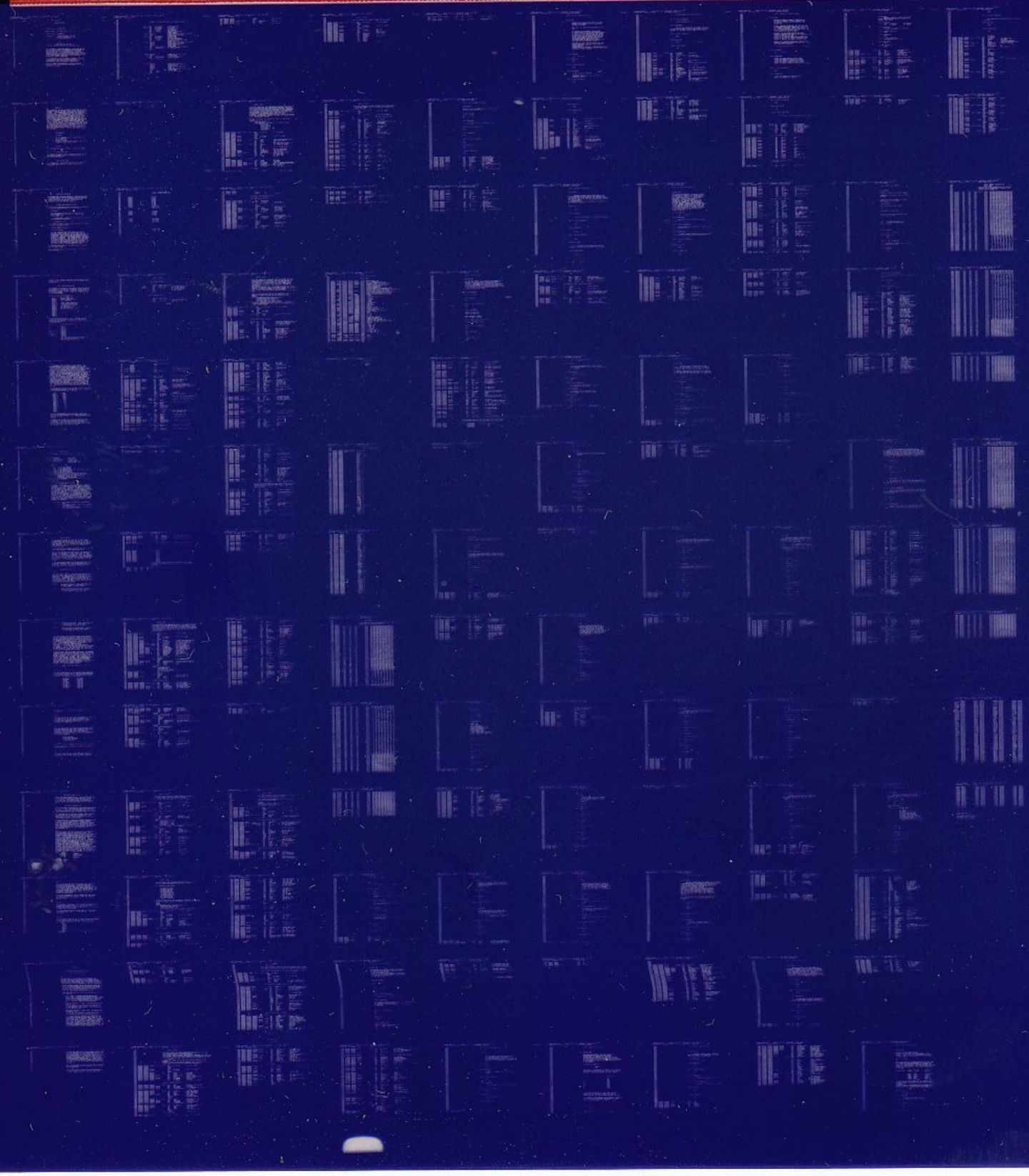
VTV30-K VTV30-K LOGIC TEST AH-S052A-MC
CVVTCA0 FICHE 1 OF 1



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000000                                  .REPT 0

                                        IDENTIFICATION
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                                PRODUCT CODE:   AC-S051A-MC

                                PRODUCT NAME:   CVVTCA0 VTV30-K LOGIC TEST

                                PRODUCT DATE:   20-MAR-80

                                MAINTAINER:     COMPUTER SPECIAL SYSTEMS,
                                                DIGITAL EQUIPMENT CO. LTD.,
                                                READING, BERKSHIRE. U.K.
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1. ABSTRACT

THIS DIAGNOSTIC HAS BEEN DESIGNED TO EXERCISE UP TO 20 (DECIMAL) VTV30-K, LSI BUS, VIDEO DISPLAY CONTROLLERS IN SEQUENCE. THE PROGRAM HAS SIX DEFAULT TESTS AND TWO OPTIONAL TESTS. THE PROGRAM ALSO HAS THE CAPABILITY TO RUN WITHOUT OPERATOR INTERVENTION, ONCE THE INITIAL PARAMETERS HAVE BEEN SET UP. IF MORE THAN ONE DEVICE IS BEING TESTED, THE OPERATOR MUST ENSURE THAT ALL THE DEVICES ARE SET UP IN ASCENDING ORDER AND THAT THEY ALL HAVE THE SAME NUMBER OF DISPLAY LINES AND CHARACTER SET TYPE. FOR EXAMPLE, THE DEVICE ADDRESSES RANGE THRU 174000, 174002, 174010, 174012, ETC., AND ALL ARE SET UP FOR 625-LINE OPERATION WITH A RAM BASED CHARACTER STORE. THE OPERATOR HAS THE FACILITY FOR HURRYING UP THE TESTS BY TYPING SPACE ON THE CONSOLE TERMINAL. THIS WILL ABORT AND PROGRAM CONTROLLED WAITS, AND PROCEED TO THE NEXT SECTION OF THE TEST. THIS FEATURE SHOULD NOT BE USED IN TEST 1.

2. REQUIREMENTS

2.1 EQUIPMENT

A. PDP-11 COMPUTER WITH A Q-BUS ADAPTOR, OR LSI-11 COMPUTER
B. CONSOLE TELETYPE
C. UP TO 20 VTV30-K COLOUR DISPLAY CONTROLLERS
D. DIAGNOSTIC TAPE AND LISTINGS

2.2 STORAGE

THIS PROGRAM REQUIRES A MINIMUM OF 8K WORDS OF MEMORY.

3. LOADING PROCEDURE

THE PROGRAM IS LOADED USING THE ABSOLUTE BINARY LOADER, OR USING THE NORMAL XXDP LOAD PROCEDURE AND IS IN ABSOLUTE BINARY FORMAT.

4. STARTING PROCEDURE

THE PROGRAM HAS A LOAD AND GO FEATURE WHICH AUTOMATICALLY STARTS THE PROGRAM AT ADDRESS 1000 UPON A SUCCESSFUL LOAD.

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                5.          RESTARTING PROCEDURE

THE PROGRAM HAS A RESTART ADDRESS AT 1200 WHICH ALLOWS
THE PROGRAM TO BE RESTARTED WITHOUT HAVING TO RE-ENTER
THE BUS ADDRESSES.  IF IT IS NECESSARY TO RESTART THE
PROGRAM WITH NEW BUS ADDRESSES, THE ADDRESS 1000
SHOULD BE USED AS THE RESTART ADDRESS.


                6.          PROGRAM AND OPERATOR ACTION

THE FOLLOWING OPERATOR REQUESTS ARE MADE BY THE PROGRAM
PRIOR TO THE COMMENCEMENT OF THE ACTUAL TESTS:-

    M736?/M737?..

    (THE OPERATOR MUST TYPE THE LAST DIGIT OF THE
    MODULE NUMBER-- 8,9,0,1 OR 2 -- TO SELECT THE
    DEVICE UNDER TEST

    (IF A PROGRAMMABLE CHARACTER SET VERSION IS SELECTED,
    THE OPERATOR IS THEN ASKED....)

    T.V.-ENCODED?(Y OR N)..

    (..WHICH IS USED TO SELECT THE CHARACTER SETS LOADED
    INTO THE CHARACTER STORE.)

    DECIMAL NUMBER OF UNITS (1)..

    FIRST BUS ADDRESS =

    (IF THE  PROGRAM FOUND THAT ONE OF THE DEVICE
    REGISTERS SELECTED WAS NOT ON THE BUS, I.E. ITS
    ADDRESS WAS NON EXISTANT, THEN AN ERROR MESSAGE WILL
    BE PRINTED.  FOR A CSR ADDRESS BEING NON EXISTANT,
    ERROR 77 IS REPORTED.  FOR A DBUF ADDRESS, THE ERROR
    REPORTED IS ERROR 76.  THE PARAMETER DATA CONTAINS
    THE ADDRESS FOUND TO BE NON EXISTANT.  BY SELECTING
    TRAP+10, THE OPERATOR CAN LOOP ON THIS ADDRESS.  IF
    THE FAULT IS NOT CORRECTED, THEN WHEN THE TESTS ARE
    RUN ON THAT DEVICE, THE PROGRAM WILL CRASH.)

THE OPERATOR SHOULD REPLY TO REQUESTS ABOVE, BY INPUT-
TING THE CORRECT DATA.

SELECT DESIRED SWITCH REGISTER SETTINGS, TYPE CNTRL-C TO
CONTINUE OR SWR = 0.
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145
146                     IN REPLY TO THE REQUEST ABOVE THE OPERATOR SHOULD SELECT
147                     DESIRED SWITCH REGISTER OPTIONS AS SET OUT UNDER SWITCH
148                     OPTIONS BELOW.
149
150
151                     7.          SWITCH REGISTER OPTIONS
152
153                     THIS PROGRAM IS DESIGNED TO RUN EQUALLY EASILY ON PDP-11
154                     PROCESSORS WITH, OR WITHOUT, A HARDWARE SWITCH REGISTER.
155                     ON STARTING, A TEST IS DONE TO SEE IF A HARDWARE SWITCH
156                     REGISTER IS PRESENT.  IF IT IS PRESENT, IT MAY BE USED
157                     IN THE NORMAL MANNER.
158
159                     THE SWITCH REGISTER SETTINGS ARE:-
160
161                         SWR15=1     INHIBIT ERROR HALT
162                         SWR14=1     INHIBIT ERROR PRINT-OUT
163                         SWR13=1     FAST ITERATION
164                         SWR12=1     :
165                         SWR11=1     :SCOPE LOOPS, SEE BELOW
166                         SWR10=1     :FOR A DESCRIPTION, AND
167                         SWR09=1     :APPENDIX A FOR EXAMPLES
168                         SWR08=1     :OF THEIR USE
169                         SWR07=1     NON INTERVENTION
170                         SWR06=1     PRE-SELECTED TEST INDICATOR
171                         SWR05=1     :
172                         SWR04=1     :
173                         SWR03=1     :TEST NOS.
174                         SWR02=1     :
175                         SWR01=1     :
176                         SWR00=1     :
177
178                     THE SETTING OF BITS 7, 8, 9, 10, 11, AND 12 IN THE
179                     SWITCH REGISTER ARE USED TO SELECT THE TRAP OPTIONS
180                     PRESENT IN THE PROGRAM. THE SELECTION IS MADE IN THE
181                     FOLLOWING MANNER:
182
183                     BIT(S) SET      TRAP FUNCTION SELECTED
184
185                     7               TRAP+2
186                     8               TRAP+4
187                     9               TRAP+10
188                     10              TRAP+20
189                     9 AND 10        TRAP+30
190                     11              TRAP+40
191                     9 AND 11        TRAP+50
192                     10 AND 11       TRAP+60
193                     9, 10 AND 11    TRAP+70
194                     12              USES THE SWITCH REGISTER SETTING THAT
195                                     WAS IN FORCE WHEN THE LAST TRAP
196                                     INSTRUCTION WAS EXECUTED.
```

IF A HARDWARE SWITCH REGISTER IS NOT PRESENT, THE PROGRAM ASSIGNS A LOCATION IN MEMORY AS A SOFTWARE SWITCH REGISTER, THE OPTIONS REMAINING AS ABOVE. THIS MEANS THAT ALL MODIFICATIONS TO THE SWITCH REGISTER MAY BE MADE USING THE CONSOLE TELETYPE VIA A MONITOR ROUTINE. THIS MONITOR IS CALLED BY TYPING CTRL-G AT THE CONSOLE TELETYPE AND RESPONDS BY PRINTING THE CURRENT CONTENTS OF THE SOFTWARE SWITCH REGISTER, FOLLOWED BY A PROMPT CHARACTER (>). THE OPERATOR SHOULD THEN TYPE IN THE NEW SWITCH REGISTER SETTINGS AS AN OCTAL NUMBER, FOLLOWED BY A CARRIAGE RETURN. TYPING CARRIAGE RETURN ALONE WILL CAUSE THE SETTING TO REMAIN UNCHANGED. THE SWITCH REGISTER IS THEN LOADED WITH THE NEW VALUE AND PROGRAM EXECUTION CONTINUES. IF A SETTING IS ENTERED WHICH INCLUDES THE PRE-SELECTED TEST BIT (SWR06), THE TEST INDICATED BY SWR 00-05 WILL BE SELECTED IMMEDIATELY. THIS DOES NOT APPLY WHEN DEFAULTING ON AN EXISTING SETTING.

THE SWR MONITOR IS ALSO CALLED AUTOMATICALLY IF AN ERROR IS DETECTED AND SWR BIT 15 IS NOT SET. OCTAL EQUIVALENTS FOR THE SWITCHES ARE AS FOLLOWS:

SWR15 =	100000
SWR14 =	40000
SWR13 =	20000
SWR12 =	10000
SWR11 =	4000
SWR10 =	2000
SWR09 =	1000
SWR08 =	400
SWR07 =	200
SWR06 =	100
SWR05 =	40
SWR04 =	20
SWR03 =	10
SWR02 =	4
SWR01 =	2
SWR00 =	1

TO SET A COMBINATION OF THESE SWITCHES, SIMPLY ADD TOGETHER THE CORRESPONDING OCTAL NUMBERS AND ENTER THE TOTAL IN RESPONSE TO 'SWR= X>''. (LEADING ZEROS MAY BE IGNORED).

FOR WORST CASE TESTING, ALL SWITCHES SHOULD BE ZERO. IT IS POSSIBLE, WITH THESE SWITCH REGISTER OPTIONS, TO EXECUTE ONLY A PRE-SELECTED TEST WITH THE FACILITY TO LOOP ON THAT TEST OR TO START THE PROGRAM PASS OR FINISH THE PROGRAM PASS AT ANY PARTICULAR TEST.

