR7,(R0)

007370  013700  001254                  MOV     BASE0,R0                ;ENABLE INTERRUPTS
007374  052710  000100                  BIS     #IE,(R0)                ;RECV
007400  062700  000004                  ADD     #4,R0
007404  052720  000100                  BIS     #IE,(R0)+               ;XMIT

007410  012710  000125                  MOV     #125,(R0)               ;XMIT CHAR TO PRIME RECEIVERS
007414  162700  000006                  SUB     #6,R0                   ;GO BACK TO RCSR
007420  012737  100000  001304          MOV     #100000,TMP1
007426  032710  000200          7$:     BIT     #DONE,(R0)              ;DONE?
007432  001004                          BNE     1$                      ;BR IF YES
007434  005337  001304                  DEC     TMP1                    ;TIMED OUT?
007440  001372                          BNE     7$                      ;BR IF NO
007442  104070                          ERROR   70                      ;NO RCVR DONE

007444  032737  000410  001252  1$:     BIT     #<BIT8.BIT3>,$DEVM      ;CH 1 DROPPED OR NO WRAP?
007452  001044                          BNE     2$                      ;BR IF EITHER SET
007454  023737  001260  001144          CMP     BASE1,$TKS              ;CH 1 CONSOLE?
007462  001440                          BEQ     2$                      ;BR IF YES

007464  013700  001262                  MOV     VECT1,R0                ;SETUP CH 1 VECTOR AREA
007470  012720  010000                  MOV     #CH1R,(R0)+             ;RECV
007474  012720  000340                  MOV     #PR7,(R0)+
007500  012720  010016                  MOV     #CH1X,(R0)+             ;XMIT
007504  012710  000340                  MOV     #PR7,(R0)

007510  013700  001260                  MOV     BASE1,R0                ;ENABLE INTERRUPTS
007514  052710  000100                  BIS     #IE,(R0)                ;RECV
```

```
2619  007520  062700  000004                  ADD     #4,R0
2620  007524  052720  000100                  BIS     #IE,(R0)+               ;XMIT
2621
2622  007530  012710  000125                  MOV     #125,(R0)               ;XMIT CHAR TO PRIME RECEIVERS
2623  007534  162700  000006                  SUB     #6,R0                   ;GO BACK TO RCSR
2624  007540  012737  100000  001304          MOV     #100000,TMP1
2625  007546  032710  000200          8$:     BIT     #DONE,(R0)              ;DONE?
2626  007552  001004                          BNE     2$                      ;BR IF YES
2627  007554  005337  001304                  DEC     TMP1                    ;TIMED OUT?
2628  007560  001372                          BNE     8$                      ;BR IF NO
2629  007562  104071                          ERROR   71                      ;NO RCVR DONE
2630
2631                                  ;ALL XMIT & REC INTERRUPTS SHOULD BE
2632                                  ;IN CONTENTION.
2633                                  ;CHAN 0 HAS PRIORITY OVER CHAN 1.
2634                                  ;RECEIVE HAS PRIORITY OVER XMIT INTERRUPTS.
2635                                  ;THEREFORE, ONCE CPU PRIORITY IS LOWERED,
2636                                  ;INTERRUPTS S/B IN THE ORDER SHOWN IN THE
2637                                  ;CHANNEL IDENTIFIER TABLE (RCH0:)
2638
2639  007564  032737  102000  001252  2$:     BIT     #<BIT15!BIT10>,$DEVM    ;CH0 DROPPED OR NO WRAP?
2640  007572  001003                          BNE     5$                      ;BR IF EITHER SET
2641
2642  007574  012704  010040                  MOV     #INTABL,R4              ;SETUP FOR SERVICE ROUTINES
2643  007600  000402                          BR      6$
2644
2645  007602  012704  010044          5$:     MOV     #INTABL+4,R4
2646
2647  007606                          6$:     SETPRI  #PR0                    ;LET'EM GO!
2648  007620  012700  177777                  MOV     #-1,R0                  ;DELAY TO ALLOW ANY PREVIOUS XMIT TO
2649  007624  077001                          SOB     R0,.                    ;FINISH BEFORE RESET
2650  007626  000005                          RESET                           ;DISABLE ALL INTERRUPTS
2651  007630                                  SETPRI  #PR7
2652
2653                                          ;NOW LETS SEE IF INTABL HAS ENTRIES IN THE CORRECT ORDER
2654
2655  007642  032737  102000  001252          BIT     #<BIT15!BIT10>,$DEVM    ;CH 0 DROPPED OR NO WRAP?
2656  007650  001011                          BNE     3$                      ;BR IF EITHER SET
2657
2658  007652  005737  010040                  TST     INTABL                  ;1'ST ENTRY 0?
2659  007656  001401                          BEQ     .+4                     ;BR IF YES
2660  007660  104250                          ERROR   250                     ;DID NOT INTERR AT ASSIGNED PRIOR
2661
2662  007662  023727  010042  000001          CMP     INTABL+2,#1             ;2'ND ENTRY 1?
2663  007670  001401                          BEQ     .+4                     ;BR IF YES
2664  007672  104250                          ERROR   250
2665
2666  007674  032737  000410  001252  3$:     BIT     #<BIT8.BIT3>,$DEVM      ;CH 1 DROPPED OR NO WRAP?
2667  007702  001016                          BNE     4$                      ;BR IF EITHER SET
2668  007704  023737  001260  001144          CMP     BASE1,$TKS              ;CH 1 CONSOLE?
2669  007712  001412                          BEQ     4$                      ;BR IF YES
2670
2671  007714  023727  010044  000002          CMP     INTABL+4,#2             ;3'RD ENTRY 2?
2672  007722  001401                          BEQ     .+4                     ;BR IF YES
2673  007724  104250                          ERROR   250
2674
```

```
 2675  007726  023727  010046  000003          CMP     INTABL+6,#3             ;4'TH ENTRY 3?
 2676  007734  001401                          BEQ     .+4                     ;BR IF ;YES
 2677  007736  104250                          ERROR   250
 2678
 2679  007740                          4$:
 2680  007740  000443                          BR      TST24           ;;EXIT TEST
 2681                .
```

```
2682
2683  007742                          STARS
2684                                  ;*              START OF SERVICE ROUTINES
2685  007742                          STARS
2686
2687  007742  005024                  CH0R:   CLR     (R4)+                   ;PUT IDENTIFIER IN TABLE
2688  007744  013700  001254                  MOV     BASE0,R0
2689  007750  042710  000100                  BIC     #1E,(R0)                ; 1 INTERR IS ALL WE WANT
2690  007754  000002                          RTI
2691
2692  007756  012724  000001          CH0X:   MOV     #1,(R4)+                ;PUT IDENTIFIED IN TABLE
2693  007762  013700  001254                  MOV     BASE0,R0
2694  007766  062700  000004                  ADD     #4,R0
2695  007772  042710  000100                  BIC     #1E,(R0)                ; 1 INTERR IS ALL WE WANT
2696  007776  000002                          RTI
2697
2698  010000  012724  000002          CH1R:   MOV     #2,(R4)+                ;PUT IDENTIFIER IN TABLE
2699  010004  013700  001260                  MOV     BASE1,R0
2700  010010  042710  000100                  BIC     #1E,(R0)                ; 1 INTERR IS ALL WE WANT
2701  010014  000002                          RTI
2702
2703  010016  012724  000003          CH1X:   MOV     #3,(R4)+                ;PUT IDENTIFIED IN TABLE
2704  010022  013700  001260                  MOV     BASE1,R0
2705  010026  062700  000004                  ADD     #4,R0
2706  010032  042710  000100                  BIC     #1E,(R0)                ; 1 INTERR IS ALL WE WANT
2707  010036  000002                          RTI
2708
2709
2710                                          ;THIS TABLE WILL CONTAIN ENTRIES
2711                                          ;REPRESENTING EACH INTR IN THE ORDER
2712                                          ;THAT IT OCCURED
2713                                          ; S/B IN THE FOLLOWING ORDER: 0,1,2,3
271.
2715  010040  000004                  INTABL: .BLKW   4
2716
2717
```

```
                                ;;*****************************************************************
                                ;*TEST 24       TEST DATA TRANSFERS WITH ALL ACTIVE LINES INTERRUPTING
                                ;*             IN THIS WE'LL ENABLE INTERRUPTS ON ALL CHANNELS.
                                ;*             THEN WE'LL XMIT AN INCREMENTING
                                ;*             DATA PATERN VIA INTERRUPTS AND RECORD THE RECEIVER
                                ;*             INTR. IN THE RECEIVER STATUS TABLE.
                                ;*      NOTE:  DOUBLE BUFFERING CANNOT BE TESTED AT ITS MAX SPEED
                                ;*             BECAUSE OF APT CONSIDERATIONS. I.E. APT SENDS
                                ;*             'BREAKS' WHICH CAUSE OVERRUN ERRORS. THEREFORE
                                ;*             THE XMIT IE IS NOT ENABLED AGAIN UNTIL THE RECVR
                                ;*             HAS OBTAINED THE PREVIOUS WORD.
                                ;;*****************************************************************
010050  000004                  TST24:  SCOPE
010052  012737  000001  001160          MOV     #1,$TIMES       ;;DO 1 ITERATION
010060  012737  000024  001200          MOV     #24,$TESTN      ;;SET TEST NUMBER IN APT MAIL BOX

010066  005037  011324          CLR     C0XMIT                  ;1'ST WORD OF CH 0 TO XMIT
010072  012737  000100  011330          MOV     #100,C1XMIT             ;1'ST WORD OF CH 1 TO XMIT

010100  012700  000724          MOV     #CHOTAB,R0              ;CLEAR OUT RECEIVER TABLES
010104  005020                  CLR     (R0)+
010106  020027  011324          CMP     R0,#STATEND             ;ALL DONE?
010112  001374                  BNE     .-6                     ;BR IF NO

010114                          SETPRI  #PR7

010126  032737  102000  001252          BIT     #<BIT15!BIT10>,$DEVM    ;CH 0 DROPPED OR NO WRAP?
010134  001035                  BNE     1$                      ;BR IF EITHER SET

010136  013700  001256          MOV     VEC0,R0                 ;SETUP CH 0 VECTOR AREA
010142  012720  010550          MOV     #R0SRV,(R0)+            ;RCVR
010146  012720  000340          MOV     #PR7,(R0)+
010152  012720  010610          MOV     #X0SRV,(R0)+            ;XMIT
010156  012710  000340          MOV     #PR7,(R0)

010162  013700  001254          MOV     BASE0,R0                ;ENABLE INTERRUPTS
010166  052710  000100          BIS     #1E,(R0)                ;RCVR
010172  062700  000004          ADD     #4,R0
010176  052710  000100          BIS     #1E,(R0)                ;XMIT

010202  032737  040000  001252          BIT     #BIT14,$DEVM            ;8 BITS/WORD?
010210  001404                  BEQ     .+12                    ;BR IF YES
010212  012737  000037  011326          MOV     #37,C0END
010220  000403                  BR      .+10
010222  012737  000077  011326          MOV     #77,C0END

010230  032737  000410  001252  1$:     BIT     #<BIT8!BIT3>,$DEVM      ;CH 1 DROPPED OR NO WRAP?
010236  001041                  BNE     2$                      ;BR IF EITHER SET
010240  023737  001260  001144          CMP     BASE1,$TKS              ;CH 1 CONSOLE?
010246  001435                  BEQ     2$                      ;BR IF YES
```

```
2769
2770  010250  013700  001262          MOV     VECT1,R0                ;SETUP CH 1 VECTOR AREA
2771  010254  012720  010636          MOV     #R1SRV,(R0)+            ;RCVR
2772  010260  012720  000340          MOV     #PR7,(R0)+
2773  010264  012720  010676          MOV     #X1SRV,(R0)+            ;XMIT
2774  010270  012710  000340          MOV     #PR7,(R0)
2775
2776  010274  013700  001260          MOV     BASE1,R0                ;ENABLE INTERRUPTS
2777  010300  052710  000100          BIS     #IE,(R0)                ;RCVR
2778  010304  062700  000004          ADD     #4,R0
2779  010310  052710  000100          BIS     #IE,(R0)                ;XMIT
2780
2781  010314  032737  000200  001252  BIT     #BIT7,$DEVM             ;8 BITS/WORD?
2782  010322  001404                  BEQ     .+12                    ;BR IF YES
2783  010324  012737  000137  011332  MOV     #137,C1END
2784  010332  000403                  BR      .+10
2785  010334  012737  000177  011332  MOV     #177,C1END
2786
2787  010342  012700  010724  2$:     MOV     #CH0TAB,R0              ;INIT BUFFER PTRS FOR SERV ROUTINES
2788  010346  012701  011124          MOV     #CH1TAB,R1
2789
2790  010352                          SETPRI  #PR0                    ;LET'EM LOOSE!
2791
2792  010364  012702  177777          MOV     #-1,R2                  ;DELAY TO ALLOW ANY PREVIOUS XMIT TO
2793  010370  077201                  SOB     R2,.                    ;FINISH BEFORE RESET
2794  010372  000005                  RESET                           ;DISABLE ALL INTERR
2795
2796  010374                          SETPRI  #PR7
2797
2798                                  ;NOW LETS CHECK TO SEE IF TABLE(S) ARE IN CORRECT ORDER
2799
2800  010406  032737  102000  001252  BIT     #<BIT15!BIT10>,$DEVM    ;CH 0 DROPPED OR NO WRAP
2801  010414  001021                  BNE     5$                      ;BR IF EITHER SET
2802
2803  010416  005000                  CLR     R0                      ;EXPECTED WORD
2804  010420  012701  010724          MOV     #CH0TAB,R1              ;TABLE PTR
2805
2806  010424  020011          3$:     CMP     R0,(R1)                 ;EXPECT = ACTUAL?
2807  010426  001405                  BEQ     4$                      ;BR IF YES
2808
2809  010430  005711                  TST     (R1)                    ;ERROR SET?
2810  010432  100002                  BPL     .+6                     ;BR IF NO
2811  010434  104270                  ERROR   270                     ;ERROR FLAG AFTER XFER
2812  010436  000401                  BR      .+4
2813  010440  104271                  ERROR   271                     ;DATA COMPARE ERROR
```

```
2814
2815  010442  020037  011326        4$:   CMP   R0,C0END              ;ALL  DONE?
2816  010446  001404                      BEQ   5$                     ;BR IF YES
2817  010450  005200                      INC   R0
2818  010452  062701  000002              ADD   #2,R1
2819  010456  000762                      BR    3$                     ;ELSE DO AGAIN
2820
2821  010460  032737  000410  001252  5$:   BIT   #<BIT8!BIT3>,$DEVM    ;CH 1 DROPPED OR NO WRAP
2822  010466  001026                      BNE   8$                     ;BR IF EITHER SET
2823  010470  023737  001260  001144        CMP   BASE1,$TKS           ;CH 1 CONSOLE?
2824  010476  001422                      BEQ   8$                     ;BR IF YES
2825
2826  010500  012700  000100              MOV   #100,R0                ;EXPECTED WORD
2827  010504  012701  011124              MOV   #CH1TAB,R1             ;TABLE PTR
2828
2829  010510  020011                6$:   CMP   R0,(R1)                ;EXPECT = ACTUAL?
2830  010512  001405                      BEQ   7$                     ;BR IF YES
2831
2832  010514  005711                      TST   (R1)                   ;ERROR SET?
2833  010516  100002                      BPL   .+6                    ;BR IF NO
2834  010520  104270                      ERROR 270                    ;ERROR FLAG UP AFTER XFER
2835  010522  000401                      BR    .+4
2836  010524  104271                      ERROR 271                    ;DATA COMPARE ERROR
2837
2838  010526  020037  011332        7$:   CMP   R0,C1END               ;ALL DONE?
2839  010532  001404                      BEQ   8$                     ;BR IF YES
2840  010534  005200                      INC   R0
2841  010536  062701  000002              ADD   #2,R1
2842  010542  000762                      BR    6$                     ;ELSE DO AGAIN
2843
2844  010544  000137  006750        8$:   JMP   NOTST
2845
```

```
2846                                    ;;*****************************************************************
2847                                    ;*              START OF SERVICE ROUTINES
2848                                    ;;*****************************************************************
2849
2850  010550  013702  001254           ROSRV:  MOV     BASE0,R2
2851  010554  062702  000002                   ADD     #2,R2                   ;POINT TO RBUF
2852  010560  011220                           MOV     (R2),(R0)+              ;PUT IN TABLE
2853  010562  023737  011324  011326           CMP     C0XMIT,C0END            ;LAST CHAR?
2854  010570  001406                           BEQ     1$                      ;BR IF YES
2855  010572  005237  011324                   INC     C0XMIT                  ;ELSE BUMP CHAR TO XMIT NEXT
2856  010576  062702  000002                   ADD     #2,R2                   ;POINT TO XCSR
2857  010602  052712  000100                   BIS     #IE,(R2)                ;RE-ENABLE
2858  010606  000002                    1$:    RTI
2859
2860  010610  013702  001254           X0SRV:  MOV     BASE0,R2
2861  010614  062702  000006                   ADD     #6,R2                   ;POINT TO XBUF
2862  010620  013712  011324                   MOV     C0XMIT,(R2)             ;SHIP WORD
2863  010624  162702  000002                   SUB     #2,R2                   ;POINT TO XCSR
2864  010630  042712  000100                   BIC     #IE,(R2)                ;DISABLE XMIT INTERR
2865                                                                            ;RE-ENABLE IN REC HANDLER
2866  010634  000002                           RTI
2867
2868
2869  010636  013702  001260           R1SRV:  MOV     BASE1,R2
2870  010642  062702  000002                   ADD     #2,R2                   ;POINT TO RBUF
2871  010646  011221                           MOV     (R2),(R1)+              ;PUT IN TABLE
2872  010650  023737  011330  011332           CMP     C1XMIT,C1END            ;LAST CHAR?
2873  010656  001406                           BEQ     1$                      ;BR IF YES
2874  010660  005237  011330                   INC     C1XMIT                  ;ELSE BUMP CHAR TO XMIT NEXT
2875  010664  062702  000002                   ADD     #2,R2                   ;POINT TO XCSR
2876  010670  052712  000100                   BIS     #IE,(R2)                ;RE-ENABLE
2877  010674  000002                    1$:    RTI
2878
2879  010676  013702  001260           X1SRV:  MOV     BASE1,R2
2880  010702  062702  000006                   ADD     #6,R2                   ;POINT TO XBUF
2881  010706  013712  011330                   MOV     C1XMIT,(R2)             ;SHIP WORD
2882  010712  162702  000002                   SUB     #2,R2                   ;POINT TO XCSR
2883  010716  042712  000100                   BIC     #IE,(R2)                ;DISABLE XMIT INTERR
2884                                                                            ;RE-ENABLE IN REC HANDLER
2885  010722  000002                           RTI
2886
2887
2888
2889                                    ;** RECEIVER STATUS TABLES **
2890                                                                    ;7 BIT WDS      8 BIT WDS
2891  010724  000100                   CH0TAB: .BLKW 100                ;  0- 37          0- 77
2892  011124  000100                   CH1TAB: .BLKW 100                ; 40- 77        100-177
2893  011324                           STATEND:
2894
2895  011324  000000                   C0XMIT: 0                        ;START WORD FOR CH 0: 0
2896  011326  000000                   C0END:  0                        ;END   WORD FOR CH 0: 37 OR 7
2897  011330  000000                   C1XMIT: 0                        ;START WORD FOR CH 1: 100
2898  011332  000000                   C1END.  0                        ;END   WORD FOR CH 1: 137 OR 17
2899
```

```
                                        .SBTTL  ROUTINE TO SIZE THE DEVICE MAP ($DEVM) & MEMORY
                                
011334  032737  100000  001252  SIZE:   BIT     #BIT15,$DEVM            ;TEST CH 0?
011342  001413                          BEQ     1$                      ;BR IF YES
011344  104401  013042                  TYPE    ,C0DROP
011350  032737  000400  001252          BIT     #BIT8,$DEVM             ;TEST CH 1?
011356  001414                          BEQ     2$                      ;BR IF YES
011360  104401  013072                  TYPE    ,C1DROP
011364  005237  011614                  INC     NOCHAN                  ;SET FLAG
011370  000417                          BR      4$
                                
011372  032737  000400  001252  1$:     BIT     #BIT8,$DEVM             ;TEST CH 1?
011400  001403                          BEQ     2$                      ;BR IF YES
011402  104401  013072                  TYPE    ,C1DROP
011406  000406                          BR      3$
                                
011410  023737  001260  001144  2$:     CMP     BASE1,$TKS              ;IS IT CONSOLE?
011416  001002                          BNE     3$                      ;BR IF NO
011420  104401  013122                  TYPE    ,C1CON
011424  005037  011614          3$:     CLR     NOCHAN
                                
011430  032737  000004  001252  4$:     BIT     #BIT2,$DEVM             ;DO RAM TEST?
011436  001402                          BEQ     10$                     ;BR IF YES
011440  104401  013170                  TYPE    ,NORAM
                                
011444  032737  000002  001252  10$:    BIT     #BIT1,$DEVM             ;DO ROM TEST?
011452  001402                          BEQ     5$                      ;BR IF YES
011454  104401  013145                  TYPE    ,NOROM
                                
011460  032737  000001  001252  5$:     BIT     #BIT0,$DEVM             ;CLOCK DISABLED?
011466  001402                          BEQ     6$                      ;BR IF YES
011470  104401  013214                  TYPE    ,CLKEN
                                
011474  012737  011636  000004  6$:     MOV     #INTSRV,ERRVEC          ;SETUP TIMEOUT TRAP ADDR
011502  012737  000200  000006          MOV     #200,ERRVEC+2           ;LOCKOUT INTERR
011510  005037  011644                  CLR     INTFLG
                                
011514  012700  020000                  MOV     #20000,R0               ;SIZE MEM. START WITH BOT OF 2ND 4K
011520  005001                          CLR     R1                      ;MEM MAP.  0-4K, 1-8K, ETC
                                
011522  011010          7$:     MOV     (R0),(R0)               ;DO MOV INSTEAD OF 'TST'
011524  005737  011644          TST     INTFLG                  ;GOT TIMEOUT INTERR?
011530  001006                  BNE     8$                      ;BR IF YES
011532  005201                  INC     R1
011534  062700  020000          ADD     #20000,R0               ;GO TO BOT OF NEXT 4K
011540  020027  160000          CMP     R0,#160000              ;BOT OF 32K?
011544  001366                  BNE     7$                      ;BR IF NO
```

```
2948
2949  011546  010037  011634          8$:     MOV     R0,MAXMEM               ;SAVE
2950  011552  162737  000002  011634          SUB     #2,MAXMEM               ;GO BACK TO TOP OF LAST VALID BLOCK
2951  011560  006301                          ASL     R1                      ;MULT BY 2
2952  011562  016137  011676  011572          MOV     MEMTBL(R1),9$
2953  011570  104401                          TYPE
2954  011572  000000                  9$:     .WORD   0                       ;MEM SIZE
2955  011574  104401  013314                  TYPE    .MEM
2956
2957  011600  012737  000006  000004          MOV     #ERRVEC+2,ERRVEC        ;RESET TMO VECTOR
2958  011606  005037  000006                  CLR     ERRVEC+2
2959
2960  011612  000207                          RTS     PC
2961
2962  011614  000000          NOCHAN: 0                                       ;0 - CHANNEL(S) TO TEST
2963                                                                          ;1 = NO CHANNELS TO TEST
2964
2965                                                  ;MSG ADDRESSES
2966  011616  013244          MEMTBL: M4K             ;       0 -  17776
2967  011620  013251                  M8K             ;   20000 -  37776
2968  011622  013256                  M12K            ;   40000 -  57776
2969  011624  013264                  M16K            ;   60000 -  77776
2970  011626  013272                  M20K            ;  100000 - 117776
2971  011630  013300                  M24K            ;  120000 - 137776
2972  011632  013306                  M28K            ;  140000 - 157776
2973
2974  011634  000000          MAXMEM: 0               ;MAX MEMORY
2975
2976
2977
2978                          .SBTTL  INTSRV  INTERRUPT SERVICE ROUTINE
2979
2980                          ;*      THIS GLOBAL ROUTINE DOES NOTHING BUT INCREMENT
2981                          ;*      'INTFLG'  EACH TIME IT IS CALLED.  IT ASSUMES
2982                          ;*      THAT THE MAIN CALLING ROUTINE WILL  KNOW  WHAT
2983                          ;*      TO LOOK FOR.
2984
2985  011636  005237  011644  INTSRV: INC     INTFLG                          ;ADD 1 TO 'INTERRUPT OCCURED' FLAG
2986  011642  000002                  RTI                                     ;THAT'S ALL
2987
2988  011644  000000          INTFLG:  0
2989
```

```
                                .SBTTL  ROUTINE TO SET UP FOR NEXT CHANNEL ADDRESS

                                ;;*****************************************************************
                                ;*      THIS  ROUTINE  CAUSES  ADRS   TO POINT TO  THE
                                ;*      ADDRESS  OF  CHANNEL  UNDER  TEST,  ADRS +2 TO
                                ;*      POINT TO THE VECTOR OF THE CHANNEL UNDER TEST.
                                ;;*****************************************************************

011646  005737  011614        CYCLE:  TST     NOCHAN                  ;ANY CHANNELS TO BE TESTED?
011652  001401                        BEQ     1$                      ;BR IF YES
011654  000207                        RTS     PC                      ;ELSE RETURN

011656  023727  001206  000002  1$:     CMP     $UNIT,#2                ;DONE ALL AVAIL CHANNELS?
011664  001024                        BNE     3$                      ;BR IF NO
011666  005037  001206                CLR     $UNIT
011672  032737  002000  001252        BIT     #BIT10,$DEVM            ;CHAN 0 DATA WRAP?
011700  001410                        BEQ     2$                      ;BR IF YES
011702  032737  000010  001252        BIT     #BIT3,$DEVM             ;CHAN 1 DATA WRAP?
011710  001404                        BEQ     2$                      ;BR IF YES
011712  104401  001310                TYPE    ,CARR
011716  000137  013334                JMP     $EOP                    ;ELSE ALL DONE

011722  012737  000001  012312  2$:     MOV     #TRUE,PHASE2
011730  005037  012314                CLR     P1CNT
011734  000207                        RTS     PC

011736  005737  001206          3$:   TST     $UNIT                   ;CHAN 0 TO BE TESTED?
011742  001066                        BNE     12$                     ;BR IF NO

011744  032737  100000  001252        BIT     #BIT15,$DEVM            ;CHAN 0 TO BE TESTED?
011752  001403                        BEQ     4$                      ;BR IF YES
011754  005237  001206                INC     $UNIT
011760  000732                        BR      CYCLE                   ;TRY OVER AGAIN FOR CHAN 1

011762  013737  001254  001270  4$:     MOV     BASE0,DLADD             ;SET CHAN 0 RCSR ADDR
011770  013737  001256  001302        MOV     VECT0,DLVEC             ; & VECTOR

011776  032737  040000  001252        BIT     #BIT14,$DEVM            ;8 BITS/WORD?
012004  001003                        BNE     5$                      ;BR IF NO
012006  005037  012300                CLR     WORDL                   ;ELSE CLEAR TO DEFAULT & NO PARITY
012012  000402                        BR      .+6
012014  005237  012300          5$:   INC     WORDL                   ;7 BITS/WORD WITH PARITY

012020  032737  010000  001252        BIT     #BIT12,$DEVM            ;ODD PARITY?
012026  001003                        BNE     7$                      ;BR IF NO
012030  005037  012302                CLR     ODD                     ;ELSE CLEAR TO DEFAULT
012034  000402                        BR      .+6
012036  005237  012302          7$:   INC     ODD

012042  032737  004000  001252        BIT     #BIT11,$DEVM            ;BREAK DETECTION ENABLED?
012050  001003                        BNE     8$                      ;BR IF YES
012052  005037  012304                CLR     BRK                     ;ELSE CLEAR TO DEFAULT
012056  000402                        BR      .+6
012060  005237  012304          8$:   INC     BRK
```

```
3045
3046  012064  032737  002000  001252          BIT     #BIT10,$DEVM            ;DATA WRAP AROUND?
3047  012072  001003                          BNE     9$                      ;BR IF NO
3048  012074  005037  012306                  CLR     WRAP                    ;ELSE CLEAR TO DEFAULT
3049  012100  000402                          BR      .+6
3050  012102  005237  012306          9$:     INC     WRAP
3051
3052  012106  005037  012310          10$:    CLR     CONSOLE                 ;CHAN 0 IS NO  CONSOLE
3053  012112  005237  001206          11$:    INC     $UNIT                   ;SETUP FOR NEXT TIME
3054  012116  000207                          RTS     PC
3055
3056  012120  032737  000400  001252  12$:    BIT     #BIT8,$DEVM             ;CHAN 1 TO BE TESTED?
3057  012126  001403                          BEQ     13$                     ;BR IF YES
3058  012130  005237  001206                  INC     $UNIT
3059  012134  000644                          BR      CYCLE                   ;TRY OVER AGAIN FOR CHAN 1
3060
3061  012136  013737  001260  001270  13$:    MOV     BASE1,DLADD             ;SET CHAN 1 RCSR ADDR
3062  012144  013737  001262  001302          MOV     VECT1,DLVEC             ; & VECTOR
3063
3064  012152  032737  000200  001252          BIT     #BIT7,$DEVM             ;8 BITS/WORD?
3065  012160  001003                          BNE     14$                     ;BR IF NO
3066  012162  005037  012300                  CLR     WORDL                   ;ELSE CLEAR TO DEFAULT & NO PARITY
3067  012166  000402                          BR      .+6
3068  012170  005237  012300          14$:    INC     WORDL                   ;7 BITS/WORD WITH PARITY
3069
3070  012174  032737  000040  001252          BIT     #BIT5,$DEVM             ;ODD PARITY?
3071  012202  001003                          BNE     16$                     ;BR IF NO
3072  012204  005037  012302                  CLR     ODD                     ;ELSE CLEAR TO DEFAULT
3073  012210  000402                          BR      .+6
3074  012212  005237  012302          16$:    INC     ODD
3075
3076  012216  032737  000020  001252          BIT     #BIT4,$DEVM             ;BREAK DETECTION ENABLED?
3077  012224  001003                          BNE     17$                     ;BR IF YES
3078  012226  005037  012304                  CLR     BRK                     ;ELSE CLEAR TO DEFAULT
3079  012232  000402                          BR      .+6
3080  012234  005237  012304          17$:    INC     BRK
3081
3082  012240  032737  000010  001252          BIT     #BIT3,$DEVM             ;DATA WRAP AROUND?
3083  012246  001003                          BNE     18$     \               ;BR IF NO
3084  012250  005037  012306                  CLR     WRAP                    ;ELSE CLEAR TO DEFAULT
3085  012254  000402                          BR      .+6     \
3086  012256  005237  012306          18$:    INC     WRAP
3087
3088  012262  023737  001260  001144          CMP     BASE1,$TKS              ;CHAN 1 CONSOLE?
3089  012270  001306                          BNE     10$                     ;BR IF NO
3090  012272  005237  012310                  INC     CONSOLE
3091  012276  000705                          BR      11$
3092
3093  012300  000000          WORDL:  0               ;WORD LENGTH    0 = 8 BITS (NO PARITY), 1 = 7 BITS (WITH PARITY)
3094  012302  000000          ODD:    0               ;ODD PARITY     0 = ODD,    1 = EVEN
3095  012304  000000          BRK:    0               ;BREAK DET      0 = DISABL, 1 = ENABL
3096  012306  000000          WRAP:   0               ;DATA WRAP      0 = YES,    1 = NO
3097  012310  000000          CONSOLE: 0              ;CONSOLE        0 = CH UNDER TEST NOT CONSOLE
3098                          ;                       ;               1 = CH UNDER TEST IS  CONSOLE
3099  012312  000000          PHASE2: 0
3100  012314  000000          P1CNT:  .0              ;CTR TO PRINT 'PHASE 1' ONLY ONCE
```

```
                        ;;*****************************************************************
                        ;ROUTINE TO DISPLAY CURRENT DEVM & ALLOW OPERATOR TO INPUT NEW VALUE.
                        ;;*****************************************************************

012316  104401  013233  GT$DEV: TYPE    ,DEVM           ;SHOW CURRENT
012322  013746  001252          MOV     $DEVM,-(SP)     ;;SAVE $DEVM FOR TYPEOUT
012326  104402                  TYPOC                   ;;GO TYPE--OCTAL ASCII(ALL DIGITS)
012330  104401  014752          TYPE    ,$MNEW          ;GET NEW

012334  005046          1$:     CLR     -(SP)           ;CLR CTR
012336  005046                  CLR     -(SP)           ;CLR NEW DEVM

012340  105777  166600  2$:     TSTB    @$TKS           ;CHAR THERE?
012344  100375                  BPL     2$              ;BR IF NO
012346  117746  166574          MOVB    @$TKB,-(SP)     ;ELSE GET CHAR
012352  042716  177600          BIC     #^C177,(SP)     ;MAKE IT 7 BIT ASCII

012356  021627  000015  3$:     CMP     (SP),#15        ;<CR>?
012362  001017                  BNE     7$              ;BR IF NO
012364  005766  000004          TST     4(SP)           ;ELSE IS IT 1'ST CHAR?
012370  001403                  BEQ     4$              ;BR IF YES
012372  016637  000002  001252  MOV     2(SP),$DEVM     ;ELSE SAVE NEW DEVM
012400  104401  001171  4$:     TYPE    ,$CRLF
012404  004737  011334  6$:     JSR     PC,SIZE         ;RE-SIZE
012410  062706  000006          ADD     #6,SP           ;RESET STACK
012414  012716  002004          MOV     #RAMROM,(SP)
012420  000002                  RTI

012422  004737  014052  7$:     JSR     PC,$TYPEC       ;ECHO CHAR
012426  021627  000060          CMP     (SP),#60        ;CHAR < 0?
012432  002420                  BLT     9$              ;BR IF YES
012434  021627  000067          CMP     (SP),#67        ;CHAR > 7?
012440  003015                  BGT     9$              ;BR IF YES
012442  042726  000060          BIC     #60,(SP)+       ;STRIP OFF ASCII
012446  005766  000002          TST     2(SP)           ;1'ST CHAR?
012452  001403                  BEQ     8$              ;BR IF YES
012454  006316                  ASL     (SP)            ;ELSE SHIFT PRESENT CHAR
012456  006316                  ASL     (SP)            ;TO MAKE ROOM
012460  006316                  ASL     (SP)            ;FOR NEW ONE

012462  005266  000002  8$.     INC     2(SP)           ;KEEP CHAR CT
012466  056616  177776          BIS     -2(SP),(SP)     ;SET IN NEW CHAR
012472  000722                  BR      2$              ;GET NEW ONE

012474  104401  001170  9$:     TYPE    ,$QUES
012500  104401  001171          TYPE    ,$CRLF
012504  005726                  TST     (SP)+           ;RESET PTR
012506  005016                  CLR     (SP)            ;CLR DEVM
012510  000713                  BR      2$              ;TRY AGAIN
```

```
3152
3153                                    ;;*****************************************************************
3154                                    ;
3155                                    ; PROGRAM TIMERS
3156                                    ;
3157                                    ;;*****************************************************************
3158
3159  012512  013537  012562           TIMER:  MOV     @(R5)+,REGHLD
3160  012516  012537  012564                   MOV     (R5)+,BITHLD
3161
3162  012522  012701  000010                   MOV     #10,R1          ;DOUBLE LOOP
3163  012526  012700  177777           1$:     MOV     #-1,R0
3164  012532  033777  012564  000022   2$:     BIT     BITHLD,@REGHLD  ;BIT THERE?
3165  012540  001005                           BNE     3$              ;BR IF YES
3166  012542  005300                           DEC     R0
3167  012544  001372                           BNE     2$
3168  012546  005301                           DEC     R1
3169  012550  001366                           BNE     1$
3170  012552  000402                           BR      4$              ;ALL TIMED OUT
3171
3172  012554  062705  000004           3$:     ADD     #4,R5           ;JUMP OVER ERR ON RETURN
3173  012560  000205                   4$:     RTS     R5
3174
3175  012562  000000                   REGHLD: 0                       ;REGISTER TO BE TESTED
3176  012564  000000                   BITHLD: 0                       ;BIT TO BE TESTED IN REGISTER
3177
3178
3179  012566  012537  012562           TIMER1: MOV     (R5)+,REGHLD
3180
3181  012572  012701  000010                   MOV     #10,R1
3182  012576  012700  177777           1$:     MOV     #-1,R0
3183  012602  005777  177754           2$:     TST     @REGHLD         ;ZERO?
3184  012606  001005                           BNE     3$              ;BR IF NO
3185  012610  005300                           DEC     R0
3186  012612  001373                           BNE     2$
3187  012614  005301                           DEC     R1
3188  012616  001367                           BNE     1$
3189  012620  000402                           BR      4$              ;ALL TIMED OUT
3190
3191  012622  062705  000004           3$:     ADD     #4,R5           ;JUMP OVER ERR ON RETURN
3192  012626  000205                   4$:     RTS     R5
3193
3194
3195  012630  012700  177777           WAIT:   MOV     #-1,R0
3196  012634  005300                           DEC     R0
3197  012636  001376                           BNE     .-2
3198  012640  000207                           RTS     PC
3199
```

```
3200
3201  012642                                MYTYPE: TYPTXT  <<CRLF>*TEST # *>
3202  012662                                        TYPOCT  $TESTN
3203  012670                                        TYPTXT  <*,ERROR # *>
3204  012710  113737  001114  001176                MOVB    $ITEMB,$FATAL   ; APT FATAL ERROR NUMBER
3205  012716                                        TYPOCS  $FATAL
3206  012726                                        TYPTXT  <*,PC = *>
3207  012744                                        TYPOCT  $ERRPC
3208
3209  012752  023727  001200  000005                CMP     $TESTN,#5       ;DOING SLU TESTS?
3210  012760  100425                                BMI     1$              ;BR IF NO
3211
3212  012762                                        TYPTXT  <*,CSR: *>      ;ELSE PROCEED
3213  013000                                        TYPOCT  DLADD
3214  013006                                        TYPTXT  <*,VECTOR: *>
3215  013026                                        TYPOCT  DLVEC
3216  013034  104401  001171                1$:     TYPE    ,$CRLF
3217  013040  000207                                RTS     PC
3218
3219
3220  013042  041600  040510  020116  CODROP: .ASCIZ  <CRLF>/CHAN 0 TESTING DROPPED/
3221  013050  020060  042524  052123
3222  013056  047111  020107  051104
3223  013064  050117  042520  000104
3224  013072  041600  040510  020116  C1DROP: .ASCIZ  <CRLF>/CHAN 1 TESTING DROPPED/
3225  013100  020061  042524  052123
3226  013106  047111  020107  051104
3227  013114  050117  042520  000104
3228  013122  041600  040510  020116  C1CON:  .ASCIZ  <CRLF>/CHAN 1 IS CONSOLE/
3229  013130  020061  051511  041440
3230  013136  047117  047523  042514
3231  013144     000
3232  013145     200  047522  020115  NOROM:  .ASCIZ  <CRLF>/ROM TEST BYPASSED/
3233  013152  042524  052123  041040
3234  013160  050131  051501  042523
3235  013166  000104
3236  013170  005015  040522  020115  NORAM:  .ASCIZ  <CR><LF>/RAM TEST BYPASSED/
3237  013176  042524  052123  041040
3238  013204  050131  051501  042523
3239  013212  000104
3240  013214  041600  047514  045503  CLKEN:  .ASCIZ  <CRLF>/CLOCK ENABLED/
3241  013222  042440  040516  046102
3242  013230  042105     000
3243  013233     200  042504  046526  DEVM:   .ASCIZ  <CRLF>/DEVM - /
3244  013240  036440  000040
3245  013244  005015  045464     000  M4K:    .ASCIZ  <CR><LF>/4K/
3246  013251     015  034012  000113  M8K:    .ASCIZ  <CR><LF>/8K/
3247  013256  005015  031061  000113  M12K:   .ASCIZ  <CR><LF>/12K/
3248  013264  005015  033061  000113  M16K:   .ASCIZ  <CR><LF>/16K/
3249  013272  005015  030062  000113  M20K:   .ASCIZ  <CR><LF>/20K/
3250  013300  005015  032062  000113  M24K:   .ASCIZ  <CR><LF>/24K/
3251  013306  005015  034062  000113  M28K:   .ASCIZ  <CR><LF>/28K/
3252  013314  046440  046505  050040  MEM:    .ASCIZ  / MEM PRESENT/<CR><LF>
3253  013322  042522  042523  052116
3254  013330  005015     000
3255          013334                          .EVEN
```

```
                                .SBTTL  END OF PASS ROUTINE

                                ;;*****************************************************************
                                ;*INCREMENT THE PASS NUMBER ($PASS)
                                ;*INDICATE END-OF-PROGRAM AFTER 1 PASSES THRU THE PROGRAM
                                ;*TYPE "END PASS #XXXXX" (WHERE XXXXX IS A DECIMAL NUMBER)
                                ;*IF THERES A MONITOR GO TO IT
                                ;*IF THERE ISN'T JUMP TO RAMROM