```
                    8.          ERROR REPORTS

THE FORMAT OF THE ERROR REPORTS IS AS FOLLOWS:-

     E# AABB                AT PC:CCCC
     GOOD: DDDD             BAD: EEEE
     STATUS: FFFF           ADDRES: GGGG
     DATA: KKKK             CALLED FROM: HHHH
                            ERROR COUNT = JJJJ

WHERE:

     AA   IS THE TEST NUMBER
     BB   IS THE ERROR NUMBER
     CCCC IS THE ADDRESS WHERE THE ERROR REPORT OCCURS.
     DDDD IS THE DATA EXPECTED
     EEEE IS THE DATA RECEIVED
     FFFF GGGG AND KKKK ARE CONTENTS OF REGISTERS.
     HHHH IS THE ADDRESS IN THE MAINLINE CODE WHERE THE
          SUBROUTINE, WHERE THE ERROR REPORT IS
          GENERATED, IS CALLED FROM.
     JJJJ IS THE NUMBER OF ERRORS REPORTED TO DATE IN
          THIS SECTION.


                    9.          ONLINE MODIFICATIONS

AVAILABLE TO THE USER IS A ROUTINE TO MODIFY PROGRAM
LOCATIONS.  IT IS ENTERED BY TYPING CNTRL-O DURING THE
RUNNING OF THE TESTS.  ON ENTRY, A PROMPT '$' IS MADE
FOR THE ADDRESS TO BE MODIFIED.  IF NO ADDRESS IS GIVEN,
IT IS ASSUMED THAT NO MODIFICATIONS ARE REQUIRED AND THE
ROUTINE WILL COMPLETE.  IF AN ADDRESS IS SPECIFIED, IT
WILL BE CHECKED TO SEE IF IT IS EVEN AND IN EXISTANCE.
ONCE IT HAS BEEN CHECKED, ITS CONTENTS ARE DISPLAYED AND
A PROMPT '/' IS MADE FOR THE NEW CONTENTS.  IF NO NEW
VALUE IS GIVEN, THE EXISTING VALUE WILL BE LOADED.
HAVING DEALT WITH THAT ADDRESS, THE ROUTINE WILL THEN
EXAMINE THE TERMINATING CHARACTER TO DETERMINE THE NEXT
OPERATION TO PERFORM.

TYPING  <ESC>  WILL COMPLETE THE MODIFICATIONS BEING
               DONE.
        <CR>   WILL CAUSE A PROMPT FOR THE NEXT ADDRESS
               TO BE MODIFIED.
        <LF>   WILL TAKE THE NEXT ADDRESS TO BE MODIFIED
               AS THE CURRENT ADDRESS+2.
```

10. MISCELLANEOUS

IF THE OPERATOR WISHES TO SOAK TEST WITHOUT MANUAL INTERVENTION, THEN HE MUST SET SWR BITS 15, 14 AND 7. THIS WILL RUN THE TESTS WITHOUT DISPLAYING AND TEST OR ERROR MESSAGES. IF, AT THE END OF THE RUN, A SUMMARY ERROR REPORT IS REQUIRED, THEN TEST 10 SHOULD BE SELECTED AND RUN.

TO RUN THE TESTS WITH ERROR REPORTING, BUT WITH NO ERROR HALT, ONLY SWR BITS 15 AND 7 NEED TO BE SET.

ONCE ALL THE DEVICES HAVE BEEN TESTED, THE PROGRAM WILL ATTEMPT TO DETERMINE IF IT WAS CALLED FROM THE XXDP MONITOR. IF LOCATIONS 42/43 ARE NOT ZERO, THE PROGRAM WILL ISSUE A CALL TO THAT ADDRESS. IF THE OPERATOR DOES NOT WISH THIS RETURN TO OCCUR, THEN HE MUST EITHER RUN WITH SWR BIT 7 SET OR ENSURE THAT LOCATIONS 42/43 ARE CLEAR.

IF THE FIELD VIDEO SIGNAL HAS TOO MUCH NOISE ON IT FOR A STATISIZED READING, ONE OF TWO ERROR REPORTS MAY BE GENERATED. ERROR 70: AN INITIAL SAMPLY COULD NOT BE TAKEN. ERROR 67: THE SIGNAL DOES NOT CHANGE STATE.

11. PROGRAM DESCRIPTION

TEST 0

THIS TEST CHECKS THAT ALL THE READ/WRITE BITS IN THE CSR CAN BE SET AND CLEARED, AND THAT THE DATA BUFFER IS UNAFFECTED. THE PROGRAM LOADS A SLIDING ONES PATTERN INTO THE CSR, THEN READS IT BACK TO CHECK THAT THE PATTERN WAS LOADED. THE DBUFF IS ALSO CHECKED FOR ZERO. HAVING CHECKED A SLIDING ONES PATTERN, THE PROCESS IS THEN REPEATED FOR SLIDING ZEROS.

ERROR 1 BIT NOT SET IN CSR. GOOD = EXPECTED, BAD = RECEIVED, ADDRESS = CSR ADDRESS, DATA = PATTERN NUMBER. TRAP+10 TO LOOP.

ERROR 2 DBUFF AFFECTED BY SETTING CSR. STATUS = RECEIVED DATA, ADDRESS = DBUFF ADDRESS, DATA = PATTERN NUMBER. TRAP+20 TO LOOP.

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                                ERROR 3     BIT NOT CLEAR IN CSR.  GOOD = EXPECTED, BAD
                                            = RECEIVED, ADDRESS = CSR ADDRESS, DATA =
                                            PATTERN NUMBER.  TRAP+30 TO LOOP.

                                ERROR 4     DBUFF AFFECTED BY CLEARING CSR.  STATUS =
                                            RECEIVED DATA, ADDRESS = DBUFF ADDRESS, DATA
                                            = PATTERN NUMBER.  TRAP+40 TO LOOP.


                                TEST 1

                                THIS TEST CHECKS THAT THE FIELD VIDEO SIGNAL TOGGLES,
                                AND THAT THE PERIOD IS ROUGHLY 1/50TH OR 1/60TH OF A
                                SECOND, DEPENDING UPON WHAT THE OPERATOR HAS SELECTED.
                                THE PROGRAM FIRST CHECKS THAT THE FIELD VIDEO SIGNAL CAN
                                GO THROUGH A HI-LOW-HI-LOW, AND A LOW-HI-LOW-HI TRANSI-
                                TION.  AS MENTIONED PREVIOUSLY, IF THE SIGNAL IS TOO
                                NOISY TO GET A READING, ERROR 67 MAY BE
                                GENERATED. IF THE SIGNAL DOES NOT WORK, ERROR 70
                                IS FLAGGED.  IF THE TEST DOES NOT COMPLETE IN A REASONA-
                                BLE AMOUNT OF TIME, IT CAN BE ASSUMED THAT THE SIGNAL
                                HAS NOT TOGGLED.  TO GET OUT OF THIS, THE OPERATOR MUST
                                TYPE SPACE TO TERMINATE THIS SECTION.

                                HAVING VERIFIED THAT THE SIGNAL CAN TOGGLE, THE PROGRAM
                                THEN USES THIS INFORMATION TO CREATE A WAIT LOOP OF ONE
                                SECOND.  THIS WAIT LOOP IS THEN USED TO TIME FIVE BY ONE
                                SECOND INTERVALS.  AT THE END OF EACH INTERVAL, THE
                                CONSOLE TELETYPE BELL IS RUNG.  THIS INFORMATION CAN BE
                                USED TO JUDGE WHETHER THE FRAME TIME IS REASONABLE.
                                SINCE THERE ARE MANY INSTRUCTIONS EXECUTED BETWEEN
                                SAMPLING POINTS, THIS TIMING INFORMATION IS NOT ACCURATE
                                AND MUST THEREFORE BE JUDGED ACCORDINGLY.  SETTING
                                TRAP+20 WILL LOOP ON RINGING THE BELL.

                                ERROR 1     NOISY SIGNAL OR ABORTED TEST.  TRAP+10 TO
                                            LOOP.


                                TEST 2

                                THIS TEST CHECKS THAT ALL THE COLOURS CAN BE DISPLAYED.
                                BY SELECTING CHARACTER CODE 0, AND THE SAME FOREGROUND
                                AND BACKGROUND COLOURS, A FULL SCREEN OF THAT COLOUR IS
                                DISPLAYED.  THE SEQUENCE OF OPERATIONS IS AS FOLLOWS:-

                                            F/B WHITE           NO VIDEO
                                            F/B BLACK           VIDEO ON
                                            F/B RED             VIDEO ON
                                            F/B GREEN           VIDEO ON
                                            F/B YELLOW          VIDEO ON
                                            F/B BLUE            VIDEO ON
                                            F/B MAGENTA         VIDEO ON
                                            F/B CYAN            VIDEO ON
                                            F/B WHITE           VIDEO ON
```

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405
406                                     SETTING TRAP+10 WILL LOOP ON THE CURRENT COLOUR
407                                     SELECTION.
408
409
410                                     TEST 3
411
412                                     THIS TEST CHECKS OUT THE X AND Y ADDRESSING OF THE DEVICE.
413                                     THE SCREEN IS SET TO BLUE AND TWO DIAGONALS ARE
414                                     DISPLAYED. ONE IS MADE OF MAGENTA BLOCKS, STARTING AT
415                                     THE TOP RIGHT CORNER, AND THE OTHER IS IN WHITE,
416                                     STARTING AT THE BOTTOM LEFT.
417
418
419                                     TEST 4
420
421                                     THIS TEST CHECKS OUT THE FOREGROUND/BACKGROUND COLOUR
422                                     SELECTION WITH BLINK AND FLASH.  CHARACTER CODE ZERO IS
423                                     SELECTED, SINCE IT IS HALF FOREGROUND AND HALF
424                                     BACKGROUND, DIVIDED VERTICALLY.  THE WHOLE DISPLAY IS
425                                     LOADED WITH THE COLOUR, BLINK AND FLASH INFORMATION IN
426                                     THE FOLLOWING ORDER:-
427
428                                             BLACK ON WHITE
429                                             BLINK WHITE ON BLACK
430                                             FLASH WHITE ON BLACK
431                                             FLASH AND BLINK
432
433
434                                     NOTE: THE FLASH WILL NORMALLY APPEAR TO 'HOP' SIDEWAYS.
435
436                                     SETTING TRAP+10 WILL LOOP ON THE CURRENT COLOUR/BLINK/-
437                                     FLASH SELECTION.
438
439
440                                     TEST 5
441
442                                     THIS TEST CHECKS OUT THE CHARACTER STORE ADDRESSING OF
443                                     THE DEVICE.  THE DISPLAY IS SET TO BLACK, THEN THE
444                                     ENTIRE CHARACTER SET IS DISPLAYED WITH RED ON BLUE.
```

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                                ROM BASED CHARACTER SET

FOR THE ROM BASED CHARACTER SET, THE CHARACTER SET WILL
DISPLAY AS RED ON BLUE IN AN AREA FROM Y = 18 THRU 21 TO
X = 7 THRU 40.  THE CHARACTER SET IS DISPLAYED AS
CHARACTER STORE ADDRESSES INCREMENTING HORIZONTALLY.
SETTING TRAP+10 WILL LOOP ON DISPLAYING THE CHARACTER
SET.

                                RAM BASED CHARACTER SET

FOR THE RAM BASED CHARACTER SET, THE DISPLAY AREA STARTS
AT X = 7, Y = 18.  THE CHARACTER CODES ARE DISPLAYED
VERTICALLY IN COLUMNS FIVE CHARACTERS LONG, I.E. COLUMN
1 RUNS FROM CODE 0 TO CODE 4, COLUMN 2 FROM 5 TO 9, ETC.

THE CHARACTER SET IS FIRST SET TO ZERO, THEN A VERTICAL
LINE IS MOVED THRU THE ENTIRE CHARACTER SET, FIVE
CHARACTERS AT A TIME.  THIS WILL APPEAR AS A VERTICAL
LINE MOVING ACROSS THE DISPLAY AREA.

SETTING TRAP+20 WILL LOOP ON THE CURRENT CHARACTER CODE.
IF TRAP+70 IS SET, THE OPERATOR CAN SELECT WHICH
CHARACTER CODE HE WANTS TO TEST.  HAVING SELECTED THE
CODE, THE PROGRAM THEN ALLOWS THE OPERATOR TO CHANGE
SWITCH REGISTER SETTINGS, SUCH AS SETTING TRAP+20.  ONCE
TRAP+70 HAS BEEN SET, IT IS THEN CLEARED, THE PROGRAM
WILL CONTINUE TESTING FROM THE CHARACTER CODE TO
OPERATOR SELECTED.

TEST 6
THIS TEST CHECKS THE DATA INTEGRITY OF THE CHARACTER
STORE ADDRESSES, HELD IN THE PICTURE STORE.  THE
CHARACTER STORE ADDRESS IS HELD IN TWO BY 4-BIT RAMS PER
PICTURE LOCATION, WITH THE HIGH BIT OF THE TOP RAM
UNUSED.  A FIVE CHARACTER STORE ADDRESS PATTERN IS USED,
SUCH THAT THE SAME BIT IN EACH RAM IS SET.  THE
ADDRESSES USED ARE 21, 42, 104, 10 AND 40.  ALTHOUGH
CHARACTER ADDRESS 40 DOES NOT SET BITS IN EACH RAM, IT
IS USED TO MAKE THE SEQUENCE ODD SO THAT IF THERE IS A
POWER OF TWO FAULT IN THE MEMORY, IT WILL GET PICKED UP.
EACH NEW ROW STARTS WITH THE NEXT CHARACTER IN THE
SEQUENCE, SO THAT THE CODES APPEAR TO BE DRAWN IN
DIAGONAL LINES RUNNING TOP RIGHT TO BOTTOM LEFT.  EACH
TIME THE COMPLETE SCREEN IS UPDATED, THE CHARACTER CODES
ARE MOVED ONE PLACE LEFT, GIVING THE EFFECT TO THE
DIAGONAL LINES MOVING RIGHT TO LEFT.  THE COLOURS USED
ARE WHITE ON BLACK.  SETTING TRAP+4 WILL LOOP ON THE
TEST.
  THE PAT   IS.        DIAMOND
                       DOUBLE QUOTES
                       CAPITAL 'D'
                       HEAVY PLUS (+) SIGN
                       (SPACE)
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503
504                                     TEST 7
505
506                                     THIS IS AN EXERCISER TEST THAT DISPLAYS ALL CHARACTERS
507                                     IN EVERY PICTURE LOCATION.  CHARACTER CODES ARE
508                                     DISPLAYED IN DIAGONAL ROWS, TOP RIGHT TO BOTTOM LEFT.
509                                     THE DIAGONAL LINE WILL BE MOVED FROM BOTTOM RIGHT TO TOP
510                                     LEFT.  THE COLOURS ARE DISPLAYED IN VERTICAL BANDS, THE
511                                     FOREGROUND COLOURS BEING RED, GREEN, THEN BLUE, AND THE
512                                     BACKGROUND COLOURS BEING RED, GREEN, YELLOW, BLUE,
513                                     MAGENTA, CYAN AND WHITE.
514
515                                     AS THE TEST PROGRESSES, IT WILL APPEAR THAT THE CHARAC-
516                                     TER CODES ARE MOVING UP VERTICAL LINES, BUT OFFSET BY
517                                     ONE PICTURE ROW, THUS GIVING THE EFFECT OF A MOVING
518                                     DIAGONAL LINE.
519
520
521                                     TEST 10
522
523                                     THIS OPTIONALLY SELECTABLE TEST IS USED TO PRINT OUT THE
524                                     ACCUMULATED ERRORS TO DATE.  IT CAN BE USED AFTER
525                                     RUNNING SOAK TESTING TO GIVE AN INDICATION OF THE NUMBER
526                                     OF ERRORS THAT HAVE OCCURED.
527
528                                     THIS TEST PRINTS A MESSAGE 'ERROR COUNT = '', FOLLOWED BY
529                                     THE CURRENT ERROR COUNT.  THE PROGRAM THEN CLEARS THE
530                                     ERROR COUNT.
531
532
533                                     TEST 11
534
535                                     THIS OPTIONALLY SELECTED TEST IS USED TO CHECK THE RESPONSE
536                                     OF THE VIDEO ADAPTERS. THERE ARE 7 BLOCKS OF 4 ROWS EACH.
537                                     EACH BLOCK IS A DIFFERENT COLOUR, IN THE SEQUENCE..
538                                             RED
539                                             GREEN
540                                             YELLOW
541                                             BLUE
542                                             MAGENTA
543                                             CYAN
544                                             WHITE
545                                     ....EACH ROW HAS .5,1,2 AND 4 MHZ VERTICAL BARS TO TEST
546                                     THE RESPONSE.
```

APPENDIX A

PDP-11 DIAGNOSTIC LOOPING FACILITIES VIA

SWITCH REGISTER OPTIONS

N.B.

THE INTENTION OF THIS APPENDIX IS TO EXPLAIN, IN GENERAL, THE SCOPE FACILITIES WITHIN PROGRAM CODING. THE USER MUST FIRST EXAMINE THE CODING ABOUT THE AREA HE WISHES TO USE SCOPING FACILITIES, TO ASCERTAIN THAT THE PARTICULAR FACILITY HE REQUIRES IS, IN FACT, AVAILABLE.

PROGRAM LOOPING CONTROL CAN BE SELECTED BY USING SWR 12 - 07. THE PROGRAM HANDLES THIS BY USE OF THE TRAPSV ROUTINE, WHICH IS ENTERED USING THE TRAP INSTRUCTION. BASICALLY, THE ROUTINE CHECKS EQUALITY BETWEEN BITS 05 - 00 OF THE TRAP INSTRUCTION AND SWR 12 - 07.

THERE ARE THREE DISTINCT FUNCTIONS CONTROLLED BY THE TRAP ROUTINE:-

A) RUN - (TRAP + 2 INSTRUCTION AND SWR 07 SET)
USUALLY USED TO INHIBIT TEST NUMBER PRINTOUT; USEFUL IN THE CASE OF NON-INTERVENTION TESTS. WHEN SWR 07 IS SET, ALL TEST NUMBER MESSAGES ARE SUPPRESSED.
NOTE: IT DOES NOT SUPPRESS ERROR PRINTOUTS.

B) LOOP ON A SUB-TEST - (TRAP + 4 INSTRUCTION AND SWR 08 SET)
THIS IS GENERALLY USED TO ALLOW THE OPERATOR, BY SETTING SWR 08, TO CONTINUOUSLY LOOP ON ONE LOGICAL TEST OR GROUP OF TESTS.

C) SCOPE ON A SUB-TEST - (TRAP + 10 - 70 INSTRUCTIONS AND SWR 09 - 11)
THIS ALLOWS THE OPERATOR TO SELECT SEVEN LEVELS OF LOOPING FACILITY WITHIN A SELECTION OR TEST.

IT IS USED TYPICALLY WITHIN A TEST WHERE ONE SUB-TEST SETS A FLAG AND THE NEXT ONE CLEARS IT. BY USING SCOPE LEVEL 1 (SWR 09) - TRAP + 10), HE COULD LOOP ON THE FIRST SUB-TEST, SCOPE LEVEL 2 (SWR10) - TRAP + 20), HE COULD LOOP ON THE SECOND SUB-TEST OR SCOPE LEVEL 3 (SWR 10 & 09 - TRAP + 30) TO LOOP CONSTANTLY THROUGH BOTH SUB-TESTS SEQUENTIALLY. THE SCOPE RETURN ADDRESS ALWAYS APPEARS AS THE ARGUMENT OR NEXT WORD AFTER THE TRAP INSTRUCTION.

```
601
602                     TO ALLOW THE SCOPE LEVEL TO BE CHANGED WITHOUT STOP-
603                     PING THE PROGRAM, E.G. TO CHANGE FROM LEVEL 1 TO 2,
604                     WHICH WOULD ALMOST CERTAINLY CAUSE LEVEL 3 OR 0 TO
605                     BE SEEN MOMENTARILY), A 'PRESERVE SCOPE' FACILITY IS
606                     PROVIDED WITH SWR12.  WHEN THIS IS SELECTED, THE
607                     PROGRAM NO LONGER INSPECTS SWR 11 - 09 BUT USES THE
608                     SETTING MEMORISED FROM BEFORE SWR 12 WAS SELECTED.
609                     THE SCOPE LEVEL MAY NOW BE CHANGED WITH NO EFFECT
610                     UNTIL SWR 12 IS SET TO 0, WHEN THE NEW SCOPE SETTING
611                     APPLIES.
612
613                     N.B.  SETTING SWR 12 SHOULD ONLY BE USED TO PRESERVE
614                     AS EXISTING SCOPE LEVEL, AS PREVIOUSLY SET ON THE
615                     SWITCH REGISTER.
616
617                     WHICH SCOPE LEVEL TO SELECT MAY BE DETERMINED THE
618                     LISTING; LEVELS 1 THROUGH 7 ARE CALLED BY TRAP + 10
619                     (SWR 09) THROUGH TRAP + 70 (SWR 09, 10 AND 11).
```