013334                          $EOP:
013334  000004                          SCOPE
013336  005037  001102                  CLR     $TSTNM          ;;ZERO THE TEST NUMBER
013342  005037  001160                  CLR     $TIMES          ;;ZERO THE NUMBER OF ITERATIONS
013346  005237  001202                  INC     $PASS           ;;INCREMENT THE PASS NUMBER
013352  042737  100000  001202          BIC     #100000,$PASS   ;;DON'T ALLOW A NEG. NUMBER
013360  005327                          DEC     (PC)+           ;;LOOP?
013362  000001                  $EOPCT: .WORD   1
013364  003022                          BGT     $DOAGN          ;;YES
013366  012737                          MOV     (PC)+,@(PC)+    ;;RESTORE COUNTER
013370  000001                  $ENDCT: .WORD   1
013372  013362                          $EOPCT
013374  104401  013441                  TYPE    ,$ENDMG         ;;TYPE "END PASS #"
013400  013746  001202                  MOV     $PASS,-(SP)     ;;SAVE $PASS FOR TYPEOUT
013404  104405                          TYPDS                   ;;GO TYPE--DECIMAL ASCII WITH SIGN
013406  104401  013436                  TYPE    ,$ENULL         ;;TYPE A NULL CHARACTER
013412  013700  000042          $GET42: MOV     @#42,R0         ;;GET MONITOR ADDRESS
013416  001405                          BEQ     $DOAGN          ;;BRANCH IF NO MONITOR
013420  000005                          RESET                   ;;CLEAR THE WORLD
013422  004710                  $ENDAD: JSR     PC,(R0)         ;;GO TO MONITOR
013424  000240                          NOP                     ;;SAVE ROOM
013426  000240                          NOP                     ;;FOR
013430  000240                          NOP                     ;;ACT11
013432                          $DOAGN:
013432  000137                          JMP     @(PC)+          ;;RETURN
013434  002004                  $RTNAD: .WORD   RAMROM
013436     377     377     000  $ENULL: .BYTE   -1,-1,0          ;;NULL CHARACTER STRING
013441     015  042412  042116  $ENDMG: .ASCIZ  <15><12>/END PASS #/
013446  050040  051501  020123
013454  000043
```

```
                                        .SBTTL  POWER DOWN AND UP ROUTINES

                                        ;;*****************************************************************
                                        ;POWER DOWN ROUTINE
013456  012737  013622  000024  $PWRDN: MOV     #$ILLUP,@#PWRVEC ;;SET FOR FAST UP
013464  012737  000340  000026         MOV     #340,@#PWRVEC+2 ;;PRIO:7
013472  010046                        MOV     R0,-(SP)        ;;PUSH R0 ON STACK
013474  010146                        MOV     R1,-(SP)        ;;PUSH R1 ON STACK
013476  010246                        MOV     R2,-(SP)        ;;PUSH R2 ON STACK
013500  010346                        MOV     R3,-(SP)        ;;PUSH R3 ON STACK
013502  010446                        MOV     R4,-(SP)        ;;PUSH R4 ON STACK
013504  010546                        MOV     R5,-(SP)        ;;PUSH R5 ON STACK
013506  017746  165426                MOV     @SWR,-(SP)      ;;PUSH @SWR ON STACK
013512  010637  013626                MOV     SP,$SAVR6       ;;SAVE SP
013516  012737  013530  000024        MOV     #$PWRUP,@#PWRVEC ;;SET UP VECTOR
013524  000000                        HALT
013526  000776                        BR      .-2             ;;HANG UP

                                        ;;*****************************************************************
                                        ;POWER UP ROUTINE
013530  012737  013622  000024  $PWRUP: MOV     #$ILLUP,@#PWRVEC ;;SET FOR FAST DOWN
013536  013706  013626                MOV     $SAVR6,SP       ;;GET SP
013542  005037  013626                CLR     $SAVR6          ;;WAIT LOOP FOR THE TTY
013546  005237  013626         1$:    INC     $SAVR6          ;;WAIT FOR THE INC
013552  001375                        BNE     1$              ;;OF  WORD
013554  012677  165360                MOV     (SP)+,@SWR      ;;POP STACK INTO @SWR
013560  012605                        MOV     (SP)+,R5        ;;POP STACK INTO R5
013562  012604                        MOV     (SP)+,R4        ;;POP STACK INTO R4
013564  012603                        MOV     (SP)+,R3        ;;POP STACK INTO R3
013566  012602                        MOV     (SP)+,R2        ;;POP STACK INTO R2
013570  012601                        MOV     (SP)+,R1        ;;POP STACK INTO R1
013572  012600                        MOV     (SP)+,R0        ;;POP STACK INTO R0
013574  012737  013456  000024        MOV     #$PWRDN,@#PWRVEC ;;SET UP THE POWER DOWN VECTOR
013602  012737  000340  000026        MOV     #340,@#PWRVEC+2 ;;PRIO:7
013610  104401                        TYPE                    ;REPORT THE POWER FAILURE
013612  013630           $PWRMG:      .WORD   $POWER          ;;POWER FAIL MESSAGE POINTER
013614  012716                        MOV     (PC)+,(SP)      ;;RESTART AT START
013616  001370           $PWRAD:      .WORD   START           ;;RESTART ADDRESS
013620  000002                        RTI
013622  000000           $ILLUP:      HALT                    ;;THE POWER UP SEQUENCE WAS STARTED
013624  000776                        BR      .-2             ;; BEFORE THE POWER DOWN WAS COMPLETE
013626  000000           $SAVR6:      0                       ;;PUT THE SP HERE
013630  005015  047520  042527  $POWER: .ASCIZ  <15><12>"POWER"
013636  000122
                                        .EVEN
```

```
                                .SBTTL  TYPE ROUTINE

                                ;;*****************************************************************
                                ;*ROUTINE TO TYPE ASCIZ MESSAGE. MESSAGE MUST TERMINATE WITH A 0 BYTE.
                                ;*THE ROUTINE WILL INSERT A NUMBER OF NULL CHARACTERS AFTER A LINE FEED.
                                ;*NOTE1:         $NULL CONTAINS THE CHARACTER TO BE USED AS THE FILLER CHARACTER.
                                ;*NOTE2:         $FILLS CONTAINS THE NUMBER OF FILLER CHARACTERS REQUIRED.
                                ;*NOTE3:         $FILLC CONTAINS THE CHARACTER TO FILL AFTER.
                                ;*
                                ;*CALL:
                                ;*1) USING A TRAP INSTRUCTION
                                ;*      TYPE    ,MESADR         ;;MESADR IS FIRST ADDRESS OF AN ASCIZ STRING
                                ;*OR
                                ;*      TYPE
                                ;*      MESADR
                                ;*

013640  105737  001157          $TYPE:  TSTB    $TPFLG          ;;IS THERE A TERMINAL?
013644  100002                          BPL     1$              ;;BR IF YES
013646  000000                          HALT                    ;;HALT HERE IF NO TERMINAL
013650  000430                          BR      3$              ;;LEAVE
013652  010046                  1$:     MOV     R0,-(SP)        ;;SAVE R0
013654  017600  000002                  MOV     @2(SP),R0       ;;GET ADDRESS OF ASCIZ STRING
013660  122737  000001  001214          CMPB    #APTENV,$ENV    ;;RUNNING IN APT MODE
013666  001011                          BNE     62$             ;;NO,GO CHECK FOR APT CONSOLE
013670  132737  000100  001215          BITB    #APTSPOOL,$ENVM ;;SPOOL MESSAGE TO APT
013676  001405                          BEQ     62$             ;;NO,GO CHECK FOR CONSOLE
013700  010037  013710                  MOV     R0,61$          ;;SETUP MESSAGE ADDRESS FOR APT
013704  004737  014772                  JSR     PC,$ATY3        ;;SPOOL MESSAGE TO APT
013710  000000                  61$:    .WORD   0               ;;MESSAGE ADDRESS
013712  132737  000040  001215  62$:    BITB    #APTCSUP,$ENVM  ;;APT CONSOLE SUPPRESSED
013720  001003                          BNE     60$             ;;YES,SKIP TYPE OUT
013722  112046                  2$:     MOVB    (R0)+,-(SP)     ;;PUSH CHARACTER TO BE TYPED ONTO STACK
013724  001005                          BNE     4$              ;;BR IF IT ISN'T THE TERMINATOR
013726  005726                          TST     (SP)+           ;;IF TERMINATOR POP IT OFF THE STACK
013730  012600                  60$:    MOV     (SP)+,R0        ;;RESTORE R0
013732  062716  000002          3$:     ADD     #2,(SP)         ;;ADJUST RETURN PC
013736  000002                          RTI                     ;;RETURN
013740  122716  000011          4$:     CMPB    #HT,(SP)        ;;BRANCH IF <HT>
013744  001430                          BEQ     8$
013746  122716  000200                  CMPB    #CRLF,(SP)      ;;BRANCH IF NOT <CRLF>
013752  001006                          BNE     5$
013754  005726                          TST     (SP)+           ;;POP  <CR><LF> EQUIV
013756  104401                          TYPE                    ;;TYPE A CR AND LF
013760  001171                          $CRLF
013762  105037  014116                  CLRB    $CHARCNT        ;;CLEAR CHARACTER COUNT
013766  000755                          BR      2$              ;;GET NEXT CHARACTER
013770  004737  014052          5$:     JSR     PC,$TYPEC       ;;GO TYPE THIS CHARACTER
013774  123726  001156          6$:     CMPB    $FILLC,(SP)+    ;;IS IT TIME FOR FILLER CHARS.?
014000  001350                          BNE     2$              ;;IF NO GO GET NEXT CHAR.
014002  013746  001154                  MOV     $NULL,-(SP)     ;;GET # OF FILLER CHARS. NEEDED
                                                                ;;AND THE NULL CHAR.
014006  105366  000001          7$:     DECB    1(SP)           ;;DOES A NULL NEED TO BE TYPED?
014012  002770                          BLT     6$              ;;BR IF NO--GO POP THE NULL OFF OF STACK
014014  004737  014052                  JSR     PC,$TYPEC       ;;GO TYPE A NULL
014020  105337  014116                  DECB    $CHARCNT        ;;DO NOT COUNT AS A COUNT
```

```
3396  014024  0( 770                    BR      7$              ;;LOOP
3397
3398                                  ;HORIZONTAL TAB PROCESSOR
3399
3400  014026  112716  000040          8$:     MOVB    #' ,(SP)        ;;REPLACE TAB WITH SPACE
3401  014032  004737  014052          9$:     JSR     PC,$TYPEC       ;;TYPE A SPACE
3402  014036  132737  000007  014116          BITB    #7,$CHARCNT     ;;BRANCH IF NOT AT
3403  014044  001372                          BNE     9$              ;;TAB STOP
3404  014046  005726                          TST     (SP)+           ;;POP SPACE OFF STACK
3405  014050  000724                          BR      2$              ;;GET NEXT CHARACTER
3406  014052  105777  165072          $TYPEC: TSTB    @$TPS           ;;WAIT UNTIL PRINTER IS READY
3407  014056  100375                          BPL     $TYPEC
3408  014060  116677  000002  165064        MOVB    2(SP),@$TPB     ;;LOAD CHAR TO BE TYPED INTO DATA REG.
3409  014066  122766  000015  000002        CMPB    #CR,2(SP)       ;;IS CHARACTER A CARRIAGE RETURN?
3410  014074  001003                        BNE     1$              ;;BRANCH IF NO
3411  014076  105037  014116                CLRB    $CHARCNT        ;;YES--CLEAR CHARACTER COUNT
3412  014102  000406                        BR      $TYPEX          ;;EXIT
3413  014104  122766  000012  000002  1$:   CMPB    #LF,2(SP)       ;;IS CHARACTER A LINE FEED?
3414  014112  001402                        BEQ     $TYPEX          ;;BRANCH IF YES
3415  014114  105227                        INCB    (PC)+           ;;COUNT THE CHARACTER
3416  014116  000000          $CHARCNT:.WORD  0               ;.CHARACTER COUNT STORAGE
3417  014120  000207          $TYPEX: RTS     PC
3418
```

```
3419                                    .SBTTL  TTY INPUT ROUTINE
3420
3421                                    ;;*******************************************************************
3422                                    .ENABL  LSB
3423
3424                                    ;;*******************************************************************
3425                                    ;*SOFTWARE SWITCH REGISTER CHANGE ROUTINE.
3426                                    ;*ROUTINE IS ENTERED FROM THE TRAP HANDLER, AND WILL
3427                                    ;*SERVICE THE TEST FOR CHANGE IN SOFTWARE SWITCH REGISTER TRAP CALL
3428                                    ;*WHEN OPERATING IN TTY FLAG MODE.
3429  014122  022737  000176  001140  $CKSWR: CMP     #SWREG,SWR      ;;IS THE SOFT-SWR SELECTED?
3430  014130  001114                          BNE     15$             ;;BRANCH IF NO
3431  014132  105777  165006                  TSTB    @$TKS           ;;CHAR THERE?
3432  014136  100111                          BPL     15$             ;;IF NO, DON'T WAIT AROUND
3433  014140  117746  165002                  MOVB    @$TKB,-(SP)     ;;SAVE THE CHAR
3434  014144  042716  177600                  BIC     #^C177,(SP)     ;;STRIP-OFF THE ASCII
3435  014150  022726  000007                  CMP     #7,(SP)+        ;;IS IT A CONTROL G?
3436  014154  001102                          BNE     15$             ;;NO, RETURN TO USER
3437  014156  123727  001134  000001          CMPB    $AUTOB,#1       ;;ARE WE RUNNING IN AUTO-MODE?
3438  014164  001476                          BEQ     15$             ;;BRANCH IF YES
3439
3440  014166  104401  014734                  TYPE    ,$CNTLG         ;;ECHO THE CONTROL-G (^G)
3441  014172  104401  014741          $GTSWR: TYPE    ,$MSWR          ;;TYPE CURRENT CONTENTS
3442  014176  013746  000176                  MOV     SWREG,-(SP)     ;;SAVE SWREG FOR TYPEOUT
3443  014202  104402                          TYPOC                   ;;GO TYPE--OCTAL ASCII(ALL DIGITS)
3444  014204  104401  014752                  TYPE    ,$MNEW          ;;PROMPT FOR NEW SWR
3445  014210  005046                  19$:    CLR     -(SP)           ;;CLEAR COUNTER
3446  014212  005046                          CLR     -(SP)           ;;THE NEW SWR
3447  014214  105777  164724          7$:     TSTB    @$TKS           ;;CHAR THERE?
3448  014220  100375                          BPL     7$              ;;IF NOT TRY AGAIN
3449
3450  014222  117746  164720                  MOVB    @$TKB,-(SP)     ;;PICK UP CHAR
3451  014226  042716  177600                  BIC     #^C177,(SP)     ;;MAKE IT 7-BIT ASCII
3452
3453  014232  021627  000003                  CMP     (SP),#3         ;;IS IT A CONTROL-C?
3454  014236  001C15                          BNE     9$              ;;BRANCH IF NOT
3455  014240  104401  014722                  TYPE    ,$CNTLC         ;;YES, ECHO CONTROL-C (^C)
3456  014244  062706  000006                  ADD     #6,SP           ;;CLEAN UP STACK
3457  014250  123727  001135  000001          CMPB    $INTAG,#1       ;;REENABLE TTY KEYBOARD INTERRUPTS?
3458  014256  001003                          BNE     8$              ;;BRANCH IF NO
3459  014260  012777  000100  164656          MOV     #100,@$TKS      ;;ALLOW TTY KEYBOARD INTERRUPTS
3460  014266  000137  012316          8$:     JMP     GT$DEV          ;;CONTROL-C RESTART
3461
3462
3463  014272  021627  000025          9$:     CMP     (SP),#25        ;;IS IT A CONTROL-U?
3464  014276  001005                          BNE     10$             ;;BRANCH IF NOT
3465  014300  104401  014727                  TYPE    ,$CNTLU         ;;YES, ECHO CONTROL-U (^U)
3466  014304  062706  0000C6          20$:    ADD     #6,SP           ;;IGNORE PREVIOUS INPUT
3467  014310  000737                          BR      19$             ;;LET'S TRY IT AGAIN
3468
3469
3470  014312  021627  000015          10$:    CMP     (SP),#15        ;;IS IT A <CR>?
3471  014316  001022                          BNE     16$             ;;BRANCH IF NO
3472  014320  005766  000004                  TST     4(SP)           ;;YES, IS IT THE FIRST CHAR?
3473  014324  001403                          BEQ     11$             ;;BRANCH IF YES
3474  014326  016677  000002  164604          MOV     2(SP),@SWR      ;;SAVE NEW SWR
```

```
3475  014334  062706  000006          11$:    ADD     #6,SP           ;;CLEAR UP STACK
3476  014340  104401  001171          14$:    TYPE    ,$CRLF          ;;ECHO <CR> AND <LF>
3477  014344  123727  001135  000001          CMPB    $INTAG,#1       ;;RE-ENABLE TTY KBD INTERRUPTS?
3478  014352  001003                          BNE     15$             ;;BRANCH IF NOT
3479  014354  012777  000100  164562          MOV     #100,@$TKS      ;;RE-ENABLE TTY KBD INTERRUPTS
3480  014362  000002                  15$:    RTI                     ;;RETURN
3481  014364  004737  014052          16$:    JSR     PC,$TYPEC       ;;ECHO CHAR
3482  014370  021627  000060                  CMP     (SP),#60        ;;CHAR < 0?
3483  014374  002420                          BLT     18$             ;;BRANCH IF YES
3484  014376  021627  000067                  CMP     (SP),#67        ;;CHAR > 7?
3485  014402  003015                          BGT     18$             ;;BRANCH IF YES
3486  014404  042726  000060                  BIC     #60,(SP)+       ;;STRIP-OFF ASCII
3487  014410  005766  000002                  TST     2(SP)           ;;IS THIS THE FIRST CHAR
3488  014414  001403                          BEQ     17$             ;;BRANCH IF YES
3489  014416  006316                          ASL     (SP)            ;;NO, SHIFT PRESENT
3490  014420  006316                          ASL     (SP)            ;;   CHAR OVER TO MAKE
3491  014422  006316                          ASL     (SP)            ;;   ROOM FOR NEW ONE.
3492  014424  005266  000002          17$:    INC     2(SP)           ;;KEEP COUNT OF CHAR
3493  014430  056616  177776                  BIS     -2(SP),(SP)     ;;SET IN NEW CHAR
3494  014434  000667                          BR      7$              ;;GET THE NEXT ONE
3495  014436  104401  001170          18$:    TYPE    ,$QUES          ;;TYPE ?<CR><LF>
3496  014442  000720                          BR      20$             ;;SIMULATE CONTROL-U
3497                                  .DSABL  LSB
3498
3499
3500                                  ;;**************************************************************
3501                                  ;*THIS ROUTINE WILL INPUT A SINGLE CHARACTER FROM THE TTY
3502                                  ;*CALL:
3503                                  ;*      RDCHR                   ;;INPUT A SINGLE CHARACTER FROM THE TTY
3504                                  ;*      RETURN HERE             ;;CHARACTER IS ON THE STACK
3505                                  ;*                              ;;WITH PARITY BIT STRIPPED OFF
3506                                  ;
3507
3508  014444  011646          $RDCHR: MOV     (SP),-(SP)      ;;PUSH DOWN THE PC
3509  014446  016666  000004  000002          MOV     4(SP),2(SP)     ;;SAVE THE PS
3510  014454  105777  164464          1$:     TSTB    @$TKS           ;;WAIT FOR
3511  014460  100375                          BPL     1$              ;;A CHARACTER
3512  014462  117766  164460  000004          MOVB    @$TKB,4(SP)     ;;READ THE TTY
3513  014470  042766  177600  000004          BIC     #^C<177>,4(SP)  ;;GET RID OF JUNK IF ANY
3514  014476  026627  000004  000023          CMP     4(SP),#23       ;;IS IT A CONTROL-S?
3515  014504  001013                          BNE     3$              ;;BRANCH IF NO
3516  014506  105777  164432          2$:     TSTB    @$TKS           ;;WAIT FOR A CHARACTER
3517  014512  100375                          BPL     2$              ;;LOOP UNTIL ITS THERE
3518  014514  117746  164426                  MOVB    @$TKB,-(SP)     ;;GET CHARACTER
3519  014520  042716  177600                  BIC     #^C177,(SP)     ;;MAKE IT 7-BIT ASCII
3520  014524  022627  000021                  CMP     (SP)+,#21       ;;IS IT A CONTROL-Q?
3521  014530  001366                          BNE     2$              ;;IF NOT DISCARD IT
3522  014532  000750                          BR      1$              ;;YES, RESUME
3523  014534  026627  000004  000140  3$:     CMP     4(SP),#140      ;;IS IT UPPER CASE?
3524  014542  002407                          BLT     4$              ;;BRANCH IF YES
3525  014544  026627  000004  000175          CMP     4(SP),#175      ;;IS IT A SPECIAL CHAR?
3526  014552  003003                          BGT     4$              ;;BRANCH IF YES
3527  014554  042766  000040  000004          BIC     #40,4(SP)       ;;MAKE IT UPPER CASE
3528  014562  000002                  4$:     RTI                     ;;GO BACK TO USER
3529                                  ;;**************************************************************
3530                                  ;*THIS ROUTINE WILL INPUT A STRING FROM THE TTY
```