B 2

EXAMPLE OF SCOPE LOOP FACILITIES WITHIN DIAGNOSTIC

```
;
TEST10: MOV     #40,COUNT       ;ITERATION COUNT.
T101:   BIS     #1,STATUS       ;SET GO BIT.
        BIT     #1,STATUS       ;IS GO BIT SET?
        BNE     T10SCP          ;YES, BRANCH.
        JSR     PC,ERROR        ;ERROR!!! GO NOT SET.
        10                      ;ERROR NUMBER.
T10SCP: TRAP+10                 ;SCOPE TEST 10 IF LEVEL 1 SELECTED.
        T101                    ;RETURN LABEL FOR SCOPE.
TEST11: BIC     #1,STATUS       ;CLEAR GO BIT
        BIT     #1,STATUS       ;GO BIT CLEAR  ?
        BEQ     T11SCP          ;GO BIT CLEAR BRANCH.
        JSR     PC,ERROR        ;NO. GO BIT FAILED TO CLEAR.
        11                      ;ERROR!!! NO. 11.
T11SCP: TRAP+30                 ;SCOPE TEST 11 IF LEVEL 3 SELECTED.
        TEST11                  ;RETURN LABEL FOR SCOPE.
        TRAP+20                 ;SCOPE TESTS 10 & 11.
        T101                    ;RTURN LABEL.
TEST12: BIS     #100,STATUS     ;NO SCOPE SELECTED. CARRY ON.
        BIT     #100,STATUS     ;IS DONE BIT SET ?
        (ETC.)
        .
        .
        .
T12SCR: TRAP+10                 ;SCOPE INT. EN. SET, LEVEL 1.
        TEST 12                 ;RETURN LABEL.
TEST13: BIC     #100,STATUS     ;CLEAR INT ENABLE BIT.
        BIT     #100,STATUS     ;IS BIT CLEAR?
        (ETC.)
        .
        .
        .
T13SCP: TRAP+30                 ;SCOPE INT CLEAR LEVEL 3.
        TEST13                  ;RETURN LABEL.
        TRAP+20                 ;SCOPE INT. SET AND CLEAR.
        TEST12                  ;LEVEL 2.
        TRAP+4                  :SCOPE LOOP ON THIS SET OF TESTS.
        T101                    ;RETURN LABEL.
        DEC     COUNT           ;DO 40 TIMES ANYWAY
        BGT     T101
TEST14: (ETC.)
        .
        .
        .
;
```

```
   673                                          .ENDR
```

```
                                        .TITLE  VTV30K DIAGNOSTIC
                                        .SBTTL  GENERAL DEFINITIONS


000000                                  R0=%00
000001                                  R1=%01
000002                                  R2=%02
000003                                  R3=%03
000004                                  R4=%04
000005                                  R5=%05
000006                                  SP=%06
000007                                  PC=%07
177776                                  PSW=177776
177570                                  HSWR=177570


100000                                  G=100000
040000                                  D=40000
020000                                  A=20000
010000                                  S=10000


177564                                  TPS=177564
177566                                  TPB=177566
177560                                  TKS=177560
177562                                  TKB=177562



                                        .ENABL  ABS
                                        .ENABL  AMA
```

```
                        .SBTTL  MACROS
                ;
                ;
                ; SET PROCESSOR PRIORITY
                ;
                ;
                        .MACRO  PSWSET  $ARG,?LAB
                        MOV     $ARG,-(SP)      ; SET UP NEW PSW AS $ARG
                        MOV     #LAB,-(SP)      ; SET RETURN ADDRESS
                        RTI                     ; RTI TO SET PRIORITY
                LAB:    NOP                     ; RETURN ADDRESS
                        .ENDM
                ;
                ;
                ; READ PROCESSOR PRIORITY
                ;
                ;
                        .MACRO  PSWREA  $ARG
                        EMT                     ; ISSUE EMT TO READ PSW
                        MOV     FSAVPW,$ARG     ; READ PSW IN $ARG
                        .ENDM
                ;
                ;
```

```
                                        .SBTTL  INITIALISATION
                    000000              .ASECT
                    000000              .=0
                    000042              .=42
000042              000000              0                       ; XXDP HOOK INITIALIZATION.
                    000200              .=200
000200              000137  001000      JMP     @#START         ; JMP TO START AT 200
                    001000              .=1000
001000  012706  001000          START:  MOV     #.,SP           ;INITIALISE STACK POINTER
001004                                  PSWSET  #340
001020  012737  012704  000004          MOV     #SWRSET,4       ;TEST FOR HARDWARE SWR
001026  012737  000340  000006          MOV     #340,6          ;TRAPS TO 4 IF IT
001034  012737  177570  007502          MOV     #HSWR,SWR       ;DOES NOT EXIST
001042  005777  006434                  TST     @SWR
001046  005037  007504                  CLR     SSWR            ;INITIALISE SOFTWARE SWR
001052  004737  012640                  JSR     PC,SILLSI       ; CHECK WHICH PROCESSOR WE ARE ON
001056  004737  012714                  JSR     PC,VECTOR       ;FILL 0-774 WITH HALT TRAPS
001062  013737  007306  007436          MOV     CSR0,DEVCSR     ; ASSUME 1 DEVICE
001070  013737  007310  007440          MOV     DBUF0,DEVBUF
001076  005037  007302                  CLR     DEVFLG
001102  004737  014734                  JSR     PC,TYPOUT
001106  006005                          GOMSG                   ;DIAGNOSTIC
001110  004737  012162                  JSR     PC,SETDEV       ; SET UP THE DEVICE
001114  004737  015776                  JSR     PC,SELBUS
001120  000137  001200                  JMP     RSTART          ;THEN GOTO THE RESTART ADDRESS
                    001174              .=1174
001174  000000          REACT:  0                               ; EXTERNAL TEST-EQUIPMENT HOOK
001176  000425          XXDPGO: BR      XXDP2

001200  012706  001000          RSTART: MOV     #START,SP       ;INITIALISE STACK POINTER
001204                                  PSWSET  #340
001220  005037  007302                  CLR     DEVFLG
001224  013737  007306  007436          MOV     CSR0,DEVCSR
001232  013737  007310  007440          MOV     DBUF0,DEVBUF

001240  004737  014734                  JSR     PC,TYPOUT
001244  006317                          WMSG                    ;SELECT DESIRED CONSOLE SWITCHES
001246  004737  013546                  JSR     PC,MONIT        ;GO TO SWR MONITOR

001252  012706  001000          XXDP2:  MOV     #START,SP       ; RESTORE THE STACK
001256                                  PSWSET  #340
001272  005037  007444                  CLR     ERRFLG          ; CLEAR ERROR FLAG
001276  005037  007574                  CLR     ERRDIS
001302  005037  007442                  CLR     ERRDI1
001306  013737  007306  007436  START1: MOV     CSR0,DEVCSR     ; START WITH THE FIRST CSR
001314  013737  007310  007440          MOV     DBUF0,DEVBUF    ;
001322  005037  007302                  CLR     DEVFLG

001326  012706  001000          START2: MOV     #START,SP       ;INITIALISE STACK POINTER
001332                                  PSWSET  #340

001346  032777  000100  006126          BIT     #100,@SWR       ;CHECK FOR PRE-SELECTED TEST
001354  001002                          BNE     START3
```

```
                                                                    G 2
   794
   795  001356  000137  001450                JMP     TEST0           ;TO TEST 0
   796  001362  000137  001366        START3: JMP     TABLE           ;TO LOOK-UP TABLE
```

```
001366  017700  006110          TABLE:  MOV     @SWR,R0         ;GET SELECTED TEST NO
001372  042700  177700                  BIC     #177700,R0
001376  022700  000011                  CMP     #11,R0          ;CHECK FOR VALID TEST NO
001402  002676                          BLT     RSTART

001404  006300                          ASL     R0
001406  000170  001412                  JMP     @TABLE1(R0)     ;JUMP TO PRE-SELECTED TEST





001412  001450                  TABLE1: TEST0
001414  002040                          TEST1
001416  002174                          TEST2
001420  002354                          TEST3
001422  002616                          TEST4
001424  003110                          TEST5
001426  004234                          TEST6
001430  004660                          TEST7
001432  005264                          TEST10
001434  005362                          TEST11
                                ; THE FOLLOWING TABLE HAS ONE ENTRY FOR EACH OF THE ABOVE
                                ; IF ZERO, IT DISABLES THE STALL FACILITY IN 'WAITS' FOR
                                ; THAT TEST.
                                ;
001436     000     000     001  TABLE2: .BYTE   0,0,1,1,1,0,1,0,0,0
001441     001     001     000
001444     001     000     000
001447     000
                                        .EVEN
```

```
                        .SBTTL  TEST0
                ;
                ; THIS TEST CHECKS THE READ/WRITE BITS OF THE CONTROL REGISTER
                ; BY WRITING A SLIDING ONES PATTERN TO THE REGISTER, TO CHECK
                ; THAT BITS CAN SET. THEN, BY WRITING A SLIDING ZEROES PATTERN
                ; CHECK THAT THE BITS CAN CLEAR. AT EACH STAGE OF THE OPERATION
                ; THE DATA BUFFER IS CHECKED TO SEE THAT THE SETTING/CLEARING
                ; HAD NO EFFECT.
                ;
001450 005037 007454    TEST0:  CLR     TESTNO          ; SET TEST NUMBER
001454 104402                   TRAP+2
001456 001472                   T0001
001460 004737 011624            JSR     PC,TESTR        ; PRINT TEST NUMBER
001464 004737 014734            JSR     PC,TYPOUT
001470 006360                   TSOMSG
001472 012704 000200    T0001:  MOV     #200,R4         ; SUGGEST AN ITERATION COUNT
001476 004737 013306            JSR     PC,FASTSW       ; IS FAST ITERATION SET
001502 010437 007506            MOV     R4,REPCNT       ; SET ACTUAL ITERATION COUNT
001506 012737 000020 007566 T0002:  MOV     #16.,DATA       ; GET LOOP COUNT
001514 012703 000004    T0003:  MOV     #4,R3           ; SELECT SLIDING ONES
001520 004737 016370            JSR     PC,GENER        ; GET THE PATTERN
001524 042737 034000 007562     BIC     #34000,GOOD     ; MASK READ ONLY BITS
001532 013737 007436 007572 T0004:  MOV     DEVCSR,ADDRES   ; GET CURRENT ADDRESS
001540 013777 007562 006024     MOV     GOOD,@ADDRES    ; SET DATA IN CSR
001546 017737 006020 007564     MOV     @ADDRES,BAD     ; READ REPLY
001554 042737 034000 007564     BIC     #34000,BAD      ; MASK UNWANTED
001562 023737 007562 007564     CMP     GOOD,BAD        ; ARE THEY THE SAME
001570 001403                   BEQ     T0005           ; YES
001572 004737 016666            JSR     PC,ERROR        ; NO REPORT AN ERROR
001576 160001                   1+D+G+A
001600 104410           T0005:  TRAP+10                 ; LOOP ON THIS DATA
001602 001532                   T0004
001604 013737 007440 007572     MOV     DEVBUF,ADDRES   ; SET DATA BUFFER ADDRESS
001612 017737 005754 007570     MOV     @ADDRES,STATUS  ; THE DATA BUFFER SHOULD BE CLEAR
001620 005737 007570            TST     STATUS          ; IS IT
001624 001403                   BEQ     T0007           ; YES
                ; ERROR-
                ; CHECK 'LEVA LOAD CAR H'
                ;       'LEVA READ CAR L'
                ;       +3VA ON E46-1 IF BAD=0
                ;       RELEVANT BIT ON LEVB B8 (E25,E46)
001626 004737 016666            JSR     PC,ERROR
001632 070002                   2+A+S+D
001634 104420           T0007:  TRAP+20
001636 001532                   T0004                   ; LOOP ON COMPLETE
001640 005337 007566            DEC     DATA            ; ALL PATTERNS DONE
001644 001323                   BNE     T0003           ; NO
                ;
                ; NOW DO SLIDING ZEROES
                ;
001646 012737 000020 007566     MOV     #16.,DATA       ; GET LOOP COUNT
001654 012703 000005    T0009:  MOV     #5,R3           ; SELECT SLIDING ZEROES
001660 004737 016370            JSR     PC,GENER        ; GET THE PATTERN
001664 042737 034000 007562     BIC     #34000,GOOD     ; MASK READ ONLY BITS
001672 013737 007436 007572 T0010:  MOV     DEVCSR,ADDRES   ; GET CURRENT ADDRESS
001700 013777 007562 005664     MOV     GOOD,@ADDRES    ; SET DATA IN CSR
```

```
 883  001706  017737  005660  007564          MOV     @ADDRES,BAD     ; READ REPLY
 884  001714  042737  034000  007564          BIC     #34000,BAD      ; MASK UNWANTED
 885  001722  023737  007562  007564          CMP     GOOD,BAD        ; ARE THEY THE SAME
 886  001730  001403                          BEQ     T0011           ; YES
 887                                  ; ERROR-
 888                                  ; REPLACE LEVB B8 E25 OR E46?
 889  001732  004737  016666                  JSR     PC,ERROR        ; NO REPORT AN ERROR
 890  001736  160003                          3+D+G+A
 891  001740  104430                  T0011:  TRAP+30                 ; LOOP ON THIS DATA
 892  001742  001672                          T0010
 893  001744  013737  007440  007572          MOV     DEVBUF,ADDRES   ; SET DBUF ADDRESS
 894  001752  017737  005614  007570          MOV     @ADDRES,STATUS  ; THE DATA BUFFER SHOULD BE CLEAR
 895  001760  005737  007570                  TST     STATUS          ; IS IT
 896  001764  001403                          BEQ     T0013           ; YES
 897                                  ; ERROR-
 898                                  ; REPLACE LEVB B8 E25 OR E46?
 899  001766  004737  016666                  JSR     PC,ERROR
 900  001772  070004                          4+A+S+D
 901  001774  104440                  T0013:  TRAP+40
 902  001776  001672                          T0010                   ; LOOP ON COMPLETE
 903  002000  005337  007566                  DEC     DATA            ; ALL PATTERNS DONE
 904  002004  001323                          BNE     T0009           ; NO
 905                                  ;
 906                                  ; END OF TEST ?
 907                                  ;
 908  002006  104404                          TRAP+4                  ; LOOP ON TEST ?
 909  002010  001514                          T0003
 910  002012  005337  007506                  DEC     REPCNT          ; ITERATE TILL DONE
 911  002016  001633                          BEQ     T0002
 912  002020  005077  005412                  CLR     @DEVCSR         ; TIDY UP AFTER TEST.
 913  002024  032777  000100  005450          BIT     #100,@SWR       ; PRESELECT TEST ?
 914  002032  001402                          BEQ     TEST1           ; NO
 915  002034  000137  001326                  JMP     START2          ; YES GO DO IT
```

```
                                        .SBTTL  TEST1
                                ;
                                ; THIS TEST CHECKS THE FIELD VIDEO TIMING BY ATTEMPTING
                                ; TO RING THE BELL EVERY SECOND FOR 5 SECONDS
                                ; IF THE BELL DOES NOT RING, TYPE CNTRL-X TO ABORT THE TEST
                                ;
                                ;
002040  012737  000001  007454  TEST1:  MOV     #1,TESTNO       ; SET TEST NUMBER
002046  104402                         TRAP+2
002050  002064                         T0101
002052  004737  011624                 JSR     PC,TESTR        ; PRINT TEST NUMBER
002056  004737  014734                 JSR     PC,TYPOUT
002062  006365                         TS1MSG
002064                          T0101:
002064  012737  000100  007506         MOV     #100,REPCNT     ; SET ITERATION COUNT
                                ;
                                ; TRY TO SYNC UP
                                ;
002072  004737  011644          T0102: JSR     PC,SYNCUP       ; SYNC UP
002076  000401                         BR      T0103           ; NO SYNC OR ABORT
002100  000403                         BR      T0104           ; GO A SYNC SIGNAL
                                ; ERROR-
                                ; CHECK 'LEVB CLOCK H' (8 MHZ)
                                ;       'LEVB CLOCK L'
                                ;       'LEVB VA02 H' (1 MHZ)
                                ;       'LEVA VA02 L' (1 MHZ)
                                ;       'LEVB VA17 H' (16.7 MILLISECS FOR 525, 20 FOR 625)
002102  004737  016666          T0103: JSR     PC,ERROR        ; ERROR
002106  000001                         1
002110  104410                  T0104: TRAP+10                 ; LOOP
002112  002072                         T0102                  ; TO HERE
002114  005337  007506                 DEC     REPCNT          ; REDUCE ITERATION
002120  001364                         BNE     T0102           ; KEEP GOING
                                ;
                                ; NOW RING THAT BELL
                                ;
002122  012737  000005  007566  T0105: MOV     #5,DATA         ; FINE BELLS
002130  004737  012040          T0106: JSR     PC,WAITS        ; WAIT ONE SECOND
002134  000001                         1
002136  004737  013166                 JSR     PC,BELL         ; DING DONG !!
002142  005337  007566                 DEC     DATA
002146  001370                         BNE     T0106           ; KEEP GOING
002150  104420                         TRAP+20
002152  002122                         T0105                   ; LOOP ?
                                ;
                                ;
002154  104404                         TRAP+4                  ; LOOP ON TEST
002156  002064                         T0101
002160  032777  000100  005314         BIT     #100,@#KSR      ; PRESELECT TEST
002166  001402                         BEQ     TEST2
002170  000137  001326                 JMP     START2          ; YES- GO DO IT
```

```
                        .SBTTL  TEST2

                ;
                ; THE TEST CHECKS THE PICTURE BY WRITING TO EVERY LOCATION,
                ; USING THE SAME FOREGROUND AND BACKGROUND COLOUR.
                ;
                ; THE SEQUENCE OF OPERATIONS IS:
                ;
                ;       F/B WHITE NO VIDEO
                ;       F/B BLACK VIDEO ON
                ;       F/B RED VIDEO ON
                ;       F/B GREEN VIDEO ON
                ;       F/B YELLOW VIDEO ON
                ;       F/B BLUE VIDEO ON
                ;       F/B MAGENTA VIDEO ON
                ;       F/B CYAN VIDEO ON
                ;       F/B WHITE VIDEO ON
                ;
                ; CHARACTER STORE ERRORS ARE DELIBERATELY BYPASSED IN THIS TEST.
                ; IF THE TEST WORKS, COLOUR INFORMATION CAN BE USED IN THE NEXT
                ; TEST.
                ; ERRORS-
                ; CHECK LOW-ORDER BITS O PICTURE STORE (LEVC)
                ;       OUTPUT LATCH ON LEVD, E23.
                ;       OUTPUT MUX ON LEVD, E18.
                ;       STATICISERS E6 & E12, WITH STROBES 'LEVB STROBE A H', '-B H'
                ;
002174  012737  000002  007454  TEST2:  MOV     #2,TESTNO       ; SET TEST NUMBER
002202  104402                         TRAP+2
002204  002220                         T0201
002206  004737  011624                  JSR     PC,TESTR        ; PRINT TEST NUMBER
002212  004737  014734                  JSR     PC,TYPOUT
002216  006411                         TS2MSG
002220  012737  000007  007464  T0201:  MOV     #7,FORGND       ; SET F/B TO WHITE
002226  012737  000007  007466          MOV     #7,BAKGND
002234  005037  007470                  CLR     BLINK           ; NO BLINK
002240  005037  007472                  CLR     FLASH           ; FLASH,
002244  005037  007450                  CLR     VIDEON          ; OR VIDEO.
002250  005037  007550                  CLR     CHAR            ; USE CHARACTER ZERO
002254  004737  012410                  JSR     PC,LOADFS       ; LOAD THE DISPLAY
                ;
                ; NOW WAIT AROUND
                ;
                ;
                ;
                ;
                ; NOW LOAD THE REST OF THE PICTURES WITH VIDEO ON
                ;
002260  005037  007464                  CLR     FORGND          ; START WITH BLACK
002264  005037  007466                  CLR     BAKGND          ; ON BLACK
002270  012737  040000  007450          MOV     #40000,VIDEON   ; BUT WITH VIDEO ON
002276  004737  012410  T0202:  JSR     PC,LOADFS       ; LOAD THE SCREEN
                ;
                ; NOW WAIT AROUND
                ;
002302  004737  012040                  JSR     PC,WAITS                ; WAIT FOR 2 SECONDS
002306  000002                         2
002310  104410                         TRAP+10
```

```
1025  002312  002276                          T0202                   ; LOOP TO HERE
1026                                  ;
1027                                  ; NOW UPDATE THE COLOURS
1028                                  ;
1029  002314  005237  007464                   INC     FORGND          ; NEW FORGROUND
1030  002320  005237  007466                   INC     BAKGND          ; AND BACKGROUND
1031  002324  023727  007464  000007           CMP     FORGND,#7       ; ALL DONE
1032  002332  003761                           BLE     T0202           ; NO
1033                                  ;
1034                                  ; COMPLETE
1035                                  ;
1036  002334  104404                           TRAP+4                  ; LOOP ON TEST ?
1037  002336  002220                           T0201
1038  002340  032777  000100  005134           BIT     #100,@SWR       ; PRESELECT TEST
1039  002346  001402                           BEQ     TEST3           ; NO
1040  002350  000137  001326                   JMP     START2          ; YES GO TO IT
```

```
                                                        .SBTTL  TEST3
                                                ;
                                                ; THIS TEST CHECKS THE CURSOR ADDRESSING FEATURES OF THE VTV30K.
                                                ; THE PICTURE IS FIRST SET TO BLUE ON BLUE.
                                                ; TWO DIAGONAL ROWS OF SQUARE CHARACTERS ARE PRODUCED. THE FIRST IN
                                                ; MAGENTA RUNS FROM THE TOP RIGHT CORNER TO THE BOTTOM OF THE SCREEN.
                                                ; THE SECOND IN WHITE RUNS FROM THE BOTTOM LEFT CORNER TO THE TOP.
                                                ;
                                                ; IF THIS TEST WORKS THE CAR AND THE PICTURE ADDRESSING IS OK.
                                                ; ERRORS-
                                                ; BROKEN, MISSING OR DUPLICATED DIAGONALS ARE CAUSED BY FAULTS
                                                ; ASSOCIATED WITH THE PICTURE ELEMENT SELECTOR ON LEVC.
                                                ;
002354  012737  000003  007454  TEST3:  MOV     #3,TESTNO       ; SET TEST NUMBER
002362  104402                         TRAP+2
002364  002400                         T0301
002366  004737  011624                 JSR     PC,TESTR        ; PRINT TEST NUMBER
002372  004737  014734                 JSR     PC,TYPOUT
002376  006416                         TS3MSG
002400  005037  007470          T0301:  CLR     BLINK           ; NO BLINK
002404  005037  007472                 CLR     FLASH           ; NO FLASH
002410  012737  040000  007450         MOV     #40000,VIDEON   ; ENABLE VIDEO
002416  005037  007550                 CLR     CHAR            ; SELECT CHARACTER ZERO
002422  012737  000004  007464         MOV     #4,FORGND       ; SELECT BLUE
002430  012737  000004  007466         MOV     #4,BAKGND       ; ON BLUE
002436  004737  012410                 JSR     PC,LOADFS       ; LOAD THE FULL SCREEN
                                                ;
                                                ; NOW DO X ADDRESS TESTING
                                                ;
002442  005037  007476          T0303:  CLR     CARY            ; START AT TOP OF SCREEN..
002446  012737  000057  007474         MOV     #47.,CARX       ; AT RIGHT.
002454  012737  000005  007464         MOV     #5,FORGND       ; SET CHARACTERS TO CYAN
002462  013737  007464  007466         MOV     FORGND,BAKGND   ; ...ALL OVER!
                                                ;
002470  004737  012522          T0302:  JSR     PC,LOELEM       ; LOAD ONE ELEMENT
002474  005237  007476                 INC     CARY            ; NEXT LINE DOWN...
002500  005337  007474                 DEC     CARX            ; SHIFT LEFT ONCE.
002504  023727  007476  000040         CMP     CARY,#32.       ; OVER TOP?
002512  001366                         BNE     T0302           ; NO, NEXT BLOCK
002514  104410                         TRAP+10                 ; LOOP ON THIS BIT
002516  002442                         T0303
002520  005037  007474          T0304:  CLR     CARX            ; NOW START AT RIGHT
002524  013737  007500  007476         MOV     YMAX,CARY       ; AT BOTTOM
002532  012737  000007  007464         MOV     #7,FORGND       ; DISPLAY IN WHITE..
002540  013737  007464  007466         MOV     FORGND,BAKGND   ; ALL OVER.
                                                ;
002546  004737  012522          T0305:  JSR     PC,LOELEM       ; LOAD ONE ELEMENT
002552  005237  007474                 INC     CARX            ; SHIFT RIGHT
002556  005337  007476                 DEC     CARY            ; SHIFT UP
002562  100371                         BPL     T0305           ; PAST TOP OF SCREEN?
002564  104420                         TRAP+20
002566  002520                         T0304                   ; LOOP ON THIS
                                                ; NOW WAIT AROUND
                                                ;
002570  004737  012040                 JSR     PC,WAITS        ; WAIT FOR 2 SECONDS
002574  000002                         2
```

```
1098  002576  104404                          TRAP+4                  ; LOOP ON TEST
1099  002600  002400                          T0301
1100  002602  032777  000100  004672          BIT     #100,@SWR       ; PRESELECT TEST
1101  002610  001402                          BEQ     TEST4
1102  002612  000137  001326                  JMP     START2          ; YES- GO DO IT
1103                          ;
```

```
                                        .SBTTL  TEST4
                                ;
                                ; THIS TEST CHECKS OUT THE FOREGROUND BACKGROUND SELECTION, BY
                                ; DISPLAYING CHARACTER CODE ZERO IN ALL LOCATIONS. CHARACTER
                                ; ZERO IS DEFINED AS BEING HALF FOREGROUND AND HALF BACKGROUND,
                                ; IN A VERTICAL STRIPE (CHARACTER DATA 360). THE FOREGROUND
                                ; AND BACKGROUND COLOURS ARE THEN ALTERED AND THE WHOLE DISPLAY
                                ; IS REFRESHED. THE SEQUENCE BEING: BLACK ON WHITE,
                                ; BLINK SET, THEN BLINK CLEAR BUT FLASH SET. FINALLY BLINK AND
                                ; FLASH ARE SET TOGETHER, CAUSING A PICTURE THAT 'HOPS' SIDEWAYS
                                ; WITH A BACKGROUND FLASHING.
                                ;
                                ; IF THIS TEST WORKS THE OUTPUT MUX (LEVB) IS FUNCTIONING.
                                ; ERRORS-
                                ; CHECK 'LEVB F/B SELECT H'
                                ;       'LEVB FLASH B H' IF BLINK OR FLASH DOES NOT WORK.
                                ;       LEVA SIGNALS ON E4...
                                ;               'LEVB FLASH A'
                                ;               'LEVB FLASH B'
                                ;               'LEVD BLINK A'
                                ;               'LEVD BLINK B'
                                ;               'LEVD DATA'
                                ;
002616  012737  000004  007454  TEST4:  MOV     #4,TESTNO       ; SET TESTNUMBER
002624  104402                         TRAP+2
002626  002642                         T0401
002630  004737  011624                 JSR     PC,TESTR        ; PRINT TEST NUMBER
002634  004737  014734                 JSR     PC,TYPOUT
002640  006426                         TS4MSG
002642  005037  007550          T0401:  CLR     CHAR            ; START WITH CHARACTER CODE 0
002646  005737  007462                 TST     PROM            ; PROM CHARACTER SET ?
002652  001022                         BNE     T0403           ; YES
002654  005001                         CLR     R1              ; BUT THERE ARE 8 LINES TO IT
002656  013700  007550          T0402:  MOV     CHAR,R0         ; GET CHARACTER NUMBER
002662  006300                         ASL     R0
002664  006300                         ASL     R0              ; SET IT IN THE RIGHT PLACE
002666  006300                         ASL     R0
002670  050100                         BIS     R1,R0           ; ADD IN LINE NUMBER
002672  052700  100000                 BIS     #100000,R0      ; SAY ITS SELECT CHSR
002676  010077  004534                 MOV     R0,@DEVCSR      ; LOAD THE CSR
002702  012777  000360  004530         MOV     #360,@DEVBUF    ; LOAD THE DATA PATTERN
002710  005201                         INC     R1              ; GET NEXT LINE
002712  020127  000007                 CMP     R1,#7           ; ALL LINES DONE
002716  003757                         BLE     T0402           ; NO YET
                                ;
002720                          T0403:
002720  005037  007472                 CLR     FLASH           ; NO FLASH
002724  005037  007470                 CLR     BLINK           ; NO BLINK
002730  012737  000007  007464         MOV     #7,FORGND       ; START WITH BLACK FOREGROUND
002736  012737  000000  007466  T0406: MOV     #0,BAKGND       ; AND IT COMPLEMENT BACKGROUND
002744  012737  040000  007450         MOV     #40000,VIDEON   ; SET VIDEO ON
002752  004737  012410                 JSR     PC,LOADFS       ; FILL THE SCREEN
                                ;
                                ; WAIT AROUND
                                ;
002756  004737  012040                 JSR     PC,WAITS                ; WAIT FOR 2 SECONDS
```

```
1161  002762  000002                        2
1162  002764  104410                        TRAP+10
1163  002766  002736                        T0406                   ; LOOP ON THIS
1164                                  ;
1165                                  ; NOW UPDATE THE FOREGROUND COLOUR
1166                                  ;
1167                                  ; NOW CHANGE BLINK STATUS
1168                                  ;
1169  002770  012737  000100  007470        MOV     #100,BLINK
1170  002776  004737  012410        T0407:  JSR     PC,LOADFS       ; LOAD DISPLAY
1171  003002  004737  012040                JSR     PC,WAITS        ; WAIT 2 SECS
1172  003006  000002                        2
1173  003010  104420                        TRAP+20
1174  003012  002776                        T0407                   ; LOOP ON PICTURE
1175  003014  005037  007470                CLR     BLINK           ; RESET BLINK
1176  003020  012737  000200  007472        MOV     #200,FLASH      ;  SET FLASH
1177  003026  004737  012410        T0409:  JSR     PC,LOADFS       ; LOAD PICTURE
1178  003032  004737  012040                JSR     PC,WAITS        ; WAIT 2 SECS
1179  003036  000002                        2
1180  003040  104430                        TRAP+30
1181  003042  003026                        T0409                   ; LOOP ON PICTURE
1182  003044  012737  000100  007470        MOV     #100,BLINK      ; NOW SET BLINK AND FLASH
1183  003052  004737  012410        T0410:  JSR     PC,LOADFS       ; FILL SCREEN
1184  003056  004737  012040                JSR     PC,WAITS        ; STALL FOR A WHILE!
1185  003062  000002                        2                       ; 2 SECS
1186  003064  104440                        TRAP+40
1187  003066  003052                        T0410                   ; LOOP ON PICTURE
1188  003070  104404                        TRAP+4                  ; LOOP ON TEST
1189  003072  002642                        T0401                   ;
1190  003074  032777  000100  004400        BIT     #100,@SWR       ; PRESELECT TEST
1191  003102  001402                        BEQ     TEST5
1192  003104  000137  001326                JMP     START2          ; YES GO TO IT
```

```
                        .SBTTL  TEST5
                ;
                ; THIS TEST CHECKS THE CHARACTER STORE FOR EITHER THE PROM
                ; OR RAM VERSIONS OF THE VTV30K. FOR THE PROM VERSION THE
                ; CHARACTER SET WILL BE DISPLAYED AS CYAN ON BLUE IN AN
                ; AREA FROM Y=10 ,X=3 THRU Y=12, X=45. THE CHARACTER SET
                ; IS DISPLAYED AS CHARACTER STORE ADDRESSES INCREMENTING
                ; HORIZONTALLY.
                ; FOR THE RAM CHARACTER SET, THE PICTURE IS LAYED OUT IN THE
                ; SAME WAY. A VERTICAL LINE IS THEN MOVED THROUGH THE CHARACTER
                ; STORE TO CHECK THE ACCESSABILITY OF THE MEMORY.
                ; NEXT A LINE IS ROTATED DOWN THE SCREEN TO CHECK THE LOW-ORDER
                ; BITS.
                ;
                ; THIS IS THE FIRST REAL TEST OF THE CHARACTER STORE. IF IT
                ; WORKS ALL CHARACTER STORE DATA AND ADDRESSING WORKS.
                ; ERRORS-
                ; CHECK HIGH-ORDER PICTURE STORE BITS (LEV8)
                ;       PICTURE STORE STATICISER (LEVD)
                ;       CHARACTER STORE ICS (LEVD)
                ;       C.S. WRITE DATA,C.S. WRITE ADDRESS
                ; VERTICALLY CORRUPTED PROM CHARS, OR FAULTS IN HORIZONTAL
                ;  LINES IN RAM VERSIONS, IMPLY FAULTS IN THE CHARACTER STORE
                ;  LINE SELECTOR (LEVD)
                ;
003110  012737  000005  007454  TEST5:  MOV     #5,TESTNO       ; SET TEST NUMBER
003116  104402                         TRAP+2
003120  003134                         T0501
003122  004737  011624                 JSR     PC,TESTR
003126  004737  014734                 JSR     PC,TYPOUT
003132  006433                         TS5MSG
003134  005737  007462         T0501:  TST     PROM            ; IS THIS A PROM CHARACTER
003140  001032                         BNE     T0502           ; SET
                ;
                ;
                ; RAM CHARACTER SET PRESENT
                ;
003142  005037  007550         TEST5A: CLR     CHAR            ; START WITH CHARACTER CODE ZERO
003146  005001                 5$:     CLR     R1              ; THERE ARE 8 LINES PER CHAR
003150  013700  007550         10$:    MOV     CHAR,R0         ; GET CHARACTER NUMBER
003154  006300                         ASL     R0              ; SET IN RIGHT PLACE
003156  006300                         ASL     R0
003160  006300                         ASL     R0
003162  050100                         BIS     R1,R0           ; ADD IN LINE NUMBER
003164  052700  100000                 BIS     #100000,R0      ; SELECT CHSR
003170  010077  004242                 MOV     R0,@DEVCSR      ; SELECT CHARACTER TO ADDRESS
003174  012777  000000  004236         MOV     #0,@DEVBUF      ; LOAD ZEROES IN
003202  005201                         INC     R1              ; UPDATE LINE NUMBER
003204  020127  000007                 CMP     R1,#7           ; ALL LINES DONE
003210  003757                         BLE     10$             ; NO
003212  005237  007550                 INC     CHAR            ; SELECT NEXT CHAR
003216  023727  007550  000177         CMP     CHAR,#177       ; ALL DONE
003224  003750                         BLE     5$              ; NO
                ;
                ; NOW FILL THE SCREEN
                ;
```

```
1250  003226  C05037  007472          T0502:  CLR     FLASH           ; NO FLASH
1251  003232  005037  007470                  CLR     BLINK           ; NO BLINK
1252  003236  012737  000000  007464          MOV     #0,FORGND       ; BLACK ON BLACK
1253  003244  012737  000000  007466          MOV     #0,BAKGND
1254  003252  005037  007550                  CLR     CHAR            ; CHARACTER CODE 0
1255  003256  012737  040000  007450          MOV     #40000,VIDEON   ; WITH VIDEO ON
1256  003264  004737  012410                  JSR     PC,LOADFS
1257  003270                          T0520:
1258  003270  012737  000003  007474          MOV     #3,CARX         ; START AT X=3
1259  003276  012737  000012  007476          MOV     #10.,CARY       ; Y=10.
1260  003304  005037  007550                  CLR     CHAR            ; CHARACTER CODE 0
1261  003310  012737  000006  007464          MOV     #6,FORGND       ; CYAN ON
1262  003316  012737  000004  007466          MOV     #4,BAKGND       ; BLUE
1263  003324  005037  007470                  CLR     BLINK
1264  003330  005037  007472                  CLR     FLASH           ; NO FLASH OR BLINK
1265  003334  012737  040000  007450          MOV     #40000,VIDEON   ; VIDEO ON
1266  003342  004737  012522          T0518:  JSR     PC,LOELEM       ; LOAD DATA OUT
1267  003346  005237  007474                  INC     CARX            ; GET NEW COORD
1268  003352  023727  007474  000056          CMP     CARX,#46.       ; END OF DISPLAY
1269  003360  001005                          BNE     T0519           ; NO
1270  003362  012737  000003  007474          MOV     #3.,CARX        ; YES START NEW LINE
1271  003370  005237  007476                  INC     CARY
1272  003374  005237  007550          T0519:  INC     CHAR            ;SELECT NEXT CHARACTER
1273  003400  023727  007550  000177          CMP     CHAR,#177       ; ALL DONE ?
1274  003406  003755                          BLE     T0518           ; NO
1275                                  ;
1276                                  ; NOW INSERT LAST CHARACTER AS FILER...
1277                                  ;
1278  003410  005737  007462                  TST     PROM            ; DIFFERENT FOR RAM...
1279  003414  001414                          BEQ     2$              ; CONTINUE FOR RAM..
1280  003416  012737  000040  007550          MOV     #' ,CHAR        ; LOAD NEW CHARACTER
1281  003424  004737  012522                  JSR     PC,LOELEM       ; IN LAST SPACE AS SPACE.
1282                                  ; NOW WAIT AROUND
1283                                  ;
1284  003430  004737  012040                  JSR     PC,WAITS        ; WAIT A BIT
1285  003434  000005                          5                       ; 5 SECONDS
1286  003436  104410                          TRAP+10
1287  003440  003226                          T0502
1288  003442  000137  004214                  JMP     T05XIT
1289                                  ;
1290  003446  012737  000125  007550  2$:     MOV     #85.,CHAR       ; FILL IN FINAL CHARACTER
1291  003454  004737  012522                  JSR     PC,LOELEM
1292  003460  004737  012040                  JSR     PC,WAITS        ; SHOW PRIME PICTURE AS CUE.
1293  003464  000001                          1
1294                                  ;
1295  003466  005005                  5$:     CLR     R5              ; POINTS TO LINE POSITION
1296                                  ;
1297  003470  105737  177560          10$:    TSTB    TKS             ; ANY ABORT?
1298  003474  100012                          BPL     12$             ; NO..
1299  003476  004737  014206                  JSR     PC,READ
1300  003502  020027  000040                  CMP     R0,#'           ; SPCAE-HURRYUP?
1301  003506  001525                          BEQ     30$             ; YES..
1302  003510  020027  000007                  CMP     R0,#'G&37       ; BELL?
1303  003514  001002                          BNE     12$             ; NO...
1304  003516  004737  013546                  JSR     PC,MONIT
1305                                  ;
```

```
1306  003522  004737  011644          12$:    JSR     PC,SYNCUP       ; DELAY 2 PERIODS
1307  003526  000240                          NOP
1308  003530  004737  011644                  JSR     PC,SYNCUP
1309  003534  000240                          NOP
1310  003536  010500                          MOV     R5,R0           ; GET LINE POSITION..
1311  003540  042700  177770                  BIC     #177770,R0      ; GET POS IN CHAR..
1312  003544  052700  000010                  BIS     #10,R0
1313  003550  012704  100000                  MOV     #100000,R4      ; PUT LINE IN INITIAL POS.
1314  003554  000241                          CLC
1315  003556  005737  007622                  TST     PAL             ; IF TV-ENCODED...
1316  003562  001401                          BEQ     20$
1317  003564  000261                          SEC                     ; DOUBLE-UP LINE
1318                                  ;
1319  003566  006004                  20$:    ROR     R4              ; SHIFT LINE TO POSN.
1320  003570  005300                          DEC     R0
1321  003572  001375                          BNE     20$
1322  003574  000304                          SWAB    R4              ; SWITCH FOR CLEAN-UP TRAILER
1323  003576  010500                          MOV     R5,R0           ; GET CURRENT CHAR..
1324  003600  042700  000007                  BIC     #7,R0           ; WITHOUT LINE..
1325  003604  162700  000010                  SUB     #10,R0          ; GET LAST CHAR...
1326  003610  100003                          BPL     22$             ; VALID CHAR?
1327  003612  005000                          CLR     R0              ; NO, START AT FIRST..
1328  003614  105004                          CLRB    R4              ; CLEAR LINE
1329  003616  000304                          SWAB    R4              ; SWAP LINES OVER..
1330                                  ;
1331  003620  020027  000520          22$:    CMP     R0,#42.*10      ; OVER TOP?
1332  003624  103402                          BCS     23$             ; NO..
1333  003626  042704  177400                  BIC     #177400,R4      ; ELSE CLEAR HIGH ORDER...
1334                                  ;
1335                                  ; NOW WE HAVE 2 CHARACTERS TO LOAD. EACH CHANGE IN THE LINE
1336                                  ; INVOLVES LOADING 2 ADJACENT CHARACTERS.... THE ONE THE
1337                                  ; LINE IS/COULD BE SCROLLING OUT OF, AND THE ONE IT IS
1338                                  ; SCROLLING INTO.
1339                                  ;
1340  003632  012702  000003          23$:    MOV     #3,R2           ; 3 ROWS OF CHARACTERS.
1341                                  ;
1342  003636  012703  000010          24$:    MOV     #10,R3          ; 8 BYTES/CHARACTER
1343  003642  052700  140000                  BIS     #140000,R0      ; CHAR STORE SEL,VIDEO-ON
1344  003646  010077  003564                  MOV     R0,@DEVCSR
1345  003652  032777  002000  003556          BIT     #2000,@DEVCSR   ; INHIBIT WRAP-ROUND
1346  003660  001034                          BNE     29$
1347                                  ;
1348  003662  010477  003552          26$:    MOV     R4,@DEVBUF      ; LOAD DATUM
1349  003666  005277  003544                  INC     @DEVCSR
1350  003672  005303                          DEC     R3
1351  003674  001372                          BNE     26$             ; FIRST CHARACTER DONE IN PAIR?
1352  003676  032777  002000  003532          BIT     #2000,@DEVCSR   ; WRAP-ROUND?
1353  003704  001022                          BNE     29$             ; YES...
1354  003706  000304                          SWAB    R4              ; YES, GET NEXT DATUM
1355  003710  012703  000010                  MOV     #10,R3
1356                                  ;
1357  003714  010477  003520          27$:    MOV     R4,@DEVBUF      ; LOAD DATUM
1358  003720  005277  003512                  INC     @DEVCSR
1359  003724  005303                          DEC     R3
1360  003726  001372                          BNE     27$
1361  003730  000304                          SWAB    R4              ; RESTORE ORIGINAL DATUM..
```

```
 1362  003732  062700  000530                ADD     #43.*10,R0      ; UPDATE TO NEXT LINE..
 1363  003736  032777  002000  003472        BIT     #2000,@DEVCSR   ; OVER TOP?
 1364  003744  001002                        BNE     29$             ; YES...DONT WRAP AROUND!
 1365  003746  005302                        DEC     R2              ; ANY MORE...
 1366  003750  001332                        BNE     24$             ; YES..
 1367                                  ;
 1368  003752  005205                  29$:  INC     R5              ;
 1369  003754  020527  000530                CMP     R5,#43.*10      ; ALL DONE?
 1370  003760  001243                        BNE     10$             ; YES...
 1371                                  ;
 1372  003762  104470                  30$:  TRAP+70                 ; LOOP?
 1373  003764  003466                        5$
 1374  003766  004737  012040                JSR     PC.WAITS        ; WAIT A SECOND...
 1375  003772  000001                        1
 1376                                  ;...THEN PROCEED TO VERTICAL-LINE...
```

```
1378  003774  005005                  35$:    CLR     R5              ; POSITION MARKER FOR LINE.
1379  003776  012704  004000                  MOV     #4000,R4        ; ZERO CHSR
1380                                  ;
1381  004002  010500                  40$:    MOV     R5,R0
1382  004004  006300                          ASL     R0              ; GET CHARACTER NUMBER
1383  004006  006300                          ASL     R0
1384  004010  105000                          CLRB    R0              ; ZERO COLOUR+BLINK
1385  004012  052700  000047                  BIS     #47,R0          ; WHITE ON BLUE
1386  004016  010577  003414                  MOV     R5,@DEVCSR      ; GET PICTURE ADDRESS
1387  004022  010077  003412                  MOV     R0,@DEVBUF      ; LOAD ELEMENT
1388  004026  005205                          INC     R5              ; NEXT PICTURE CELL!
1389  004030  005304                          DEC     R4              ; ANY MORE PICTURE?
1390  004032  001363                          BNE     40$             ; ..YES..
1391  004034  012705  002000                  MOV     #2000,R5        ; NOW CLEAR CHARACTER STRE
1392  004040  012777  100000  003370          MOV     #100000,@DEVCSR
1393                                  ;
1394  004046  005077  003366          45$:    CLR     @DEVBUF         ; ZERO BYTE IN CHSR
1395  004052  005277  003360                  INC     @DEVCSR
1396  004056  005305                          DEC     R5              ; ANY MORE?
1397  004060  001372                          BNE     45$             ; YES..
1398                                  ;
1399  004062  105737  177560          50$:    TSTB    TKS             ; ANY ABORT?
1400  004066  100012                          BPL     52$             ; NO
1401  004070  004737  014206                  JSR     PC,READ
1402  004074  020027  000040                  CMP     R0,#'           ; ABORT?
1403  004100  001440                          BEQ     70$             ; ..YES...
1404  004102  020027  000007                  CMP     R0,#'G&37       ; BELL?
1405  004106  001002                          BNE     52$             ; NO..
1406  004110  004737  013546                  JSR     PC,MONIT        ; CALL MONITOR.
1407                                  ;
1408  004114  004737  011644          52$:    JSR     PC,SYNCUP       ; WAIT..
1409  004120  000240                          NOP
1410  004122  004737  011644                  JSR     PC,SYNCUP
1411  004126  000240                          NOP
1412  004130  010500                          MOV     R5,R0           ; GET CHARACTER..
1413  004132  005300                          DEC     R0              ; GET LAST FOR CLEARING
1414  004134  100406                          BMI     53$
1415  004136  052700  140000                  BIS     #140000,R0      ; VIDEO ON, CHSR SELECT.
1416  004142  010077  003270                  MOV     R0,@DEVCSR      ; GET ADDRESS..
1417  004146  005077  003266                  CLR     @DEVBUF         ; ZERO CHARACTER BYTE.
1418                                  ;
1419  004152  010500                  53$:    MOV     R5,R0           ; GET CURRENT CHAR.
1420  004154  052700  140000                  BIS     #140000,R0
1421  004160  010077  003252                  MOV     R0,@DEVCSR      ; LOAD ADDRESS
1422  004164  012777  000377  003246          MOV     #377,@DEVBUF    ; LIGHT LINE.
1423  004172  005205                          INC     R5              ; STEP TO NEXT LINE.
1424  004174  020527  000400                  CMP     R5,#400         ; NEXT LINE?
1425  004200  001330                          BNE     50$             ; YES, LOOP
1426                                  ;
1427  004202  104420                  70$:    TRAP+20
1428  004204  003774                          35$                     ; LOOP ON SUBTEST
1429  004206  004737  012040                  JSR     PC,WAITS
1430  004212  000001                          1                       ; WAIT FOR 1 SEC
1431                                  ;
1432                                  ;
1433                                  ; END OF TEST..
```

```
 1434                                           ;
 1435  004214  104404                          T05XIT: TRAP+4                  ; LOOP ON TEST?
 1436  004216  003134                                  T0501
 1437  004220  032777  000100  003254                  BIT     #100,@SWR       ; PRESELECTED TEST?
 1438  004226  001402                                  BEQ     TEST6
 1439  004230  000137  001326                          JMP     START2
```

```
                                                .SBTTL  TEST6
                                        ;
                                        ; THIS TEST DISPLAYS A ROTATING CHARACTER PATTERN IN ALL PICTURE
                                        ; LOCATIONS, WITH COLOUR WHITE ON BLACK.
                                        ;
                                        ; THIS CHECKS THE HIGH-ORDER PICTURE STORE BITS (THESE HOLD THE
                                        ; SELECTED CHARACTER NUMBER)
                                        ;
                                        ; ERRORS-
                                        ; HIGH ORDER PICTURE STORE BITS (LEVC)
                                        ; PICTURE STORE STATICISER (LEVD)
                                        ;
004234  012737  000006  007454  TEST6:  MOV     #6,TESTNO       ; SET TEST NUMBER
004242  104402                          TRAP+2
004244  004260                          T0601
004246  004737  011624                  JSR     PC,TESTR        ; PRINT TESTNUMBER
004252  004737  014734                  JSR     PC,TYPOUT
004256  006441                          TS6MSG
004260  012737  000005  007506  T0601:  MOV     #5,REPCNT
004266  005737  007462                  TST     PROM            ; IS THERE A PROM ON BOARD
004272  001037                          BNE     T0604           ; YES DON'T LOAD CHSR
                                        ;
                                        ; RAM CHARACTER SET NEEDS LOADING
                                        ;
004274  012700  007624                  MOV     #P02CHR,R0      ; GET START OF DATA TO LOAD
004300  005037  007550                  CLR     CHAR            ; START AT CHARACTER ZERO
004304  005001                  T0602:  CLR     R1              ; 8 LINES PER CHARACTER
004306  013702  007550          T0603:  MOV     CHAR,R2         ; GET CHAR CODE
004312  006302                          ASL     R2
004314  006302                          ASL     R2              ; SET IN RIGHT PLACE
004316  006302                          ASL     R2
004320  050102                          BIS     R1,R2           ; ADD IN LINE NUMBER
004322  052702  100000                  BIS     #100000,R2      ; SELECT CHSR
004326  010277  003104                  MOV     R2,@DEVCSR      ; LOAD CSR
004332  112003                          MOVB    (R0)+,R3        ; GET DATA
004334  000303                          SWAB    R3
004336  105003                          CLRB    R3              ; ENSURE 8 BITS LOADED
004340  000303                          SWAB    R3
004342  010377  003072                  MOV     R3,@DEVBUF      ; LOAD DATA OUT
004346  005201                          INC     R1              ; UPDATE LINE NUMBER
004350  020127  000007                  CMP     R1,#7           ; ALL LINES DONE
004354  003754                          BLE     T0603           ; NO
004356  005237  007550                  INC     CHAR            ; UPDATE CHAR COUNT
004362  023727  007550  000177          CMP     CHAR,#177       ; ALL DONE
004370  003745                          BLE     T0602           ; NOT YET
                                        ;
                                        ; NOW START PUTTING UP PICTURE
                                        ;
004372                          T0604:
004372  012737  040000  007450          MOV     #40000,VIDEON   ; VIDEO ON
004400  012737  000000  007466          MOV     #0,BAKGND       ; BLACK BACKGROUND
004406  012737  000007  007464          MOV     #7,FORGND       ; WHITE FOREGROUND
004414  005037  007470                  CLR     BLINK
004420  005037  007472                  CLR     FLASH           ; NO BLINK OR FLASH
004424  012700  007266                  MOV     #CHXLST,R0      ; POINT TO START OF LIST
004430  010001                  T0605:  MOV     R0,R1           ; GET PICTURE STARTER
```