```
                                        ;*CALL:
                                        ;*      RDLIN                   ;;INPUT A STRING FROM THE TTY
                                        ;*      RETURN HERE             ;;ADDRESS OF FIRST CHARACTER WILL BE ON THE STACK
                                        ;*                              ;;TERMINATOR WILL BE A BYTE OF ALL 0'S
                                        ;
014564  010346                 $RDLIN: MOV     R3,-(SP)                ;;SAVE R3
014566  012703  014712          1$:     MOV     #$TTYIN,R3              ;;GET ADDRESS
014572  022703  014722          2$:     CMP     #$TTYIN+8.,R3           ;;BUFFER FULL?
014576  101415                          BLOS    4$                      ;;BR IF YES
014600  104410                          RDCHR                           ;;GO READ ONE CHARACTER FROM THE TTY
014602  112613                          MOVB    (SP)+,(R3)              ;;GET CHARACTER
014604  122713  000003                  CMPB    #3,(R3)                 ;;IS IT A CONTROL-C?
014610  001005                          BNE     10$                     ;;BRANCH IF NO
014612  104401  014722                  TYPE    ,$CNTLC                 ;;TYPE A CONTROL-C (^C)
014616  012603                          MOV     (SP)+,R3                ;;RESTORE R3
014620  000137  012316                  JMP     GT$DEV                  ;;GOTO CONTROL-C RESTART
014624  122713  000177          10$:    CMPB    #177,(R3)               ;;IS IT A RUBOUT
014630  001003                          BNE     3$                      ;;SKIP IF NOT
014632  104401  001170          4$:     TYPE    ,$QUES                  ;;TYPE A '?'
014636  000753                          BR      1$                      ;;CLEAR THE BUFFER AND LOOP
014640  111337  014710          3$:     MOVB    (R3),9$                 ;;ECHO THE CHARACTER
014644  104401  014710                  TYPE    ,9$
014650  122723  000015                  CMPB    #15,(R3)+               ;;CHECK FOR RETURN
014654  001346                          BNE     2$                      ;;LOOP IF NOT RETURN
014656  105063  177777                  CLRB    -1(R3)                  ;;CLEAR RETURN (THE 15)
014662  104401  001172                  TYPE    ,$LF                    ;;TYPE A LINE FEED
014666  012603                          MOV     (SP)+,R3                ;;RESTORE R3
014670  011646                          MOV     (SP),-(SP)              ;;ADJUST THE STACK AND PUT ADDRESS OF THE
014672  016666  000004  000002          MOV     4(SP),2(SP)             ;;      FIRST ASCII CHARACTER ON IT
014700  012766  014712  000004          MOV     #$TTYIN,4(SP)
014706  000002                          RTI                             ;;RETURN
014710     000                  9$:     .BYTE   0                       ;;STORAGE FOR ASCII CHAR. TO TYPE
014711     000                          .BYTE   0                       ;;TERMINATOR
014712  000010                  $TTYIN: .BLKB   8.                      ;;RESERVE 8 BYTES FOR TTY INPUT
014722  041536  005015     000  $CNTLC: .ASCIZ  /^C/<15><12>            ;;CONTROL "C"
014727     136  006525  000012  $CNTLU: .ASCIZ  /^U/<15><12>            ;;CONTROL "U"
014734  043536  005015     000  $CNTLG: .ASCIZ  /^G/<15><12>            ;;CONTROL "G"
014741     015  051412  051127  $MSWR:  .ASCIZ  <15><12>/SWR - /
014746  036440  000040
014752  020040  042516  020127  $MNEW:  .ASCIZ  /  NEW = /
014760  020075     000
014764                          .EVEN
```

```
                                        .SBTTL  APT COMMUNICATIONS ROUTINE
                                        ;;*****************************************************************
015010 010046                           $ATY1:  MOV     R0,-(SP)        ;;PUSH R0 ON STACK
015012 010146                           $ATY3:  MOV     R1,-(SP)        ;;PUSH R1 ON STACK
015014 105737 015226                    $ATY4:  TSTB    $MFLG           ;;SHOULD TYPE A MESSAGE?
015020 001450                           $ATYC:  BEQ     5$              ;;IF NOT:  BR
015022 122737 000001 001214                     CMPB    #APTENV,$ENV    ;;OPERATING UNDER APT?
015030 001031                                   BNE     3$              ;;IF NOT:  BR
015032 132737 000100 001215                     BITB    #APTSPOOL,$ENVM ;;SHOULD SPOOL MESSAGES?
015040 001425                                   BEQ     3$              ;;IF NOT:  BR
015042 017600 000004                            MOV     @4(SP),R0       ;;GET MESSAGE ADDR.
015046 062766 000002 000004                     ADD     #2,4(SP)                ;;BUMP RETURN ADDR.
015054 005737 001174                    1$:     TST     $MSGTYPE        ;;SEE IF DONE W/ LAST XMISSION?
015060 001375                                   BNE     1$              ;;IF NOT:  WAIT
015062 010037 001210                            MOV     R0,$MSGAD       ;;PUT ADDR IN MAILBOX
015066 105720                           2$:     TSTB    (R0)+           ;;FIND END OF MESSAGE
015070 001376                                   BNE     2$
015072 163700 001210                            SUB     $MSGAD,R0       ;;SUB START OF MESSAGE
015076 006200                                   ASR     R0              ;;GET MESSAGE LNGTH IN WORDS
015100 010037 001212                            MOV     R0,$MSGLGT      ;;PUT LENGTH IN MAILBOX
015104 012737 000004 001174                     MOV     #4,$MSGTYPE     ;;TELL APT TO TAKE MSG.
015112 000413                                   BR      5$
015114 017637 000004 015140             3$:     MOV     @4(SP),4$       ;;PUT MSG ADDR IN JSR LINKAGE
015122 062766 000002 000004                     ADD     #2,4(SP)                ;;BUMP RETURN ADDRESS
015130 013746 177776                            MOV     177776,-(SP)    ;;PUSH 177776 ON STACK
015134 004737 013640                            JSR     PC,$TYPE        ;;CALL TYPE MACRO
015140 000000                           4$:     .WORD   0
015142                                  5$:
015142 105737 015230                    10$:    TSTB    $FFLG           ;;SHOULD REPORT FATAL ERROR?
015146 001416                                   BEQ     12$             ;;IF NOT:  BR
015150 005737 001214                            TST     $ENV            ;;RUNNING UNDER APT?
015154 001413                                   BEQ     12$             ;;IF NOT:  BR
015156 005737 001174                    11$:    TST     $MSGTYPE        ;;FINISHED LAST MESSAGE?
015162 001375                                   BNE     11$             ;;IF NOT:  WAIT
015164 017637 000004 001176                     MOV     @4(SP),$FATAL   ;;GET ERROR #
015172 062766 000002 000004                     ADD     #2,4(SP)                ;;BUMP RETURN ADDR.
015200 005237 001174                            INC     $MSGTYPE        ;;TELL APT TO TAKE ERROR
015204 105037 015230                    12$:    CLRB    $FFLG           ;;CLEAR FATAL FLAG
015210 105037 015227                            CLRB    $LFLG           ;;CLEAR LOG FLAG
015214 105037 015226                            CLRB    $MFLG           ;;CLEAR MESSAGE FLAG
015220 012601                                   MOV     (SP)+,R1        ;;POP STACK INTO R1
015222 012600                                   MOV     (SP)+,R0        ;;POP STACK INTO R0
015224 000207                                   RTS     PC              ;;RETURN
015226    000                           $MFLG:  .BYTE   0               ;;MESSG. FLAG
015227    000                           $LFLG:  .BYTE   0               ;;LOG FLAG
015230    000                           $FFLG:  .BYTE   0               ;;FATAL FLAG
015232                                          .EVEN
000200                                  APTSIZE=200
000001                                  APTENV=001
000100                                  APTSPOOL=100
```

```
3629          000040                  APTCSUP=040
```

```
                                .SBTTL  ERROR HANDLER ROUTINE

                                ;;*******************************************************************
                                ;*THIS ROUTINE WILL INCREMENT THE ERROR FLAG AND THE ERROR COUNT,
                                ;*SAVE THE ERROR ITEM NUMBER AND THE ADDRESS OF THE ERROR CALL
                                ;*AND GO TO MYTYPE ON ERROR
                                ;*THE SWITCH OPTIONS PROVIDED BY THIS ROUTINE ARE:
                                ;*SW15=1         HALT ON ERROR
                                ;*SW13-1         INHIBIT ERROR TYPEOUTS
                                ;*SW10-1         BELL ON ERROR
                                ;*SW09=1         LOOP ON ERROR
                                ;*CALL
                                ;*      ERROR   N       ;;ERROR-EMT AND N ERROR ITEM NUMBER

015232                          $ERROR:
015232  104407                          CKSWR                   ;;TEST FOR CHANGE IN SOFT-SWR
015234  105237  001103          7$:     INCB    $ERFLG          ;;SET THE ERROR FLAG
015240  001775                          BEQ     7$              ;;DON'T LET THE FLAG GO TO ZERO
015242  013777  001102  163672          MOV     $TSTNM,@DISPLAY ;;DISPLAY TEST NUMBER AND ERROR FLAG
015250  032777  002000  163662          BIT     #BIT10,@SWR     ;;BELL ON ERROR?
015256  001402                          BEQ     1$              ;;NO - SKIP
015260  104401  001164                  TYPE    ,$BELL          ;;RING BELL
015264  005237  001112          1$:     INC     $ERTTL          ;;COUNT THE NUMBER OF ERRORS
015270  011637  001116                  MOV     (SP),$ERRPC     ;;GET ADDRESS OF ERROR INSTRUCTION
015274  162737  000002  001116          SUB     #2,$ERRPC
015302  117737  163610  001114          MOVB    @$ERRPC,$ITEMB  ;;STRIP AND SAVE THE ERROR ITEM CODE
015310  032777  020000  163622          BIT     #BIT13,@SWR     ;;SKIP TYPEOUT IF SET
015316  001004                          BNE     20$             ;;SKIP TYPEOUTS
015320  004737  012642                  JSR     PC,MYTYPE       ;;GO TO USER ERROR ROUTINE
015324  104401  001171                  TYPE    ,$CRLF
015330                          20$:
015330  122737  000001  001214          CMPB    #APTENV,$ENV    ;;RUNNING IN APT MODE
015336  001007                          BNE     2$              ;;NO,SKIP APT ERROR REPORT
015340  113737  001114  015352          MOVB    $ITEMB,21$      ;;SET ITEM NUMBER AS ERROR NUMBER
015346  004737  015002                  JSR     PC,$ATY4        ;;REPORT FATAL ERROR TO APT
015352     000                  21$:    .BYTE   0
015353     000                          .BYTE   0
015354  000777                  22$:    BR      22$             ;;APT ERROR LOOP
015356  005777  163556          2$:     TST     @SWR            ;;HALT ON ERROR
015362  100002                          BPL     3$              ;;SKIP IF CONTINUE
015364  000000                          HALT                    ;;HALT ON ERROR!
015366  104407                          CKSWR                   ;;TEST FOR CHANGE IN SOFT-SWR
015370  032777  001000  163542  3$:     BIT     #BIT09,@SWR     ;;LOOP ON ERROR SWITCH SET?
015376  001402                          BEQ     4$              ;;BR IF NO
015400  013716  001110                  MOV     $LPERR,(SP)     ;;FUDGE RETURN FOR LOOPING
015404  005737  001162          4$:     TST     $ESCAPE         ;;CHECK FOR AN ESCAPE ADDRESS
015410  001402                          BEQ     5$              ;;BR IF NONE
015412  013716  001162                  MOV     $ESCAPE,(SP)    ;;FUDGE RETURN ADDRESS FOR ESCAPE
015416                          5$:
015416  022737  013422  000042          CMP     #$ENDAD,@#42    ;;ACT-11 AUTO-ACCEPT?
015424  001001                          BNE     6$              ;;BRANCH IF NO
015426  000000                          HALT                    ;;YES
015430                          6$:
015430  000002                          RTI                     ;;RETURN
```

```
                        .SBTTL  SCOPE HANDLER ROUTINE

                        ;;*********************************************************************
                        ;*THIS ROUTINE CONTROLS THE LOOPING OF SUBTESTS. IT WILL INCREMENT
                        ;*AND LOAD THE TEST NUMBER($TSTNM) INTO THE DISPLAY REG.(DISPLAY<7:0>)
                        ;*AND LOAD THE ERROR FLAG ($ERFLG) INTO DISPLAY<15:08>
                        ;*THE SWITCH OPTIONS PROVIDED BY THIS ROUTINE ARE:
                        ;*SW14=1         LOOP ON TEST
                        ;*SW11=1         INHIBIT ITERATIONS
                        ;*SW09=1         LOOP ON ERROR
                        ;*SW08=1         LOOP ON TEST IN SWR<7:0>
                        ;*CALL
                        ;*      SCOPE           ;;SCOPE=IOT

015432                  $SCOPE:
015432  104407                 CKSWR                   ;;TEST  FOR CHANGE IN SOFT-SWR
015434  032777  040000  163476 1$:     BIT     #BIT14,@SWR     ;;LOOP ON PRESENT TEST?
015442  001114                 BNE     $OVER           ;;YES IF SW14=1
                        ;#####START OF CODE FOR THE XOR TESTER#####
015444  000416          $XTSTR: BR      6$              ;;IF RUNNING ON THE "XOR" TESTER CHANCE
                                                        ;;THIS INSTRUCTION TO A "NOP" (NOP 240)
015446  013746  000004         MOV     @#ERRVEC,-(SP)  ;;SAVE THE CONTENTS OF THE ERROR VECTOR
015452  012737  015472  000004 MOV     #5$,@#ERRVEC    ;;SET FOR TIMEOUT
015460  005737  177060         TST     @#177060        ;;TIME OUT ON XOR?
015464  012637  000004         MOV     (SP)+,@#ERRVEC  ;;RESTORE THE ERROR VECTOR
015470  000463                 BR      $SVLAD          ;;GO TO THE NEXT TEST
015472  022626          5$:     CMP     (SP)+,(SP)+     ;;CLEAR THE STACK AFTER A TIME OUT
015474  012637  000004         MOV     (SP)+,@#ERRVEC  ;;RESTORE THE  ?ROR VECTOR
015500  000423                 BR      7$              ;;LOOP ON THE  'RESENT TEST
015502                  6$:;#####END OF CODE FOR THE XOR TESTER#####
015502  032777  000400  163430         BIT     #BIT08,@SWR     ;;LOOP ON SPEC. TEST?
015510  001404                 BEQ     2$              ;;BR IF NO
015512  127737  163422  001102         CMPB    @SWR,$TSTNM     ;;ON THE RIGHT TEST?    SWR<7:0>
015520  001465                 BEQ     $OVER           ;;BR IF  ES
015522  105737  001103  2$:     TSTB    $ERFLG          ;;HAS AN ERROR OCCURRED?
015526  001421                 BEQ     3$              ;;BR IF NO
015530  123737  001115  001103         CMPB    $ERMAX,$ERFLG   ;;MAX. ERRORS FOR THIS TEST OCCURRED?
015536  101015                 BHI     3$              ;;BR IF NO
015540  032777  001000  163372         BIT     #BIT09,@SWR     ;;LOOP ON ERROR?
015546  001404                 BEQ     4$              ;;BR IF NO
015550  013737  001110  001106 7$:     MOV     $LPERR,$LPADR   ;;SET LOOP ADDRESS TO LAST SCOPE
015556  000446                 BR      $OVER
015560  105037  001103  4$:     CLRB    $ERFLG          ;;ZERO THE ERROR FLAG
015564  005037  001160         CLR     $TIMES          ;;CLEAR THE NUMBER OF ITERATIONS TO MAKE
015570  000415                 BR      1$              ;;ESCAPE TO THE NEXT TEST
015572  032777  004000  163340 3$:     BIT     #BIT11,@SWR     ;;INHIBIT ITERATIONS?
015600  001011                 BNE     1$              ;;BR IF YES
015602  005737  001202         TST     $PASS           ;;IF FIRST PASS OF PROGRAM
015606  001406                 BEQ     1$              ;;      INHIBIT ITERATIONS
015610  005237  001104         INC     $ICNT           ;;INCREMENT ITERATION COUNT
015614  023737  001160  001104 CMP     $TIMES,$ICNT    ;;CHECK THE NUMBER OF ITERATIONS MADE
015622  002024                 BGE     $OVER           ;;BR IF MORE ITERATION REQUIRED
015624  012737  000001  001104 1$:     MOV     #1,$ICNT        ;;REINITIALIZE THE ITERATION COUNTER
015632  013737  015710  001160         MOV     $MXCNT,$TIMES   ;;SET NUMBER OF ITERATIONS TO DO
015640  105237  001102  $SVLAD: INCB    $TSTNM          ;;COUNT TEST NUMBERS
015644  113737  001102  001200         MOVB    $TSTNM,$TESTN   ;;SET TEST NUMBER IN APT MAILBOX
```

```
 3740  015652  011637  001106                  MOV     (SP),$LPADR     ;;SAVE SCOPE LOOP ADDRESS
 3741  015656  011637  001110                  MOV     (SP),$LPERR     ;;SAVE ERROR LOOP ADDRESS
 3742  015662  005037  001162                  CLR     $ESCAPE         ;;CLEAR THE ESCAPE FROM ERROR ADDRESS
 3743  015666  112737  000001  001115          MOVB    #1,$ERMAX       ;;ONLY ALLOW ONE(1) ERROR ON NEXT TEST
 3744  015674  013777  001102  163240  $OVER:  MOV     $ISTNM,@DISPLAY ;;DISPLAY TEST NUMBER
 3745  015702  013716  001106                  MOV     $LPADR,(SP)     ;;FUDGE RETURN ADDRESS
 3746  015706  000002                          RTI                     ;;FIXES PS
 3747  015710  003720                  $MXCNT: 2000.                   ;;MAX. NUMBER OF ITERATIONS
```

```
                                .SBTTL  CONVERT BINARY TO DECIMAL AND TYPE ROUTINE

                                ;;*****************************************************************
                                ;*THIS ROUTINE IS USED TO CHANGE A 16-BIT BINARY NUMBER TO A 5-DIGIT
                                ;*SIGNED DECIMAL (ASCII) NUMBER AND TYPE IT. DEPENDING ON WHETHER THE
                                ;*NUMBER IS POSITIVE OR NEGATIVE A SPACE OR A MINUS SIGN WILL BE TYPED
                                ;*BEFORE THE FIRST DIGIT OF THE NUMBER. LEADING ZEROS WILL ALWAYS BE
                                ;*REPLACED WITH SPACES.
                                ;*CALL:
                                ;*      MOV     NUM,-(SP)       ;;PUT THE BINARY NUMBER ON THE STACK
                                ;*      TYPDS                   ;;GO TO THE ROUTINE

015712                          $TYPDS:
015712  010046                         MOV     R0,-(SP)        ;;PUSH R0 ON STACK
015714  010146                         MOV     R1,-(SP)        ;;PUSH R1 ON STACK
015716  010246                         MOV     R2,-(SP)        ;;PUSH R2 ON STACK
015720  010346                         MOV     R3,-(SP)        ;;PUSH R3 ON STACK
015722  010546                         MOV     R5,-(SP)        ;;PUSH R5 ON STACK
015724  012746  020200                 MOV     #20200,-(SP)    ;;SET BLANK SWITCH AND SIGN
015730  016605  000020                 MOV     20(SP),R5       ;;GET THE INPUT NUMBER
015734  100004                         BPL     1$              ;;BR IF INPUT IS POS.
015736  005405                         NEG     R5              ;;MAKE THE BINARY NUMBER POS.
015740  112766  000055  000001         MOVB    #'-,1(SP)       ;;MAKE THE ASCII NUMBER NEG.
015746  005000                 1$:     CLR     R0              ;;ZERO THE CONSTANTS INDEX
015750  012703  016126                 MOV     #$DBLK,R3       ;;SETUP THE OUTPUT POINTER
015754  112723  000040                 MOVB    #' ,(R3)+       ;;SET THE FIRST CHARACTER TO A BLANK
015760  005002                 2$:     CLR     R2              ;;CLEAR THE BCD NUMBER
015762  016001  016116                 MOV     $DTBL(R0),R1    ;;GET THE CONSTANT
015766  160105                 3$:     SUB     R1,R5           ;;FORM THIS BCD DIGIT
015770  002402                         BLT     4$              ;;BR IF DONE
015772  005202                         INC     R2              ;;INCREASE THE BCD DIGIT BY 1
015774  000774                         BR      3$
015776  060105                 4$:     ADD     R1,R5           ;;ADD BACK THE CONSTANT
016000  005702                         TST     R2              ;;CHECK IF BCD DIGIT=0
016002  001002                         BNE     5$              ;;FALL THROUGH IF 0
016004  105716                         TSTB    (SP)            ;;STILL DOING LEADING 0'S?
016006  100407                         BMI     7$              ;;BR IF YES
016010  106316                 5$:     ASLB    (SP)            ;;MSD?
016012  103003                         BCC     6$              ;;BR IF NO
016014  116663  000001  177777         MOVB    1(SP),-1(R3)    ;;YES--SET THE SIGN
016022  052702  000060         6$:     BIS     #'0,R2          ;;MAKE THE BCD DIGIT ASCII
016026  052702  000040         7$:     BIS     #' ,R2          ;;MAKE IT A SPACE IF NOT ALREADY A DIGIT
016032  110223                         MOVB    R2,(R3)+        ;;PUT THIS CHARACTER IN THE OUTPUT BUFFER
016034  005720                         TST     (R0)+           ;;JUST INCREMENTING
016036  020027  000010                 CMP     R0,#10          ;;CHECK THE TABLE INDEX
016042  002746                         BLT     2$              ;;GO DO THE NEXT DIGIT
016044  003002                         BGT     8$              ;;GO TO EXIT
016046  010502                         MOV     R5,R2           ;;GET THE LSD
016050  000764                         BR      6$              ;;GO CHANGE TO ASCII
016052  105726                 8$:     TSTB    (SP)+           ;;WAS THE LSD THE FIRST NON-ZERO?
016054  100003                         BPL     9$              ;;BR IF NO
016056  116663  177777  177776         MOVB    -1(SP),-2(R3)   ;;YES--SET THE SIGN FOR TYPING
016064  105013                 9$:     CLRB    (R3)            ;;SET THE TERMINATOR
016066  012605                         MOV     (SP)+,R5        ;;POP STACK INTO R5
016070  012603                         MOV     (SP)+,R3        ;;POP STACK INTO R3
016072  012602                         MOV     (SP)+,R2        ;;POP STACK INTO R2
```