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1497  004432  005037  007476                  CLR     CARY            ; START AT TOP LEFT
1498  004436  010102                  T0606:  MOV     R1,R2           ; GET LINE STARTER
1499  004440  005037  007474                  CLR     CARX            ; START OF LINE
1500  004444  011237  007550          T0607:  MOV     (R2),CHAR       ; GET CHAR CODE
1501  004450  004737  012522                  JSR     PC,LOELEM       ; DISPLAY THE CHARACTER
1502  004454  062702  000002                  ADD     #2,R2           ; GET NEXT POINTER
1503  004460  021227  177777                  CMP     (R2),#-1        ; END OF TABLE ?
1504  004464  001002                          BNE     1$
1505  004466  012702  007266                  MOV     #CHXLST,R2      ; YES RESET IT
1506  004472  005237  007474          1$:     INC     CARX            ; GET NEXT COORD
1507  004476  023737  007474  007446        CMP     CARX,XMAX       ; END OF ROW ?
1508  004504  003757                          BLE     T0607           ; NOT YET
1509  004506  062701  000002                  ADD     #2,R1           ; GET NEW LINE STARTER
1510  004512  021127  177777                  CMP     (R1),#-1        ; END OF TABLE
1511  004516  001002                          BNE     2$              ; NO
1512  004520  012701  007266                  MOV     #CHXLST,R1      ; YES RESET IT
1513  004524  005237  007476          2$:     INC     CARY            ; UPDATE ROW
1514  004530  023737  007476  007500        CMP     CARY,YMAX       ; END OF DISPLAY ?
1515  004536  003737                          BLE     T0606           ; NOT YET
1516                                  ;
1517                                  ; WAIT AROUND
1518                                  ;
1519  004540  004737  012040                  JSR     PC,WAITS                ; WAIT 2 SECONDS
1520  004544  000002                          2
1521  004546  005337  007506                  DEC     REPCNT          ; ALL DONE
1522  004552  001406                          BEQ     T0615           ; YES
1523                                  ;
1524                                  ;
1525                                  ;       UPDATE NEW PICTURE STARTER
1526                                  ;
1527  004554  062700  000002                  ADD     #2,R0           ; NEW STARTER
1528  004560  021027  177777                  CMP     (R0),#-1        ; ALL DONE ?
1529  004564  001321                          BNE     T0605           ; NO
1530  004566  000701                          BR      T0604           ; YES RESET TABLE MIXTURE
1531  004570  104404                  T0615:  TRAP+4
1532  004572  004372                          T0604
1533  004574  032777  000100  002700        BIT     #100,@SWR       ; PRESELECT TEST
1534  004602  001402                          BEQ     1$
1535  004604  000137  001326                  JMP     START2          ; YES GO DO IT
1536  004610                          1$:
1537  004610  005237  007302                  INC     DEVFLG          ; UPDATE UNIT COUNT
1538  004614  023737  007302  007304        CMP     DEVFLG,DEVCNT   ; ALL UNITS DONE
1539  004622  002402                          BLT     2$              ; NOT YET
1540  004624  000137  013062                  JMP     ENDIT           ; YES, SIGNAL END OF PASS
1541  004630  013700  007302          2$:     MOV     DEVFLG,R0       ; GET CURRENT UNIT
1542  004634  005200                          INC     R0
1543  004636  006300                          ASL     R0              ; AS A WORD OFFSET
1544  004640  016037  007306  007436        MOV     CSR0(R0),DEVCSR ; GET NEW CSR ADDRESS
1545  004646  016037  007310  007440        MOV     DBUF0(R0),DEVBUF; AND DATA BUFFER
1546  004654  000137  001326                  JMP     START2
```