```
3804  016074  012601                  MOV     (SP)+,R1        ;;POP STACK INTO R1
3805  016076  012600                  MOV     (SP)+,R0        ;;POP STACK INTO R0
3806  016100  104401  016126          TYPE    ,$DBLK          ;;NOW TYPE THE NUMBER
3807  016104  016666  000002  000004  MOV     2(SP),4(SP)     ;;ADJUST THE STACK
3808  016112  012616                  MOV     (SP)+,(SP)
3809  016114  000002                  RTI                     ;;RETURN TO USER
3810  016116  023420          $DTBL:  10000.
3811  016120  001750                  1000.
3812  016122  000144                  100.
3813  016124  000012                  10.
3814  016126  000004          $DBLK:  .BLKW   4
```

```
                                .SBTTL  BINARY TO OCTAL (ASCII) AND TYPE

                                ;;*****************************************************************
                                ;*THIS ROUTINE IS USED TO CHANGE A 16-BIT BINARY NUMBER TO A 6-DIGIT
                                ;*OCTAL (ASCII) NUMBER AND TYPE IT.
                                ;*$TYPOS---ENTER HERE TO SETUP SUPPRESS ZEROS AND NUMBER OF DIGITS TO TYPE
                                ;*CALL:
                                ;*      MOV     NUM,-(SP)       ;;NUMBER TO BE TYPED
                                ;*      TYPOS                   ;;CALL FOR TYPEOUT
                                ;*      .BYTE   N               ;;N-1 TO 6 FOR NUMBER OF DIGITS TO TYPE
                                ;*      .BYTE   M               ;;M 1 OR 0
                                ;*                                      ;;1=TYPE LEADING ZEROS
                                ;*                                      ;;0=SUPPRESS LEADING ZEROS
                                ;*
                                ;*$TYPON----ENTER HERE TO TYPE OUT WITH THE SAME PARAMETERS AS THE LAST
                                ;*$TYPOS OR $TYPOC
                                ;*CALL:
                                ;*      MOV     NUM,-(SP)       ;;NUMBER TO BE TYPED
                                ;*      TYPON                   ;;CALL FOR TYPEOUT
                                ;*
                                ;*$TYPOC---ENTER HERE FOR TYPEOUT OF A 16 BIT NUMBER
                                ;*CALL:
                                ;*      MOV     NUM,-(SP)       ;;NUMBER TO BE TYPED
                                ;*      TYPOC                   ;;CALL FOR TYPEOUT

016136  017646  000000          $TYPOS: MOV     @(SP),-(SP)     ;;PICKUP THE MODE
016142  116637  000001  016361          MOVB    1(SP),$OFILL    ;;LOAD ZERO FILL SWITCH
016150  112637  016363                  MOVB    (SP)+,$OMODE+1  ;;NUMBER OF DIGITS TO TYPE
016154  062716  000002                  ADD     #2,(SP)         ;;ADJUST RETURN ADDRESS
016160  000406                          BR      $TYPON
016162  112737  000001  016361  $TYPOC: MOVB    #1,$OFILL       ;;SET THE ZERO FILL SWITCH
016170  112737  000006  016363          MOVB    #6,$OMODE+1     ;;SET FOR SIX(6) DIGITS
016176  112737  000005  016360  $TYPON: MOVB    #5,$OCNT        ;;SET THE ITERATION COUNT
016204  010346                          MOV     R3,-(SP)        ;;SAVE R3
016206  010446                          MOV     R4,-(SP)        ;;SAVE R4
016210  010546                          MOV     R5,-(SP)        ;;SAVE R5
016212  113704  016363                  MOVB    $OMODE+1,R4     ;;GET THE NUMBER OF DIGITS TO TYPE
016216  005404                          NEG     R4
016220  062704  000006                  ADD     #6,R4           ;;SUBTRACT IT FOR MAX. ALLOWED
016224  110437  016362                  MOVB    R4,$OMODE       ;;SAVE IT FOR USE
016230  113704  016361                  MOVB    $OFILL,R4       ;;GET THE ZERO FILL SWITCH
016234  016605  000012                  MOV     12(SP),R5       ;;PICKUP THE INPUT NUMBER
016240  005003                          CLR     R3              ;;CLEAR THE OUTPUT WORD
016242  006105                  1$:     ROL     R5              ;;ROTATE MSB INTO "C"
016244  000404                          BR      3$              ;;GO DO MSB
016246  006105                  2$:     ROL     R5              ;;FORM THIS DIGIT
016250  006105                          ROL     R5
016252  006105                          ROL     R5
016254  010503                          MOV     R5,R3
016256  006103                  3$:     ROL     R3              ;;GET LSB OF THIS DIGIT
016260  105337  016362                  DECB    $OMODE          ;;TYPE THIS DIGIT?
016264  100016                          BPL     7$              ;;BR IF NO
016266  042703  177770                  BIC     #177770,R3      ;;GET RID OF JUNK
016272  001002                          BNE     4$              ;;TEST FOR 0
016274  005704                          TST     R4              ;;SUPPRESS THIS 0?
016276  001403                          BEQ     5$              ;;BR IF YES
```

```
 3871  016300  005204                  4$:     INC     R4              ;;DON'T SUPPRESS ANYMORE 0'S
 3872  016302  052703  000060                  BIS     #'0,R3          ;;MAKE THIS DIGIT ASCII
 3873  016306  052703  000040          5$:     BIS     #' ,R3          ;;MAKE ASCII IF NOT ALREADY
 3874  016312  110337  016356                  MOVB    R3,8$           ;;SAVE FOR TYPING
 3875  016316  104401  016356                  TYPE    ,8$             ;;GO TYPE THIS DIGIT
 3876  016322  105337  016360          7$:     DECB    $OCNT           ;;COUNT BY 1
 3877  016326  003347                  .       BGT     2$              ;;BR IF MORE TO DO
 3878  016330  002402                          BLT     6$              ;;BR IF DONE
 3879  016332  005204                          INC     R4              ;;INSURE LAST DIGIT ISN'T A BLANK
 3880  016334  000744                          BR      2$              ;;GO DO THE LAST DIGIT
 3881  016336  012605                  6$:     MOV     (SP)+,R5        ;;RESTORE R5
 3882  016340  012604                          MOV     (SP)+,R4        ;;RESTORE R4
 3883  016342  012603                          MOV     (SP)+,R3        ;;RESTORE R3
 3884  016344  016666  000002  000004         MOV     2(SP),4(SP)     ;;SET THE STACK FOR RETURNING
 3885  016352  012616                          MOV     (SP)+,(SP)
 3886  016354  000002                          RTI                     ;;RETURN
 3887  016356     000                  8$:     .BYTE   0               ;;STORAGE FOR ASCII DIGIT
 3888  016357     000                          .BYTE   0               ;;TERMINATOR FOR TYPE ROUTINE
 3889  016360     000                  $OCNT:  .BYTE   0               ;;OCTAL DIGIT COUNTER
 3890  016361     000                  $OFILL: .BYTE   0               ;;ZERO FILL SWITCH
 3891  016362  000000                  $OMODE: .WORD   0               ;;NUMBER OF DIGITS TO TYPE
```

```
                                        .SBTTL  TRAP DECODER

                                        ;;**************************************************************
                                        ;*THIS ROUTINE WILL PICKUP THE LOWER BYTE OF THE "TRAP" INSTRUCTION
                                        ;*AND USE IT TO INDEX THROUGH THE TRAP TABLE FOR THE STARTING ADDRESS
                                        ;*OF THE DESIRED ROUTINE. THEN USING THE ADDRESS OBTAINED IT WILL
                                        ;*GO TO THAT ROUTINE.

016364  010046                  $TRAP:  MOV     R0,-(SP)        ;;SAVE R0
016366  016600  000002                  MOV     2(SP),R0        ;;GET TRAP ADDRESS
016372  005740                          TST     -(R0)           ;;BACKUP BY 2
016374  111000                          MOVB    (R0),R0         ;;GET RIGHT BYTE OF TRAP
016376  006300                          ASL     R0              ;;POSITION FOR INDEXING
016400  016000  016420                  MOV     $TRPAD(R0),R0   ;;INDEX TO TABLE
016404  000200                          RTS     R0              ;;GO TO ROUTINE

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

016406  011646                  $TRAP2: MOV     (SP),-(SP)      ;;MOVE THE PC DOWN
016410  016666  000004  000002          MOV     4(SP),2(SP)     ;;MOVE THE PSW DOWN
016416  000002                          RTI                     ;;RESTORE THE PSW

                                        .SBTTL  TRAP TABLE

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

                                        ;       ROUTINE
                                        ;       -------
016420  016406                  $TRPAD: .WORD   $TRAP2
016422  013640                          $TYPE   ;;CALL=TYPE     TRAP+1(104401)  TTY TYPEOUT ROUTINE
016424  016162                          $TYPOC  ;;CALL=TYPOC    TRAP+2(104402)  TYPE OCTAL NUMBER (WITH LEADING ZEROS)
016426  016136                          $TYPOS  ;;CALL=TYPOS    TRAP+3(104403)  TYPE OCTAL NUMBER (NO LEADING ZEROS)
016430  016176                          $TYPON  ;;CALL=TYPON    TRAP+4(104404)  TYPE OCTAL NUMBER (AS PER LAST CALL)
016432  015712                          $TYPDS  ;;CALL=TYPDS    TRAP+5(104405)  TYPE DECIMAL NUMBER (WITH SIGN)

016434  014172                          $GTSWR  ;;CALL=GTSWR    TRAP+6(104406)  GET SOFT-SWR SETTING

016436  014122                          $CKSWR  ;;CALL=CKSWR    TRAP+7(104407)  TEST FOR CHANGE IN SOFT-SWR
016440  014444                          $RDCHR  ;;CALL=RDCHR    TRAP+10(104410) TTY TYPEIN CHARACTER ROUTINE
016442  014564                          $RDLIN  ;;CALL=RDLIN    TRAP+11(104411) TTY TYPEIN STRING ROUTINE
016444  012316                          GT$DEV  ;;CALL=GTDEVM   TRAP+12(104412) ^C WILL OPEN UP DEV MAP

                                                ;MAX ADDR FOR 4K ALLOWED FOR APT = 17400
                                                ;MAX ADDR FOR 4K FOR ABS LOADER ONLY = 17500
        000001                  .END
```

```
ABASE  = 000000            634#    890     931
ACDW1  = 000000            890
ACDW2  = 000000            890
ACPUOP= 000000             890     905
ADDR    0027.4            1257*   1274*   1286#
ADDW0  = 000000            890
ADDW1  = 000000            890
ADDW10= 000000             890
ADDW11= 000000             890
ADDW12= 000000             890
ADDW13= 000000             890
ADDW14= 000000             890
ADDW15= 000000             890
ADDW2  = 000000            890
ADDW3  = 000000            890
ADDW4  = 000000            890
ADDW5  = 000000            890
ADDW6  = 000000            890
ADDW7  = 000000            890
ADDW8  = 000000            890
ADDW9  = 000000            890
ADEVCT= 000000             890     896
ADEVM  = 000000            634#    890     932
AENV   = 000000            890     901
AENVM  = 000000            890     902
AFATAL= 000000             890     893
AMADR1= 000000             890     918
AMADR2= 000000             890     922
AMADR3= 000000             890     925
AMADR4= 000000             890     928
AMAMS1= 000000             890     912
AMAMS2= 000000             890     920
AMAMS3= 000000             890     923
AMAMS4= 000000             890     926
AMSGAD= 000000             890     898
AMSGLG= 000000             890     899
AMSGTY= 000000             890     892
AMTYP1= 000000             890     913
AMTYP2= 000000             890     921
AMTYP3= 000000             890     924
AMTYP4= 000000             890     927
APASS  = 000000            890     895
APRIOR= 000000             890
APTCSU= 000040            3370    3629#
APTENV= 000001            3363    3585    3627#   3661
APTSIZ= 000200            1031    3626#
APTSPO= 000100            3365    3587    3628#
ASWREG= 000000             890     903
ATESTN= 000000             890     894
AUNIT  = 000000            890     897
AUSWR  = 000000            634#    890     904
AVECT1= 000000             634#    890     929
AVECT2= 000000             890     930
BASE0   001254             951#   2592    2688    2693    2754    2850    2860    3025
BASE1   001260             953#   2608    2617    2668    2699    2704    2767    2776    2823    2869    2879    2917    3061
                          3088
```

```
BITHLD  012564          3160*   3164    3176#
BIT0  = 000001           752#   1305    2425    2455    2930
BIT00 = 000001           742#    752     789
BIT01 = 000002           741#    751
BIT02 = 000004           740#    750
BIT03 = 000010           739#    749
BIT04 = 000020           738#    748
BIT05 = 000040           737#    747
BIT06 = 000100           736#    746     776     788
BIT07 = 000200           735#    745     775     787
BIT08 = 000400           734#    744    3714
BIT09 = 001000           733#    743    3672    3722
BIT1  = 000002           751#   1243    2432    2461    2926
BIT10 = 002000           732#   2583    2639    2655    2745    2800    3006    3046    3649
BIT11 = 004000           731#   3040    3729
BIT12 = 010000           730#    783    2532    3034
BIT13 = 020000           729#    782    3656
BIT14 = 040000           728#    781    2759    3028    3700
BIT15 = 100000           727#    780    2583    2639    2655    2745    2800    2903    3020
BIT2  = 000004           750#   1079    1117    2446    2467    2922
BIT3  = 000010           749#   2441    2474    2606    2666    2765    2821    3008    3082
BIT4  = 000020           748#   3076
BIT5  = 000040           747#   3070
BIT6  = 000100           746#
BIT7  = 000200           745#   2781    3064
BIT8  = 000400           744#   2606    2666    2765    2821    2906    2912    3056
BIT9  = 001000           743#
BKGND   002554          1120*   1123    1130    1134    1140    1155    1158    1165    1174    1212    1221    1223*   1231#
BPTVEC= 000014           759#
BREAK = 000001           789#   1436    1448    1451    1464    1467    1480    1486    2407    2486    2490    2496
BRK     012304          1425    2395    3042*   3044*   3078*   3080*   3095#
CARR    001310           968#   1228    1339    2557    3010
CHOR    007742          2587    2687#
CHOTAB  010724          2738    2787    2804    2891#
CHOX    007756          2589    2692#
CH1R    010000          2612    2698#
CH1TAB  011124          2788    2827    2892#
CH1X    010016          2614    2703#
CKSWR = 104407          1171    1206    3645    3671    3699    3931#
CLKEN   013214          2932    3240#
CLKVEC= 000100           965#   1298*   1299*   1326*   1327*
CLR   = 000000           770#
CONSOL  012310          1427    1650    1754    1791    1831    1981    2031    2113    2185    234_    3052*   3090*   3097#
CR    = 000015           667#   3236    3245    3246    3247    3248    3249    3250    3251    3252    3409    3419
CRLF  = 000200           668#   1055    2537    2542    3202    3220    3224    3228    3232    3240    3243    3380    3419
CYCLE   011646          1342    2999#   3023    3059
CODROP  013042          2905    3220#
COEND   011326          2761*   2763*   2815    2853    2896#
COXMIT  011324          2735*   2853    2855*   2862    2895#
C1CON   013122          2919    3228#
C1DROP  013072          2908    2914    3224#
C1END   011332          2783*   2785*   2838    2872    2898#
C1XMIT  011330          2736*   2872    2874*   2881    2897#
DATA    006240          2225*   2244    2318    2324    2332#   2345    2350*   2359*   2361
DDISP   177570           674#    871    1019
DEVM    013253          3107    3243#
```

```
DISPLA  001142            871#  1019*  1027*  3648*  3744*
DISPRE  000174            801#  1027
DLADD   001270            959#  1344   1346   1349   1352   2546   3025*  3061*  3214
DLVEC   001302            964#  1956   2035   2208   2548   3026*  3062*  3216
DONE    000200            775#  1765   1775   1803   1814   1846   1917   2137   2414   2508   2600   2625
DSWR  = 177570            673#   870   1018
EMTVEC= 000030            762#  1002*  1003*
ERRCHK  006746           2404*  2425*  2432*  2446*  2455   2461   2467   2474   2523#
ERRCNT  006200           2223*  2253   2262   2308#  2320   2354*  2441*
ERRFLG  004370           1658*  1695*  1710   1740#
ERROR = 100000            780#  1876   1934   2146   2265   2343
ERRVEC= 000004            755#  1016   1017*  1028*  1183*  1184*  1207*  1208*  1245*  1246*  1282*  1283*  1376*
                         1377*  1392*  1393*  2934*  2935*  2957*  2958*  3705   3706*  3708*  3711*
EXFLG   004372           1660*  1721*  1728*  1732   1741#
EX1     006176           2187   2304#
EX2     006744           2397   2520#
FRERR = 020000            782#  2275   2429
GNS   = ****** U          800   1054   2537   2542   2545   2547   2549   3202   3204   3207   3213   3215   3923
                         3924   3925   3926   3927   3929   3931   3932   3933   3934
GTDEVM= 104412           1060   3934#
GTSWR = 104406           1049   3929#
GTSDEV  012316           3107#  3460   3546   3934
HIROM   001266            956#  1260   1277
HT    = 000011            665#  3378   3419
IE    = 000100            776#   788#  1508   1520   1523   1536   1539   1552   1556   1577   1589   1592   1605
                         1608   1621   1625   1970   1974   2003   2047   2064   2087   2235   2238   2258   2260
                         2329   2352   2364   2370   2593   2595   2618   2620   2689   2695   2700   2706   2755
                         2757   2777   2779   2857   2864   2876   2883
INTABL  010040           2576*  2577*  2578*  2579*  2642   2645   2658   2662   2671   2675   2715#
INTFLG  011644           1253*  1255   1270*  1272   1300*  1311   1319   1382*  1384   1954*  1976   1988   2006*
                         2013   2044*  2067   2074   2090*  2096   2936*  2942   2985*  2988#
INTSRV  011636            975   1245   1298   1376   1958   2036   2934   2985#
IOTVEC= 000020            760#  1000*  1001*
LF    = 000012            666#  3236   3245   3246   3247   3248   3249   3250   3251   3252   3413   3419
LOOP    003126           1336#  2561
LOROM   001264            955#  1252   1269
MAXMEM  011634           1085   1095   1124   1156   1178   1186   1216   2949*  2950*  2974#
MEM     013314           2955   3252#
MEMTBL  011616           2952   2966#
MODTST  007264           1362   2564#
MYTYPE  012642           3201#  3658
M12K    013256           2968   3247#
M16K    013264           2969   3248#
M20K    013272           2970   3249#
M24K    013300           2971   3250#
M28K    013306           2972   3251#
M4K     013244           2966   3245#
M8K     013251           2967   3246#
NOCHAN  011614           1226   1337   2909*  2920*  2962#  2999
NORAM   013170           2924   3236#
NOROM   013145           2928   3232#
NOTST   006750           2525#  2844
NUMBER  006202           2229*  2231*  2244   2309#  2318   2350   2361
ODD     012302           2437   3036*  3038*  3072*  3074*  3094#
ORERR   040000            781#  1861   1894   1922   2268
PASS    004366           1653*  1713*  1715   1739#
```

```
PERR    010000            783#  2282  2439  2444
PHASE2  012312           1332*  1360  2534  2553  2555* 3013* 3099#
PIRQ  = 177772            672#
PIRQVE= 000240            766#
PR0   = 000000            689#  1972  2051  2206  2648  2791
PR1   = 000040            690#
PR2   = 000100            691#
PR3   = 000140            692#
PR4   = 000200            693#
PR5   = 000240            694#
PR6   = 000300            695#
PR7   = 000340            696#   976  1377  1501  1959  2037  2101  2213  2219  2582  2588  2590  2613
                         2615  2652  2744  2750  2752  2772  2774  2797
PS    = 177776            669#   670
PSW   = 177776            670#
PWRVEC= 000024            761#  1006* 1007* 3299* 3300* 3309* 3315* 3327* 3328*
PICNT   012314           1334*  2539  2542* 3014* 3100#
RAMROM  002004           1064#  3128  3290
RBUF    001274            961#  1346* 1347* 1399  1811  1857  1894  1922  1934  2143  2340  2419  2449
                         2501  2514
RCSR    001272            960#  1344* 1380  1395  1577  1589* 1592  1605* 1608  1621* 1625  1764  1775
                         1802  1814  1845  1916  2047* 2064* 2087* 2136  2238* 2260* 2352* 2364* 2413
                         2507
RDCHR = 104410           3540  3932#
RDLIN = 104411           3933#
RDWRD   002556           1149* 1150  1173* 1174  1232#
RDY   = 000200            787#  1634  1672  1690  1703  1965  2058  2127
REC     006242           2211  2338#
REGHLD  012562           3159* 3164  3175# 3179* 3183
RESVEC= 000010            756#
RHLD    006346           2265  2268  2275  2282  2340* 2343  2345  2377#
ROSRV   010550           2749  2850#
RISRV   010636           2771  2869#
SAVBK   002560           1140* 1141* 1142  1143  1147* 1148  1150  1154* 1155  1233#
SET   = 177777            769#  1695  1710  1721  1728  1732
SIZE    011334           1062  2903#  3126
SLU     003112           1332#
STACK = 001100            660#   998  1064  1336
START   001370            804    989   991#  3332
STATEN  011324           2740  2893#
SIKLMT= 177774            671#
SWR     001140            870#   996  1018* 1020  1026* 1033* 1047  2532  3307  3320* 3429  3474* 3649
                         3656  3668  3672  3700  3714  3716  3722  3729
SWREG   000176            802#  1026  1047  3429  3442
SW0   = 000001            724#
SW00  = 000001            714#   724
SW01  = 000002            713#   723
SW02  = 000004            712#   722
SW03  = 000010            711#   721
SW04  = 000020            710#   720
SW05  = 000040            709#   719
SW06  = 000100            708#   718
SW07  = 000200            707#   717
SW08  = 000400            706#   716
SW09  = 001000            705#   715
SW1   = 000002            723#
```

```
SW10   = 002000   704#
SW11   = 004000   703#
SW12   = 010000   702#
SW13   = 020000   701#
SW14   = 040000   700#
SW15   = 100000   699#
SW2    = 000004   722#
SW3    = 000010   721#
SW4    = 000020   720#
SW5    = 000040   719#
SW6    = 000100   718#
SW7    = 000200   717#
SW8    = 000400   716#
SW9    = 001000   715#
TBITVE= 000014   757#
TBUF    001300   963#  1352*  1353*  1407   1668*  1676*  1685*  1761*  1799*  1842*  1852*  1913*  2040*
                 2054*  2093*  2133*  2324*  2410*  2504*
TCSR    001276   962#  1349*  1350*  1403   1436   1448*  1451   1464*  1467   1480*  1486   1508   1520*
                 1523   1536*  1539   1552*  1556*  1634   1671   1677   1690   1702   1964   1970*  1974*
                 2003*  2057*  2126   2235*  2258*  2329*  2370*  2407*  2486*  2489   2496*
TIMER   012512   1670   1701*  1763   1801   1844   1915   1963   2056   2125   2135   2412   2488   2506
                 3159#
TIMER1  012566   1975   2066   3179#
TKVEC  = 000060   764#
TMP1    001304   966#  2243*  2246*  2599*  2602*  2624*  2627*
TMP2    001306   967#  2242*  2248*
TPVEC  = 000064   765#
TRAN    006204   2217   2317#
TRAPVE= 000034   763#  1004*  1005*
TRPCAT  001312   974#
TRTVEC= 000014   758#
TRUE   = 000001   771#  1360   2534   2553   3013
TST1    002010   1075#
TST10   003766   1568#
TST11   004152   1635   1646#
TST12   004374   1651   1674   1705   1748#
TST13   004476   1753   1755   1767   1785#
TST14   004574   1790   1792   1805   1825#
TST15   005020   1830   1832   1848   1867   1884   1900   1919   1929   1950#
TST16   005232   1967   1978   2025#
TST17   005464   2030   2032   2060   2069   2107#
TST2    002102   1080   1096   1113#
TST20   005654   2112   2114   2129   2139   2157   2162   2179#
TST21   006350   2305   2387#
TST22   006750   2416   2492   2510   2521   2529#
TST23   007264   2572#
TST24   010050   2680   2731#
TST3    002562   1198   1227   1239#
TST4    002746   1244   1284   1291#
TST5    003256   1372#
TST6    003426   1421#
TST7    003612   1428   1496#
TYPDS  = 104405   2550   3279   3927#
TYPE   = 104401   1041   1228   1339   2537   2542   2545   2547   2549   2550   2557   2905   2908   2914
                 2919   2924   2928   2932   2953   2955   3010   3107   3110   3125   3147   3148   3202
                 3204   3207   3213   3215   3216   3277   3280   3329   3383   3440   3441   3444   3455
```

```
                        3465    3476    3495    3544    3549    3552    3556    3651    3659    3806    3875    3923#
TYPOC  = 104402          2546    2548    3109    3203    3208    3214    3216    3443    3924#
TYPON  = 104404          3926#
TYPOS  = 104403          3206    3925#
VECT0    001256           952#   2586    2748    3026
VECT1    001262           954#   2611    2770    3062
WAIT     012630          1853    1984    2012    2071    2095    2498    3195#
WORDL    012300          2154    2164    2227    2435    3030*   3032*   3066*   3068*   3093#
WRAP     012306          1752    1789    1829    2029    2111    2183    2391    3048*   3050*   3084*   3086*   3096#
XOSRV    010610          2751    2860#
X1SRV    010676          2773    2879#
$APTHD   001000           830     836#
$ASTAT=  ****** U        3607    3622
$ATYC    015010          3578    3580#
$ATY1    014764          3576#
$ATY3    014772          3368    3577#
$ATY4    015002          3579#   3664
$AUTOB   001134           867#   1051*   3437    3572
$BASE    001250           931#
$BDADR   001122           862#
$BDDAT   001126           864#
$BELL    001164           882#   3651    3684
$BGNLE=  177777           634#
$CHARC   014116          3385*   3395*   3402    3411*   3416#
$CKSWR   014122          3429#   3931
$CMTAG   001100           850#    993     994    1002    1008    1009    1010
$CM3   = 000000           880#
$CNTLC   014722          3455    3544    3565#
$CNTLG   014734          3440    3567#
$CNTLU   014727          3465    3566#
$CPUOP   001222           905#
$CRLF    001171           884#   2550    3125    3148    3216    3284    3419    3476    3565    3659    3684
$DBLK    016126          3772    3806    3814#
$DEVCT   001204           896#   1359*
$DEVM    001252           932#   1079    1117    1243    1305    2583    2606    2639    2655    2666    2745    2759    2765
                         2781    2800    2821    2903    2906    2912    2922    2926    2930    3006    3008    3020    3028
                         3034    3040    3046    3056    3064    3070    3076    3082    3108    3124*
$DOAGN   013432          3273    3282    3288#
$DTBL    016116          3775    3810#
$ENDAD   013422           816    1039    3284#   3679
$ENDCT   013370          1008    3275#
$ENDMG   013441          3277    3292#
$ENULL   013436          3280    3291#
$ENV     001214           901#   1045    1058    3363    3585    3609    3661
$ENVM    001215           902#   1031    3365    3370    3587
$EOP     013334          1229    1340    2558    3011    3265#
$EOPCT   013362          1008*   3272#   3276
$ERFLG   001103           853#   3646*   3684    3689    3718    3720    3726*   3748
$ERMAX   001115           859#   1011*   3720    3743*   3748
$ERRFL=  000000          1448#   1449    1464#   1465    1480#   1481    1520#   1521    1536#   1537    1552#   1553    1589#
                         1590    1605#   1606    1621#   1622    1653#   1654    1658#   1659    1660#   1661    1668#   1669
                         1685#   1686    1695#   1696    1713#   1714    1721#   1722    1728#   1729    1761#   1762    1799#
                         1800    1811#   1812    1842#   1843    1852#   1853    1857#   1858    1913#   1914    1970#   1971
                         1974#   1975    2003#   2004    2006#   2007    2010#   2011    2044#   2045    2047#   2048    2054#
                         2055    2064#   2065    2087#   2088    2090#   2091    2093#   2094    2117#   2118    2120    2124
                         2133#   2134    2143#   2144    2208#   2209    2211#   2212    2213#   2214    2217#   2218    2219#
```

```
                    2220    2223#   2224    2225#   2226    2235#   2236    2238#   2239    2258#   2259    2260#   2261
                    2324#   2325    2329#   2330    2340#   2341    2350#   2351    2352#   2353    2354#   2355    2359#
                    2360    2364#   2365    2370#   2371    2404#   2405    2407#   2408    2410#   2411    2419#   2420
                    2425#   2426    2432#   2433    2486#   2487    2496#   2497    2501#   2502    2504#   2505
$ERROR  015232      1002    3644#
$ERRPC  001116       860#   3208    3653*   3654*   3655    3684
$ERRTB  001254       949#
$ERTTL  001112       857#   2550    2552*   3552*   3684
$ESCAP  001162       881#   1010*   3675    3677    3684    3742*
$ETABL  001214       900#
$ETEND  001254       842     933#
$FATAL  001176       893#   3204*   3206    3613*
$FFLG   015230      3576*   3579*   3607    3616*   3624#
$FILLC  001156       878#   3388    3419
$FILLS  001155       877#   3419
$FSAND= 000310       634#   1438    1453    1469    1488    1510    1525    1541    1558    1579    1594    1610    1627
                    1692    1712    1717    1777    1816    1863    1878    1896    1924    1936    1983    1990    2076
                    2148    2264    2267    2270    2277    2284    2320    2345    2363    2423    2431    2457    2463
                    2469    2476    2516
$FSBAD- 000401       634#   1438    1453    1469    1488    1510    1525    1541    1558    1579    1594    1610    1627
                    1692    1712    1717    1777    1816    1863    1878    1896    1924    1936    1983    1990    2076
                    2148    2264    2267    2270    2277    2284    2322    2348    2363    2423    2431    2457    2463
                    2469    2476    2516
$FSBLA- 000170       634#
$FSCAS= 000150       634#
$FSDEC= 000220       634#
$FSGOO- 000400       634#   1436    1451    1467    1486    1508    1523    1539    1556    1577    1592    1608    1625
                    1690    1710    1715    1775    1814    1861    1876    1894    1922    1934    1981    1988    2074
                    2146    2262    2265    2268    2275    2282    2318    2343    2361    2421    2429    2455    2461
                    2467    2474    2514
$FSIF   000110       634#   1436    1441    1451    1456    1467    1472    1486    1491    1508    1513    1523    1528
                    1539    1544    1556    1561    1577    1582    1592    1597    1608    1613    1625    1630    1690
                    1699    1708    1710    1715    1723    1725    1730    1775    1780    1814    1820    1861    1869
                    1876    1886    1894    1902    1922    1931    1934    1940    1981    1988    1993    1995    2074
                    2079    2146    2151    2262    2265    2268    2273    2275    2280    2282    2287    2292    2296
                    2301    2303    2318    2320    2326    2343    2345    2356    2361    2366    2372    2374    2421
                    2427    2429    2434    2455    2459    2461    2465    2467    2472    2474    2480    2514    2519
$FSINC  000210       634#   2117    2173
$FSLOO= 000200       634#   1655    1732    1735
$FSNAM- 000160       634#
$FSNO - 000403       634#   1436    1451    1467    1486    1508    1523    1539    1556    1577    1592    1608    1625
                    1690    1710    1715    1775    1814    1861    1876    1894    1922    1934    1981    1988    2074
                    2146    2262    2265    2268    2275    2282    2318    2320    2343    2345    2361    2429    2455
                    2461    2467    2474
$FSOR = 000320       634#   1438    1453    1469    1488    1510    1525    1541    1558    1579    1594    1610    1627
                    1692    1712    1717    1777    1816    1863    1878    1896    1924    1936    1983    1990    2076
                    2148    2264    2267    2270    2277    2284    2320    2322    2345    2363    2423    2431    2457
                    2463    2469    2476    2516
$FSRTN- 000300       634#
$FSSEL= 000140       634#
$FSUNT- 000130       634#
$FSWHI- 000120       634#   2320    2345
$FSYES  000402       634#   1436    1451    1467    1486    1508    1523    1539    1556    1577    1592    1608    1625
                    1690    1710    1715    1775    1814    1861    1876    1894    1922    1934    1981    1988    2074
                    2146    2262    2265    2268    2275    2282    2318    2320    2343    2345    2361    2421    2429
                    2455    2461    2467    2474    2514
```

```
$GDADR  001120          861#
$GDDAT  001124          863#
$GET42  013412         3281#
$GTSWR  014172         3441#  3929
$HD   = 000000          645
$HIBTS  001000          837#
$ICNT   001104          854#  3733*  3734   3736*  3747
$IFLEV= 177777          634#  1436#  1441#  1451#  1456#  1467#  1472#  1486#  1491#  1508#  1513#  1523#  1528#
                       1539#  1544#  1556#  1561#  1577#  1582#  1592#  1597#  1608#  1613#  1625#  1630#  1690#
                       1708#  1710#  1715#  1723#  1730#  1775#  1780#  1814#  1820#  1861#  1869#  1876#  1886#
                       1894#  1902#  1922#  1931#  1934#  1940#  1981#  1988#  1993#  1995#  2074#  2079#  2146#
                       2151#  2262#  2265#  2268#  2277   2284   2292#  2301#  2303#  2318#  2326#  2343#  2361#
                       2372#  2374#  2421#  2427#  2429#  2434#  2455#  2459#  2461#  2465#  2467#  2472#  2474#
                       2480#  2514#  2519#
$ILLUP  013622         3299   3315   3334#
$INTAG  001135          868#  3457   3477   3572
$ISK0 = 000001         1436#  1441   1451#  1456   1457#  1472   1486#  1491   1508#  1513   1523#  1528   1539#
                       1544   1556#  1561   1577#  1582   1592#  1597   1608#  1613   1625#  1630   1690#  1708
                       1710#  1730   1775#  1780   1814#  1820   1861#  1869   1876#  1886   1894#  1902   1922#
                       1931   1934#  1940   1981#  1995   2074#  2079   2146#  2151   2262#  2303   2318#  2326
                       2343#  2374   2421#  2427   2429#  2434   2455#  2459   2461#  2465   2467#  2472   2474#
                       2480   2514#  2519
$ISK1 = 000001         1715#  1723   1988#  1993   2265#  2301   2361#  2372
$ISK2 = 000003         2268#  2277#  2284#  2292
$ITEMB  001114          858#  3204   3655*  3663   3684
$LF     001172          885#  3419   3556   3565   3684
$LFLG   015227         3617*  3623#
$LOCTA= 177777          634#  1437   1438   1441   1442   1452   1453   1456   1457   1468   1469   1472   1473
                       1487   1488   1491   1492   1509   1510   1513   1514   1524   1525   1528   1529   1540
                       1541   1544   1545   1557   1558   1561   1562   1578   1579   1582   1583   1593   1594
                       1597   1598   1609   1610   1613   1614   1626   1627   1630   1631   1655   1656   1691
                       1692   1699   1700   1701   1708   1709   1711   1712   1716   1717   1723   1724   1725
                       1726   1727   1730   1731   1733   1734   1735   1736   1737   1776   1777   1780   1781
                       1815   1816   1820   1821   1862   1863   1869   1870   1877   1878   1886   1887   1895
                       1896   1902   1903   1923   1924   1931   1932   1935   1936   1940   1941   1982   1983
                       1989   1990   1993   1994   1995   1996   2075   2076   2079   2080   2118   2119   2120
                       2121   2122   2123   2124   2147   2148   2151   2152   2173   2174   2175   2263   2264
                       2266   2267   2269   2270   2273   2274   2275   2276   2277   2280   2281   2282   2283
                       2284   2287   2288   2289   2292   2293   2294   2295   2296   2297   2298   2301   2302
                       2303   2304   2319   2320   2321   2322   2326   2327   2344   2345   2346   2347   2348
                       2356   2357   2358   2362   2363   2366   2367   2368   2372   2373   2374   2375   2422
                       2423   2427   2428   2430   2431   2434   2475   2456   2457   2459   2460   2462   2463
                       2465   2466   2468   2469   2472   2473   2475   2476   2480   2481   2515   2516   2519
                       2520
$LPADR  001106          855#  1012*  3724*  3740*  3745   3747
$LPERR  001110          856#  1013*  1432*  1445*  1460*  1476*  1504*  1517*  1532*  1548*  1573*  1586*  1601*
                       1617*  1632*  1757*  1770*  1794*  1835*  1873*  1889*  1905*  1961*  1999*  2041*  2083*
                       2400*  2482*  3674   3724   3741*  3747
$LSTCN  177777          634#  1436   1438   1441   1451   1453   1456   1467   1469   1472   1486   1488   1491
                       1508   1510   1513   1523   1525   1528   1539   1541   1544   1556   1558   1561   1577
                       1579   1582   1592   1594   1597   1608   1610   1613   1625   1627   1630   1655   1656
                       1690   1692   1700   1701   1708   1710   1712   1715   1717   1723   1726   1727   1730
                       1735   1736   1775   1777   1780   1814   1816   1820   1861   1863   1869   1876   1878
                       1886   1894   1896   1902   1922   1924   1931   1934   1936   1940   1981   1983   1988
                       1990   1993   1995   2074   2076   2079   2117   2119   2120   2121   2124   2146   2148
                       2151   2173   2174   2262   2264   2265   2267   2268   2270   2274   2275   2277   2281
```

```
                    2282  2284  2288  2289  2292  2293  2294  2297  2298  2301  2303  2318  2322
                    2326  2343  2348  2357  2358  2361  2363  2367  2368  2372  2374  2421  2423
                    2427  2429  2431  2434  2455  2457  2459  2461  2463  2465  2467  2469  2472
                    2474  2476  2480  2514  2516  2519
$LSTIN- 000000       634#  1436  1437  1438  1448  1449  1451  1452  1453  1464  1465  1467  1468
                    1469  1480  1481  1486  1487  1488  1508  1509  1510  1520  1521  1523  1524
                    1525  1536  1537  1539  1540  1541  1552  1553  1556  1557  1558  1577  1578
                    1579  1589  1590  1592  1593  1594  1605  1606  1608  1609  1610  1621  1622
                    1625  1626  1627  1653  1654  1658  1659  1660  1661  1668  1669  1685  1686
                    1690  1691  1692  1695  1696  1699  1700  1710  1711  1712  1713  1714  1715
                    1716  1717  1721  1722  1725  1726  1728  1729  1732  1733  1734  1735  1736
                    1761  1762  1775  1776  1777  1799  1800  1811  1812  1814  1815  1816  1842
                    1843  1852  1853  1857  1858  1861  1862  1863  1876  1877  1878  1894  1895
                    1896  1913  1914  1922  1923  1924  1934  1935  1936  1970  1971  1974  1975
                    1981  1982  1983  1988  1989  1990  2003  2004  2006  2007  2010  2011  2044
                    2045  2047  2048  2054  2055  2064  2065  2074  2075  2076  2087  2088  2090
                    2091  2093  2094  2117  2118  2119  2120  2121  2122  2123  2124  2133  2134
                    2143  2144  2146  2147  2148  2173  2174  2208  2209  2211  2212  2213  2214
                    2217  2218  2219  2220  2223  2224  2225  2226  2235  2236  2238  2239  2258
                    2259  2260  2261  2262  2263  2264  2265  2266  2267  2268  2269  2270  2273
                    2274  2275  2276  2277  2280  2281  2282  2283  2284  2287  2288  2296  2297
                    2318  2319  2320  2321  2322  2324  2325  2329  2330  2340  2341  2343  2344
                    2345  2346  2347  2350  2351  2352  2353  2354  2355  2356  2357  2359  2360
                    2361  2362  2363  2364  2365  2366  2367  2370  2371  2404  2405  2407  2408
                    2410  2411  2419  2420  2421  2422  2423  2425  2426  2429  2430  2431  2432
                    2433  2455  2456  2457  2461  2462  2463  2467  2468  2469  2474  2475  2476
                    2486  2487  2496  2497  2501  2502  2504  2505  2514  2515  2516
$LSTST= 177777       634#  1436  1438  1441  1451  1453  1456  1467  1469  1472  1486  1488  1491
                    1508  1510  1513  1523  1525  1528  1539  1541  1544  1556  1558  1561  1577
                    1579  1582  1592  1594  1597  1608  1610  1613  1625  1627  1630  1655  1656
                    1690  1692  1699  1700  1701  1708  1710  1712  1715  1717  1723  1725  1726
                    1727  1730  1732  1735  1736  1775  1777  1780  1814  1816  1820  1861  1863
                    1869  1876  1878  1886  1894  1896  1902  1922  1924  1931  1934  1936  1940
                    1981  1983  1988  1990  1993  1995  2074  2076  2079  2117  2119  2120  2121
                    2124  2146  2148  2151  2173  2174  2262  2264  2265  2267  2268  2270  2273
                    2274  2275  2277  2280  2281  2282  2284  2287  2288  2289  2292  2293  2294
                    2296  2297  2298  2301  2303  2318  2322  2326  2343  2348  2356  2357  2358
                    2361  2363  2366  2367  2368  2372  2374  2421  2423  2427  2429  2431  2434
                    2455  2457  2459  2461  2463  2465  2467  2469  2472  2474  2476  2480  2514
                    2516  2519
$LSTTA  000000       634#  1441  1442  1456  1457  1472  1473  1491  1492  1513  1514  1528  1529
                    1544  1545  1561  1562  1582  1583  1597  1598  1613  1614  1630  1631  1655
                    1656  1700  1701  1708  1709  1723  1724  1726  1727  1730  1731  1736  1737
                    1780  1781  1820  1821  1869  1870  1886  1887  1902  1903  1931  1932  1940
                    1941  1993  1994  1995  1996  2079  2080  2119  2120  2121  2122  2151  2152
                    2174  2175  2274  2275  2281  2282  2288  2289  2292  2293  2294  2295  2297
                    2298  2301  2302  2303  2304  2326  2327  2347  2348  2357  2358  2367  2368
                    2372  2373  2374  2375  2427  2428  2434  2435  2459  2460  2465  2466  2472
                    2473  2480  2481  2519  2520
$MADR1  001226       918#
$MADR2  001232       922#
$MADR3  001236       925#
$MADR4  001242       928#
$MAIL   001174       838   842   891#  1030  1045  1077  1115  1241  1293  1374  1423  1498  1570
                    1648  1750  1787  1827  1952  2027  2109  2181  2389  2574  2733  5363  5661
                    3739
```