```
                                        .SBTTL  TEST7
                                ;
                                ; THIS TEST DISPLAYS A ROTATING CHARACTER PATTERN IN ALL PICTURE
                                ; LOCATIONS. IN ADDITION THE COLOUR, IS CHANGED FOR EACH COLUMN.
                                ;
                                ; THIS IS AN EXERCISER ONLY, NOT PART OF THE DIAGNOSTIC ROUTINES
                                ;
004660  012737  000007  007454  TEST7:  MOV     #7,TESTNO       ; SET TEST NUMBER
004666  104402                         TRAP+2
004670  004704                         T0701
004672  004737  011624                 JSR     PC,TESTR        ; PRINT TESTNUMBER
004676  004737  014734                 JSR     PC,TYPOUT
004702  006454                         TS7MSG
004704  012737  000200  007506  T0701:  MOV     #200,REPCNT
004712  005737  007462                 TST     PROM            ; IS THERE A PROM ON BOARD
004716  001037                         BNE     T0704           ; YES DON'T LOAD CHSR
                                ;
                                ; RAM CHARACTER SET NEEDS LOADING
                                ;
004720  012700  007624                 MOV     #P02CHR,R0      ; GET START OF DATA TO LOAD
004724  005037  007550                 CLR     CHAR            ; START AT CHARACTER ZERO
004730  005001                 T0702:  CLR     R1              ; 8 LINES PER CHARACTER
004732  013702  007550         T0703:  MOV     CHAR,R2         ; GET CHAR CODE
004736  006302                         ASL     R2
004740  006302                         ASL     R2              ; SET IN RIGHT PLACE
004742  006302                         ASL     R2
004744  050102                         BIS     R1,R2           ; ADD IN LINE NUMBER
004746  052702  100000                 BIS     #100000,R2      ; SELECT CHSR
004752  010277  002460                 MOV     R2,@DEVCSR      ; LOAD CSR
004756  112003                         MOVB    (R0)+,R3        ; GET DATA
004760  000303                         SWAB    R3
004762  105003                         CLRB    R3              ; ENSURE 8 BITS LOADED
004764  000303                         SWAB    R3
004766  010377  002446                 MOV     R3,@DEVBUF      ; LOAD DATA OUT
004772  005201                         INC     R1              ; UPDATE LINE NUMBER
004774  020127  000007                 CMP     R1,#7           ; ALL LINES DONE
005000  003754                         BLE     T0703           ; NO
005002  005237  007550                 INC     CHAR            ; UPDATE CHAR COUNT
005006  023727  007550  000177         CMP     CHAR,#177       ; ALL DONE
005014  003745                         BLE     T0702           ; NOT YET
                                ;
                                ; NOW START PUTTING UP PICTURE
                                ;
005016                          T0704:
005016  012737  040000  007450         MOV     #40000,VIDEON   ; ENABLE VIDEO
005024  012737  000000  007460         MOV     #0,BASE1        ; START AT CHARAACTER 0
005032  005037  007476         T0705:  CLR     CARY            ; START AT FIRST ROW
005036  013737  007460  007456         MOV     BASE1,BASE      ; SET THIS PICTURE START
005044  013737  007456  007550 T0706:  MOV     BASE,CHAR       ; SET START FOR THIS ROW
005052  005037  007474                 CLR     CARX            ; START OF COLUMN
005056  005037  007472         T0707:  CLR     FLASH           ; NO FLASH
005062  005037  007470                 CLR     BLINK           ; NO BLINK
005066  012737  000001  007466         MOV     #1,BAKGND       ; RED ON
005074  012737  000001  007464 T0710:  MOV     #1,FORGND       ; RED
005102  004737  012522         T0711:  JSR     PC,LOELEM       ; DISPLAY THE CHARACT.
005106  005237  007550                 INC     CHAR            ; SELECT NEXT ONE
```