```
$MAMS1  001224            912#
$MAMS2  001230            920#
$MAMS3  001234            923#
$MAMS4  001240            926#
$MBADR  001002            838#
$MCALL= 000000              1#    634
$MFLG   015226           3577*   3583    3618*   3622#
$MNEW   014752           3110    3444    3570#
$MSGAD  001210            898#   3593*   3596
$MSGLG  001212            899#   3598*
$MSGTY  001174            892#   3591    3599*   3611    3615*
$MSWR   014741           3441    3568#
$MTYP1  001225            913#
$MTYP2  001231            921#
$MTYP3  001235            924#
$MTYP4  001241            927#
$MXCNT  015710           3737    3747#
$NESTL- 177777            634#   1436#   1441#   1451#   1456#   1467#   1472#   1486#   1491#   1508#   1513#   1523#   1528#
                         1539#   1544#   1556#   1561#   1577#   1582#   1592#   1597#   1608#   1613#   1625#   1630#   1655#
                         1690#   1699    1708#   1710#   1725#   1723#   1725    1730#   1732    1735#   1775#   1780#   1814#
                         1820#   1861#   1869#   1876#   1886#   1894#   1902#   1922#   1931#   1934#   1940#   1981#   1988#
                         1993#   1995#   2074#   2079#   2117#   2146#   2151#   2173#   2262#   2265#   2268#   2273    2280
                         2287    2292#   2296    2301#   2303#   2318#   2326#   2343#   2356    2361#   2366    2372#   2374#
                         2421#   2427#   2429#   2434#   2455#   2459#   2461#   2465#   2467#   2472#   2474#   2480#   2514#
                         2519#
$NSK0   000110           1436#   1441    1451#   1456    1467#   1472    1486#   1491    1508#   1513    1523#   1528    1539#
                         1544    1556#   1561    1577#   1582    1592#   1597    1608#   1613    1625#   1630    1655#   1732
                         1735    1775#   1780    1814#   1820    1861#   1869    1876#   1886    1894#   1902    1922#   1931
                         1934#   1940    1981#   1995    2074#   2079    2117#   2173    2262#   2303    2318#   2326    2343#
                         2356    2374    2421#   2427    2429#   2434    2455#   2459    2461#   2465    2467#   2472    2474#
                         2480    2514#   2519
$NSK1 - 000110           1690#   1699    1708    1710#   1725    1730    1988#   1993    2146#   2151    2265#   2296    2301
                         2361#   2366    2372
$NSK2   000110           1715#   1723    2268#   2273    2280    2287    2292
$NULL   001154            876#   3390    3419
$NWTST  000001           1068#   1070    1100#   1102    1236#   1288#   1365#   1367    1416#   1418    1493#   1563#   1565
                         1641#   1643    1743#   1745    1782#   1822#   1942#   1944    2019#   2021    2104#   2176#   2380#
                         2382    2526#   2566#   2568    2719#   2721
$OCNT   016360           3847*   3876*   3889#
$OMODE  016362           3842*   3846*   3851    3854*   3865*   3891#
$OVER   015674           3701    3717    3725    3735    3744#
$PASS   001202            895#   1030*   3269*   3270*   3278    3291    3731    3748
$PASTM  001006            840#
$POWER  013630           3330    3337#
$PWRAD  013616           3332#
$PWRDN  013456           1006    3299#   3327
$PWRMG  013612           3330#
$PWRUP  013530           3309    3315#
$QUES   001170            883#   3147    3419    3495    3549    3565    3684
$RDCHR  014444           3508#   3932
$RDDEC= ****** U         3934
$RDLIN  014564           3536#   3933
$RDOCT= ****** U         3934
$RDSZ = 000010           3529#
$RTNAD  013434           3290#
$R2A  - ****** U         3934
```

```
$SAVLE= 177777          634#  1735#  1736#  2120#  2124#
$SAVRE= ****** U        3934
$SAVR6  013626          3308*  3316   3317*  3318*  3336#
$SCOPE  015432          1000   3698#
$SETUP= 000137           991#   999   1000   1002   1004   1006   1008   1009   1010   1012   1039   1042   3267
                        3424   3572   3645   3671   3679   3699
$SSKO = 000037          1735#  1736   2120#  2124
$STUP = 177777           991#
$SVLAD  015640          3709   3738#
$SVPC = 000104           814#   819
$SWR    167400           634#   645    650    651    652    653    654    655    656    880    881    882   1009
                        1010   1012   1013   1076   1114   1240   1292   1373   1422   1497   1569   1647   1749
                        1786   1826   1951   2026   2108   2180   2388   2530   2573   2732   3262   3268   3283
                        3289   3291   3333   3636   3637   3638   3639   3640   3649   3656   3668   3672   3684
                        3690   3691   3692   3693   3694   3700   3712   3714   3715   3718   3719   3720   3727
                        3728   3729   3741   3744   3747
$SWREG  001216           903#  1033
$SWRMK- 000000           656    657   3694   3695   3716
$TAGLE- 177777           634#  1438#  1441#  1453#  1456#  1469#  1472#  1488#  1491#  1510#  1513#  1525#  1528#
                        1541#  1544#  1558#  1561#  1579#  1582#  1594#  1597#  1610#  1613#  1627#  1630#  1656#
                        1692#  1700#  1701#  1708#  1712#  1717#  1723#  1726#  1727#  1730#  1732   1735#  1777#
                        1780#  1816#  1820#  1863#  1869#  1878#  1886#  1896#  1902#  1924#  1931#  1936#  1940#
                        1983#  1990#  1993#  1995#  2076#  2079#  2119#  2121#  2124#  2148#  2151#  2173#  2174#
                        2264#  2267#  2270#  2274#  2275#  2277#  2281#  2282#  2284#  2288#  2289#  2292#  2293#
                        2294#  2297#  2298#  2301#  2303#  2322#  2326#  2348#  2357#  2358#  2363#  2367#  2368#
                        2372#  2374#  2423#  2427#  2431#  2434#  2457#  2459#  2463#  2465#  2469#  2472#  2476#
                        2480#  2516#  2519#
$TAGNU- 000070           634#  1437   1438#  1452   1453#  1468   1469#  1487   1488#  1509   1510#  1524   1525#
                        1540   1541#  1557   1558#  1578   1579#  1593   1594#  1609   1610#  1626   1627#  1655
                        1656#  1691   1692#  1699   1701#  1711   1712#  1716   1717#  1725   1727#  1776   1777#
                        1815   1816#  1862   1863#  1877   1878#  1895   1896#  1923   1924#  1935   1936#  1982
                        1983#  1989   1990#  2075   2076#  2118   2119#  2120#  2123   2124#  2147   2148#  2263
                        2264#  2266   2267#  2269   2270#  2273   2275#  2276   2277#  2280   2282#  2283   2284#
                        2287   2289#  2296   2298#  2319   2321   2322#  2344   2346   2347   2348#  2356   2358#
                        2362   2363#  2366   2368#  2422   2423#  2430   2431#  2456   2457#  2462   2463#  2468
                        2469#  2475   2477   2515   2516#
$TEMP   000067          1441#  1448#  1449#  1456#  1464#  1465#  1472#  1480#  1481#  1491#  1513#  1520#  1521#
                        1528#  1536#  1537#  1544#  1552#  1553#  1561#  1582#  1589#  1590#  1597#  1605#  1606#
                        1613#  1621#  1622#  1630#  1653#  1654#  1658#  1659#  1660#  1661#  1668#  1669#  1685#
                        1686#  1695#  1696#  1699#  1700#  1708#  1713#  1714#  1721#  1722#  1723#  1725#  1726#
                        1728#  1729#  1730#  1732#  1733   1735#  1736#  1761#  1762#  1780#  1799#  1800#  1811#
                        1812#  1820#  1842#  1843#  1852#  1853#  1857#  1858#  1869#  1886#  1902#  1913#  1914#
                        1931#  1940#  1970#  1971#  1974#  1975#  1993#  1995#  2003#  2004#  2006#  2007#  2010#
                        2011#  2044#  2045#  2047#  2048#  2054#  2055#  2064#  2065#  2079#  2087#  2088#  2090#
                        2091#  2093#  2094#  2121#  2124#  2133#  2134#  2143#  2144#  2151#  2173#  2174#  2208#
                        2209#  2211#  2212#  2213#  2214#  2217#  2218#  2219#  2220#  2223#  2224#  2225#  2226#
                        2235#  2236#  2238#  2239#  2258#  2259#  2260#  2261#  2273#  2274#  2277#  2280#  2281#
                        2284#  2287#  2288#  2292#  2293#  2294#  2296#  2297#  2301#  2303#  2324#  2325#  2326#
                        2329#  2330#  2340#  2341#  2350#  2351#  2352#  2353#  2354#  2355#  2356#  2357#  2359#
                        2360#  2364#  2365#  2366#  2367#  2370#  2371#  2372#  2374#  2404#  2405#  2407#  2408#
                        2410#  2411#  2419#  2420#  2425#  2426#  2427#  2432#  2433#  2434#  2459#  2465#  2472#
                        2480#  2486#  2487#  2496#  2497#  2501#  2502#  2504#  2505#  2519#
$TESTN  001200           894#  1077*  1115*  1241*  1293*  1374*  1423*  1498*  1570*  1648*  1750*  1787*  1827*
                        1952*  2027*  2109*  2181*  2389*  2574*  2733*  3203   3209   3739*
$TIMES  001160           880#  1009*  1076*  1114*  1240*  1292*  1373*  1422*  1497*  1569*  1647*  1749*  1786*
                        1826*  1951*  2026*  2108*  2180*  2388*  2530*  2573*  2732*  3268*  3727*  3734   3737*
```

```
                        3747
$TKB     001146          873#  3117  3422  3433  3450  3512  3518
$TKS     001144          872#  2608  2668  2767  2823  2917  3088  3115  3422  3431  3447  3459*  3479*
                        3510  3516
$TN    = 000025          634#   645  1068  1076#  1077  1080  1096  1100  1114#  1115  1198  1227  1236
                       1240#  1241  1244  1284  1288  1292#  1293  1365  1373#  1374  1416  1422#  1423
                       1428  1493  1497#  1498  1563  1569#  1570  1635  1641  1647#  1648  1651  1674
                       1705  1743  1749#  1750  1753  1755  1767  1782  1786#  1787  1790  1792  1805
                       1822  1826#  1827  1830  1832  1848  1867  1884  1900  1919  1929  1942  1951#
                       1952  1967  1978  2019  2026#  2027  2030  2032  2060  2069  2104  2108#  2109
                       2112  2114  2129  2139  2157  2162  2176  2180#  2181  2305  2380  2388#  2389
                       2416  2492  2510  2521  2526  2530#  2566  2573#  2574  2680  2719  2732#  2733
$TPB     001152          875#  3408*  3419
$TPFLG   001157          879#  3357  3419
$TPS     001150          874#  3406  3419
$TRAP    016364         1004  3900#
$TRAP2   016406         3911#  3922
$TRP   = 000013         3915#  3924#  3925#  3926#  3927#  3928#  3929  3930#  3931  3932#  3933#  3934#  3935#
$TRPAD   016420         3905  3922#
$TSK0  - 000067         1438#  1441  1453#  1456  1469#  1472  1488#  1491  1510#  1513  1525#  1528  1541#
                        1544  1558#  1561  1579#  1582  1594#  1597  1610#  1613  1627#  1630  1656#  1735
                        1777#  1780  1816#  1820  1863#  1869  1878#  1886  1896#  1902  1924#  1931  1936#
                        1940  1983#  1995  2076#  2079  2119#  2121  2124#  2174  2264#  2303  2322#  2326
                        2348#  2357  2358#  2374  2423#  2427  2431#  2434  2457#  2459  2463#  2465  2469#
                        2472  2476#  2480  2516#  2519
$TSK1  - 000060         1656#  1732  1735  1990#  1993  2124#  2173  2267#  2297  2298#  2301  2363#  2367
                        2368#  2372
$TSK2  - 000045         1692#  1700  1701#  1708  1712#  1726  1727#  1730  2148#  2151  2270#  2274  2275#
                        2294
$TSK3  - 000047         1717#  1723  2277#  2281  2282#  2293
$TSK4  = 000051         2284#  2288  2289#  2292
$TSTM    001004          839#
$TSTNM   001102          852#  2560*  3267*  3648  3684  3689  3716  3738*  3739  3744  3748
$TTYIN   014712         3537  3538  3560  3564#
$TYPBN=  ****** U       3928
$TYPDS   015712         3760#  3927
$TYPE    013640         3357#  3604  3915  3923
$TYPEC   014052         3131  3387  3394  3401  3406#  3407  3481
$TYPEX   014120         3412  3414  3417#
$TYPOC   016162         3845#  3924
$TYPON   016176         3844  3847#  3926
$TYPOS   016136         3840#  3925
$UNIT    001206          897#  1333*  2556*  3003  3005*  3017  3022*  3053*  3058*
$UNITM   001010          841#
$USWR    001220          904#
$VECT1   001244          929#
$VECT2   001246          930#
$XTSTR   015444         3703#
$YESNO=  000001         1448#  1449#  1464#  1465#  1480#  1481#  1520#  1521#  1536#  1537#  1552#  1553#  1589#
                        1590#  1605#  1606#  1621#  1622#  1713#  1714#  1970#  1971#  1974#  1975#  2003#  2004#
                        2047#  2048#  2064#  2065#  2087#  2088#  2120#  2121#  2235#  2236#  2238#  2239#  2258#
                        2259#  2260#  2261#  2329#  2330#  2352#  2353#  2354#  2355#  2359#  2360#  2364#  2365#
                        2370#  2371#  2407#  2408#  2425#  2426#  2432#  2433#  2486#  2487#  2496#  2497#
$$BYTE - 000402         1436#  1451#  1467#  1486#  1508#  1523#  1539#  1556#  1577#  1592#  1608#  1625#  1690#
                        1710#  1715#  1775#  1814#  1861#  1876#  1894#  1922#  1934#  1981#  1988#  2074#  2146#
                        2262#  2265#  2268#  2275#  2282#  2318#  2320#  2343#  2345#  2361#  2421#  2429#  2455#
```

```
                    2461#  2467#  2474#  2514#
$$FLAG= 000001      1436#  1438   1441#  1451#  1453   1456#  1467#  1469   1472#  1486#  1488   1491#  1508#
                    1510   1513#  1523#  1525   1528#  1539#  1541   1544#  1556#  1558   1561#  1577#  1579
                    1582#  1592#  1594   1597#  1608#  1610   1613#  1625#  1627   1630#  1690#  1692   1708#
                    1710#  1712   1715#  1717   1723#  1730#  1775#  1777   1780#  1814#  1816   1820#  1861#
                    1863   1869#  1876#  1878   1886#  1894#  1896   1902#  1922#  1924   1931#  1934#  1936
                    1940#  1981#  1983   1988#  1990   1993#  1995#  2074#  2076   2079#  2146#  2148   2151#
                    2262#  2264   2265#  2267   2268#  2270   2275#  2277   2282#  2284   2292#  2301#  2303#
                    2318#  2320#  2322   2326#  2343#  2345#  2348   2361#  2363   2372#  2374#  2421#  2423
                    2427#  2429#  2431   2434#  2455#  2457   2459#  2461#  2463   2465#  2467#  2469   2472#
                    2474#  2476   2480#  2514#  2516   2519#
$$GET4- 000000      3283#
$$LOC - 006740      1437#  1438   1452#  1453   1468#  1469   1487#  1488   1509#  1510   1524#  1525   1540#
                    1541   1557#  1558   1578#  1579   1593#  1594   1609#  1610   1626#  1627   1691#  1692
                    1711#  1712   1716#  1717   1776#  1777   1815#  1816   1862#  1863   1877#  1878   1895#
                    1896   1923#  1924   1935#  1936   1982#  1983   1989#  1990   2075#  2076   2147#  2148
                    2263#  2264   2266#  2267   2269#  2270   2276#  2277   2283#  2284   2319#  2320   2321#
                    2322   2346#  2347   2362#  2363   2422#  2423   2430#  2431   2456#  2457   2462#  2463
                    2468#  2469   2475#  2476   2515#  2516
$OFILL  016361      3841*  3845*  3855   3890#
$1      003500      1437   1441#
$10     003766      1557   1561#
$11     004024      1578   1582#
$12     004052      1593   1597#
$13     004100      1609   1613#
$14     004130      1626   1630#
$15     004202      1655#  1735
$16     004364      1733   1736#
$17     004272      1691   1700#
$2      003526      1452   1456#
$20     004306      1699   1708#
$21     004344      1711   1726#
$22     004342      1716   1723#
$23     004352      1725   1730#
$24     004476      1776   1780#
$25     004574      1815   1820#
$26     004702      1862   1869#
$27     004722      1877   1886#
$3      003554      1468   1472#
$30     004744      1895   1902#
$31     005006      1923   1931#
$32     005020      1935   1940#
$33     005172      1982   1995#
$34     005172      1989   1993#
$35     005410      2075   2079#
$36     005524      2118   2121#
$37     005522      2119#  2173
$4      003612      1487   1491#
$40     005654      2123   2174#
$40CAT= ****** U    3658   3700
$41     005602      2147   2151#
$42     006176      2263   2303#
$43     006174      2266   2297#
$44     006140      2269   2274#
$45     006172      2273   2294#
$46     006154      2276   2281#
```

```
$47     006172          2280    2293#
$5      003662          1509    1513#
$50     006170          2283    2288#
$51     006172          2287    2292#
$52     006176          2296    2301#
$53     006230          2319    2321    2326#
$54     006270          2344    2347#
$55     006312          2346    2357#
$56     006344          2356    2374#
$57     006336          2362    2367#
$6      003710          1524    1528#
$60     006344          2366    2372#
$61     006474          2422    2427#
$62     006510          2430    2434#
$63     006604          2456    2459#
$64     006616          2462    2465#
$65     006630          2468    2472#
$66     006642          2475    2480#
$67     006744          2515    2519#
$7      003736          1540    1544#
.       016446           796#    800#    806#    814     815#    817#    819#    820#    826     827#    829#    831#    849#
                         886     997    1012    1013    1356    1408    1437    1438    1452    1453    1468    1469    1483
                        1487    1488    1509    1510    1524    1525    1540    1541    1557    1558    1578    1579    1593
                        1594    1609    1610    1626    1627    1691    1692    1711    1712    1716    1717    1737    1776
                        1777    1815    1816    1862    1863    1877    1878    1895    1896    1923    1924    1935    1936
                        1982    1983    1989    1990    2014    2075    2076    2097    2147    2148    2170    2263    2264
                        2266    2267    2269    2270    2276    2277    2283    2284    2319    2320    2321    2322    2346
                        2347    2362    2363    2422    2423    2430    2431    2456    2457    2462    2463    2468    2469
                        2475    2476    2515    2516    2537#   2542#   2649    2659    2663    2672    2676    2715#   2741
                        2760    2762    2782    2784    2793    2810    2812    2833    2835    2891#   2892#   3031    3037
                        3043    3049    3067    3073    3079    3085    3197    3202#   3207#   3213#   3255#   3291    3295
                        3311    3335    3419    3422    3564#   3565    3572#   3625#   3684    3747    3748    3814#
.$ASTA- ****** U        3577    3580
.$x     001000           826#    831
```

```
BEGIN       1#
CALL        1#
CASE        1#
COMMEN      1#    767#
DECR        1#
DECRU       1#
DEFAUL      1#
ELSE        1#   1608   1724   2272   2279   2286   2295   2355   2365
END         1#
ENDCOM      1#    767#
ENDDEC      1#
ENDDO       1#
ENDIF       1#   1440   1455   1471   1490   1512   1527   1543   1560   1581   1596   1612   1629   1707   1722
          1729   1779   1819   1868   1885   1901   1930   1939   1992   1994   2078   2150   2291   2300   2302
          2325   2371   2373   2426   2433   2458   2464   2471   2479   2518
ENDINC      1#   2172
ENDLOO      1#   1734
ENDRTN      1#
ENDSEL      1#
ERROR     661#   1093   1132   1145   1152   1176   1195   1214   1258   1275   1313   1321   1386   1397   1401
          1405   1409   1439   1454   1470   1489   1511   1526   1542   1559   1580   1595   1611   1628   1636
          1673   1704   1719   1766   1778   1804   1817   1847   1864   1880   1898   1918   1925   1937   1966
          1977   1991   2015   2059   2068   2077   2098   2128   2138   2149   2156   2161   2168   2250   2271
          2278   2285   2290   2299   2415   2451   2457   2463   2469   2476   2491   2509   2517   2604   2629
          2660   2664   2673   2677   2811   2813   2834   2836
ESCAPE      1#    767#
EXIF        1#   1731
EXIFB       1#
GETPRI      1#    767#
GETSWR      1#    767#  1042#
IF          1#   1435   1450   1466   1485   1507   1522   1538   1555   1576   1591   1607   1624   1689   1709
          1714   1774   1813   1860   1875   1893   1921   1933   1980   1987   2073   2145   2261   2264   2267
          2317   2342   2360   2428   2454   2460   2466   2473
IFB         1#   2420   2513
IFCOND      1#
IF.ERR      1#
IF.NO.      1#
INCR        1#   2116
INCRU       1#
INLINE      1#
LEAVE       1#
LET         1#   1447   1463   1479   1519   1535   1551   1588   1604   1620   1652   1657   1659   1667   1684
          1694   1712   1720   1727   1760   1798   1810   1841   1851   1856   1912   1969   1973   2002   2005
          2009   2043   2046   2053   2063   2086   2089   2092   2132   2142   2207   2210   2212   2216   2218
          2222   2224   2234   2237   2257   2259   2323   2328   2339   2349   2351   2353   2358   2363   2369
          2403   2406   2409   2418   2424   2431   2485   2495   2500   2503
LOCAL       1#
LOOP        1#   1654
LPADR     634#   1431   1444   1459   1475   1503   1516   1531   1547   1572   1585   1600   1616   1756   1769
          1793   1834   1872   1888   1904   1960   1998   2040   2082   2399   2481
MSG      1068#   1070   1100#  1102   1365#  1367   1416#  1418   1563#  1565   1641#  1643   1743#  1745   1942#
          1944   2019#  2021   2380#  2382   2566#  2568   2719#  2721
MULT        1#    767#
NEWTST      1#    767#  1068   1100   1236   1288   1365   1416   1493   1563   1641   1743   1782   1822   1942
          2019   2104   2176   2380   2526   2566   2719
NOLOCA      1#
```

```
POP          1#    767#  3320  3321  3619  3620  3801
PUSH         1#    767#  3301  3307  3580  3582  3603  3760
REPEAT       1#
REPORT       1#    634#   767#
RETURN       1#
ROUTIN       1#
SAVR14       1#
SCOPE      662#   1075  1113  1239  1291  1372  1421  1496  1568  1646  1748  1785  1825  1950  2025
          2107   2179  2387  2529  2572  2731  3266
SELECT       1#
SETPRI       1#    767#  1500  1971  2050  2100  2205  2581  2647  2651  2743  2790  2796
SETTRA    3915#   3924  3925  3926  3927  3929  3931  3932  3933  3934
SETUP        1#    767#   991
SKIP         1#    767#  1080  1096  1197  1227  1244  1284  1428  1635  1651  1674  1705  1753  1755
          1767   1790  1792  1805  1830  1832  1848  1867  1884  1900  1919  1929  1967  1978  2030
          2032   2060  2069  2112  2114  2129  2139  2157  2162  2304  2416  2492  2510  2520  2679
SLASH        1#    767#
SPACE      767#
STARS        1#    767#   793   812   823   825   832   845   886   889   970   972  1068  1074  1100
          1112   1236  1238  1248  1250  1265  1267  1288  1290  1365  1371  1411  1413  1416  1420
          1493   1495  1563  1567  1641  1645  1743  1747  1782  1784  1822  1824  1942  1949  2019
          2024   2104  2106  2176  2178  2313  2315  2334  2336  2380  2386  2526  2528  2566  2571
          2683   2685  2719  2730  2846  2848  2993  2997  3103  3105  3153  3157  3258  3297  3313
          3342   3421  3424  3500  3529  3575  3632  3686  3750  3817  3894
STRUCT       1#    634#
SWRSU        1#    767#  1014#
TRMTRP    3915#
TYPBIN       1#    767#
TYPDEC       1#    767#  2549  3278
TYPNAM       1#    767#  1035
TYPNUM       1#    767#
TYPOCS       1#    767#  3205
TYPOCT       1#    767#  2545  2547  3108  3202  3207  3213  3215  3442
TYPTXT       1#    767#  2536  2541  2544  2546  2548  3201  3203  3206  3212  3214
UNTIL        1#
UNTILB       1#
WAITMS     634#
WHILE        1#
WHILEB       1#
$ADDON       1#   1436  1438  1451  1453  1467  1469  1486  1488  1508  1510  1523  1525  1539  1541
          1556   1558  1577  1579  1592  1594  1608  1610  1625  1627  1655  1656  1690  1692  1701
          1710   1712  1715  1717  1727  1735  1775  1777  1814  1816  1861  1863  1876  1878  1894
          1896   1922  1924  1934  1936  1981  1983  1988  1990  2074  2076  2117  2119  2120  2124
          2146   2148  2262  2264  2265  2267  2268  2270  2275  2277  2282  2284  2289  2298  2318
          2322   2343  2348  2358  2361  2363  2368  2421  2423  2429  2431  2455  2457  2461  2463
          2467   2469  2474  2476  2514  2516
$AND         1#   2318
$BRANC       1#   1437  1452  1468  1487  1509  1524  1540  1557  1578  1593  1609  1626  1691  1699
          1711   1716  1725  1733  1735  1776  1815  1862  1877  1895  1923  1935  1982  1989  2075
          2118   2123  2147  2173  2263  2266  2269  2273  2276  2280  2283  2287  2296  2319  2321
          2344   2346  2356  2362  2366  2422  2430  2456  2462  2468  2475  2515
$BRCOD       1#   1732  2122  2343
$CALL        1#
$CHECK       1#   1436  1451  1467  1486  1508  1523  1539  1556  1577  1592  1608  1625  1690  1710
          1715   1775  1814  1861  1876  1894  1922  1934  1981  1988  2074  2146  2262  2265  2268
          2275   2282  2318  2343  2361  2421  2429  2455  2461  2467  2474  2514
```

```
$CHK1     1#  1653  1658  1660  1668  1685  1695  1721  1728  1761  1799  1811  1842  1852  1857
        1913  2006  2010  2044  2054  2090  2093  2117  2120  2133  2143  2208  2211  2213  2217
        2219  2223  2225  2324  2340  2350  2404  2410  2419  2501  2504
$CKOP2    1#  1448  1464  1480  1520  1536  1552  1589  1605  1621  1713  1970  1974  2003  2047
        2064  2087  2235  2238  2258  2260  2329  2352  2354  2359  2364  2370  2407  2425  2432
        2486  2496
$CKR6     1#
$CMND     1#  1436  1451  1467  1486  1508  1523  1539  1556  1577  1592  1608  1625  1690  1710
        1715  1775  1814  1861  1876  1894  1922  1934  1981  1988  2074  2146  2262  2265  2268
        2275  2282  2318  2320  2343  2345  2361  2421  2429  2455  2461  2467  2474  2514
$COMPA    1#  1436  1451  1467  1486  1508  1523  1539  1556  1577  1592  1608  1625  1690  1710
        1715  1775  1814  1861  1876  1894  1922  1934  1981  1988  2074  2117  2146  2262  2265
        2268  2275  2282  2318  2343  2361  2421  2429  2455  2461  2467  2474  2514
$COUNT    1#
$DO       1#
$ELSE     1#  2275  2282
$ERRMS    1#
$EXIFA    1#
$EXIFO    1#
$EXIF2    1#
$EXIF3    1#
$GENBR    1#  1437  1452  1468  1487  1509  1524  1540  1557  1578  1593  1609  1626  1691  1699
        1711  1716  1725  1733  1735  1776  1815  1862  1877  1895  1923  1935  1982  1989  2075
        2118  2123  2147  2173  2263  2266  2269  2273  2276  2280  2283  2287  2296  2319  2321
        2344  2346  2356  2362  2366  2422  2430  2456  2462  2468  2475  2515
$GENTA    1#  1441  1456  1472  1491  1513  1528  1544  1561  1582  1597  1613  1630  1655  1700
        1708  1723  1726  1730  1736  1780  1820  1869  1886  1902  1931  1940  1993  1995  2079
        2119  2121  2151  2174  2274  2281  2288  2292  2293  2294  2297  2301  2303  2326  2347
        2357  2367  2372  2374  2427  2434  2459  2465  2472  2480  2519
$IF       1#  1436  1451  1467  1486  1508  1523  1539  1556  1577  1592  1608  1625  1690  1710
        1715  1775  1814  1861  1876  1894  1922  1934  1981  1988  2074  2146  2262  2265  2268
        2275  2282  2318  2343  2361  2421  2429  2455  2461  2467  2474  2514
$IFCOD    1#  1436  1451  1467  1486  1508  1523  1539  1556  1577  1592  1608  1625  1690  1710
        1715  1775  1814  1861  1876  1894  1922  1934  1981  1988  2074  2146  2262  2265  2268
        2275  2282  2318  2320  2345  2361  2421  2429  2455  2461  2467  2474  2514
$IFCON    1#
$IFOPR    1#  1437  1452  1468  1487  1509  1524  1540  1557  1578  1593  1609  1626  1691  1711
        1716  1776  1815  1862  1877  1895  1923  1935  1982  1989  2075  2147  2263  2266  2269
        2276  2283  2319  2321  2346  2362  2422  2430  2456  2462  2468  2475  2515
$LET      1#  1448  1464  1480  1520  1536  1552  1589  1605  1621  1653  1658  1660  1668  1685
        1695  1713  1721  1728  1761  1799  1811  1842  1852  1857  1913  1970  1974  2003  2006
        2010  2044  2047  2054  2064  2087  2090  2093  2133  2143  2208  2211  2213  2217  2219
        2223  2225  2235  2238  2258  2260  2324  2329  2340  2350  2352  2354  2359  2364  2370
        2404  2407  2410  2419  2425  2432  2486  2496  2501  2504
$LPCNT    1#  2117
$OPADD    1#  1713  2120  2354  2359
$OPAND    1#
$OPCD1    1#  1448  1464  1480  1520  1536  1552  1589  1605  1621  1713  1970  1974  2003  2047
        2064  2087  2120  2235  2238  2258  2260  2329  2352  2354  2359  2364  2370  2407  2425
        2432  2486  2496
$OPCD2    1#
$OPCOD    1#  1448  1464  1480  1520  1536  1552  1589  1605  1621  1713  1970  1974  2003  2047
        2064  2087  2120  2235  2238  2258  2260  2329  2352  2354  2359  2364  2370  2407  2425
        2432  2486  2496
$OPCOM    1#
$OPDEF    1#  1436  1437  1448  1451  1452  1464  1467  1468  1480  1486  1487  1508  1509  1520
```

```
                1523    1524    1536    1539    1540    1552    1556    1557    1577    1578    1589    1592    1593    1605    1608
                1609    1621    1625    1626    1653    1658    1660    1668    1685    1690    1691    1695    1699    1710    1711
                1713    1715    1716    1721    1725    1728    1732    1733    1735    1761    1775    1776    1799    1811    1814
                1815    1842    1852    1857    1861    1862    1876    1877    1894    1895    1913    1922    1923    1934    1935
                1970    1974    1981    1982    1988    1989    2003    2006    2010    2044    2047    2054    2064    2074    2075
                2087    2090    2093    2117    2118    2120    2122    2123    2133    2143    2146    2147    2173    2208    2211
                2213    2217    2219    2223    2225    2235    2238    2258    2260    2262    2263    2265    2266    2268    2269
                2273    2275    2276    2280    2282    2283    2287    2296    2318    2319    2320    2321    2324    2329    2340
                2343    2344    2345    2346    2350    2352    2354    2356    2359    2361    2362    2364    2366    2370    2404
                2407    2410    2419    2421    2422    2425    2429    2430    2432    2455    2456    2461    2462    2467    2468
                2474    2475    2486    2496    2501    2504    2514    2515
$OPEQU          1#
$OPNAN          1#
$OPNEG          1#
$OPNOR          1#
$OPNOT          1#  1464    1536    1605    1970    2003    2047    2087    2258    2260    2329    2352    2364    2496
$OPOR           1#  1448    1480    1520    1552    1589    1621    1974    2064    2235    2238    2370    2407    2425    2432
                2486
$OPROT          1#
$OPRO           1#  1653    1658    1660    1668    1685    1695    1721    1728    1761    1799    1811    1842    1852    1857
                1913    2006    2010    2044    2054    2090    2093    2117    2133    2143    2208    2211    2213    2217    2219
                2223    2225    2324    2340    2350    2404    2410    2419    2501    2504
$OPR1           1#  2120
$OPR2           1#  1448    1464    1480    1520    1536    1552    1589    1605    1621    1713    1970    1974    2003    2047
                2064    2087    2235    2238    2258    2260    2329    2352    2354    2359    2364    2370    2407    2425    2432
                2486    2496
$OPSHF          1#
$OPSUB          1#
$OPSWB          1#
$OPXOR          1#
$OR             1#  2343
$PUT            1#
$STRUC          1#
$SUBON          1#  1441    1456    1472    1491    1513    1528    1544    1561    1582    1597    1613    1630    1700    1708
                1723    1726    1730    1735    1736    1780    1820    1869    1886    1902    1931    1940    1993    1995    2079
                2121    2124    2151    2173    2174    2274    2281    2288    2292    2293    2294    2297    2301    2303    2326
                2357    2367    2372    2374    2427    2434    2459    2465    2472    2480    2519
$THEN           1#  1436    1451    1467    1486    1508    1523    1539    1556    1577    1592    1608    1625    1690    1710
                1715    1775    1814    1861    1876    1894    1922    1934    1981    1988    2074    2146    2262    2265    2268
                2275    2282    2320    2345    2361    2421    2429    2455    2461    2467    2474    2514
$TILA           1#
$TILO           1#
$UNTL2          1#
$UNTL3          1#
$WHILE          1#
$$CMRE        843#
$$CMTM        843#
$$DEFA          1#
$$ENDS          1#
$$ERRO          1#
$$ESCA          1#  767#
$$GEN           1#  1441    1456    1472    1491    1513    1528    1544    1561    1582    1597    1613    1630    1655    1700
                1708    1723    1726    1730    1736    1780    1820    1869    1886    1902    1931    1940    1993    1995    2079
                2119    2121    2151    2174    2274    2281    2288    2292    2293    2294    2297    2301    2303    2326    2347
                2357    2367    2372    2374    2427    2434    2459    2465    2472    2480    2519
$$GETS          1#  1441    1456    1472    1491    1513    1528    1544    1561    1582    1597    1613    1630    1699    1700
```

```
        1708    1723    1725    1726    1730    1732    1735    1736    1780    1820    1869    1886    1902    1931    1940
        1993    1995    2079    2121    2124    2151    2173    2174    2273    2274    2277    2280    2281    2284    2287
        2288    2292    2293    2294    2296    2297    2301    2303    2326    2356    2357    2366    2367    2372    2374
        2427    2434    2459    2465    2472    2480    2519
$$GETT    1#    1699    1725    1732    2273    2277    2280    2284    2287    2296    2356    2366
$$LPLN    1#    2120
$$NEWT    1#     767#   1068    1100    1236    1288    1365    1416    1493    1563    1641    1743    1782    1822    1942
        2019    2104    2176    2380    2526    2566    2719
$$POP     1#    1441    1456    1472    1491    1513    1528    1544    1561    1582    1597    1613    1630    1700    1708
        1723    1726    1730    1735    1736    1780    1820    1869    1886    1902    1931    1940    1993    1995    2079
        2121    2124    2151    2173    2174    2274    2281    2288    2292    2293    2294    2297    2301    2303    2326
        2357    2367    2372    2374    2427    2434    2459    2465    2472    2480    2519
$$PUSH    1#    1436    1438    1451    1453    1467    1469    1486    1488    1508    1510    1523    1525    1539    1541
        1556    1558    1577    1579    1592    1594    1608    1610    1625    1627    1655    1656    1690    1692    1701
        1710    1712    1715    1717    1727    1735    1775    1777    1814    1816    1861    1863    1876    1878    1894
        1896    1922    1924    1934    1936    1981    1983    1988    1990    2074    2076    2117    2119    2120    2124
        2146    2148    2262    2264    2265    2267    2268    2270    2275    2277    2282    2284    2289    2298    2318
        2322    2343    2348    2358    2361    2363    2368    2421    2423    2429    2431    2455    2457    2461    2463
        2467    2469    2474    2476    2514    2516
$$SELE    1#
$$SET   3915#   3924    3925    3926    3927    3929    3931    3932    3933    3934
$$SETM  1030#
$$SETS    1#    1436    1438    1451    1453    1467    1469    1486    1488    1508    1510    1523    1525    1539    1541
        1556    1558    1577    1579    1592    1594    1608    1610    1625    1627    1655    1656    1690    1692    1701
        1710    1712    1715    1717    1727    1735    1775    1777    1814    1816    1861    1863    1876    1878    1894
        1896    1922    1924    1934    1936    1981    1983    1988    1990    2074    2076    2117    2119    2120    2124
        2146    2148    2262    2264    2265    2267    2268    2270    2275    2277    2282    2284    2289    2298    2318
        2322    2343    2348    2358    2361    2363    2368    2421    2423    2429    2431    2455    2457    2461    2463
        2467    2469    2474    2476    2514    2516
$$SETT    1#    2277    2284
$$SKIP    1#     767#   1080    1096    1198    1227    1244    1284    1428    1635    1651    1674    1705    1753    1755
        1767    1790    1792    1805    1830    1832    1848    1867    1884    1900    1919    1929    1967    1978    2030
        2032    2060    2069    2112    2114    2129    2139    2157    2162    2305    2416    2492    2510    2521    2680
.EQUAT    1#     634#    657
.HEADE    1#     634#    635
.KT11     1#
.SETUP    1#     634#    991
.SWRHI    1#     634#    646
.SWRLO   657#
.$ACT1    1#     634#    810
.$APTB    1#     634#    887#
.$APTH    1#     634#    821
.$APTY    1#     634#   3573
.$ASTA    1#
.$CATC    1#     634#    794
.$CMTA    1#     634#    843
.$DB2D    1#
.$DB2O    1#
.$DIV     1#
.$EOP     1#     634#   3256
.$ERRO    1#     634#   3630
.$ERRT    1#
.$MULT    1#
.$POWE    1#     634#   3295
.$RAND    1#
.$RDDE    1#
```

```
.$RDOC      1#
.$READ      1#    634#   3419
.$R2AZ      1#
.$SAVE      1#
.$SB2D      1#
.$SB2O      1#
.$SCOP      1#    634#   3684
.$SIZE      1#
.$SUPR      1#
.$TRAP      1#    634#   3892
.$TYPB      1#
.$TYPD      1#    634#   3748
.$TYPE      1#    634#   3340
.$TYPO      1#    634#   3815
.$40CA      1#
.1170       1#


. ABS.  016446     000     OVR   RW    REL   LCL   I


 ERRORS DETECTED:  0

 Z:CVMXAA,Z:CVMXAA/CRF/SOL=CVMXAA.SML,SYSMAC.SML,CVMXAA.P11
 RUN-TIME:  44 45 3 SECONDS
 RUN-TIME RATIO:  172/93-1.8
 CORE USED:  42K  (83 PAGES)
```