```
1604  005112  042737  177600  007550          BIC     #177600,CHAR    ; IN RANGE 0-177
1605  005120  005237  007474                  INC     CARX            ; GET NEXT COORD
1606  005124  023737  007474  007446          CMP     CARX,XMAX       ; END OF ROW ?
1607  005132  003432                          BLE     T0712           ; NOT YET
1608  005134  005237  007456                  INC     BASE            ; ELSE SET NEW ROW STARTER
1609  005140  042737  177600  007456          BIC     #177600,BASE    ; IN RANGE 0-177
1610  005146  005237  007476                  INC     CARY            ; UPDATE ROW
1611  005152  023737  007476  007500          CMP     CARY,YMAX       ; END OF DISPLAY ?
1612  005160  003731                          BLE     T0706           ; NOT YET
1613  005162  005237  007460                  INC     BASE1           ; SET NEW PICTURE STARTER
1614  005166  042737  177600  007460          BIC     #177600,BASE1   ; IN RANGE 0-177
1615                                  ;
1616                                  ; WAIT AROUND
1617                                  ;
1618  005174  004737  012040                  JSR     PC,WAITS                ; WAIT 1 SECONDS
1619  005200  000001                          1
1620  005202  005337  007506                  DEC     REPCNT
1621  005206  001422                          BEQ     T0715
1622  005210  000137  005032                  JMP     T0705                   ; YES
1623  005214  000137  005254                  JMP     T0715           ; NO EXIT TEST
1624                                  ;
1625  005220  006337  007464          T0712:  ASL     FORGND          ; GET NEW FOREGROUND
1626  005224  023727  007464  000004          CMP     FORGND,#4       ; ALL DONE
1627  005232  003723                          BLE     T0711           ; NO
1628  005234  005237  007466                  INC     BAKGND          ; GET NEXT BACK GROUND
1629  005240  023727  007466  000007          CMP     BAKGND,#7       ; ALL DONE
1630  005246  003712                          BLE     T0710           ; NO
1631  005250  000137  005056                  JMP     T0707           ; YES
1632  005254  104404          T0715:  TRAP+4
1633  005256  004704                  T0701
1634  005260  000137  001326                  JMP     START2          ; YES GO DO IT
```

```
1636                                            .SBTTL  TEST10
1637                                    ;
1638                                    ; THIS TEST PRINTS THE CURRENT ACCUMULATION OF ERRORS
1639                                    ;
1640  005264  012737  000010  007454   TEST10: MOV     #10,TESTNO      ; SET TEST NUMBER
1641  005272  104402                          TRAP+2
1642  005274  005310                          T1001
1643  005276  004737  011624                 JSR     PC,TESTR        ; PRINT TEST NUMBER
1644  005302  004737  014734                 JSR     PC,TYPOUT
1645  005306  006462                          TS10MS
1646  005310  004737  014700          T1001:  JSR     PC,CRLF         ; NEW LINE
1647  005314  004737  014734                 JSR     PC,TYPOUT       ; SAY
1648  005320  007205                          EMSG9                   ; ERROR COUNT =
1649  005322  013700  007442                 MOV     ERRDI1,R0       ; PRINT HI WORD
1650  005326  004737  015024                 JSR     PC,PROCT
1651  005332  013700  007574                 MOV     ERRDIS,R0       ; AND LO WORD
1652  005336  004737  015024                 JSR     PC,PROCT
1653  005342  005037  007444                 CLR     ERRFLG
1654  005346  005037  007574                 CLR     ERRDIS
1655  005352  005037  007442                 CLR     ERRDI1
1656  005356  000137  001200                 JMP     RSTART          ; RESTART
```

```
                                        .SBTTL  TEST11
                                ;
                                ; THIS TEST DISPLAYS A PICTURE SUITABLE FOR TESTING ADAPTERS.
                                ; 7 BLOCKS OF 4 ROWS EACH OF THE FOLLOWING COLOURS,WITH 1,
                                ; 2, AND 4 MHZ BARS
                                ;
005362  012737  000011  007454  TEST11: MOV     #11,TESTNO      ; SET TEST NUMBER
005370  104402                        TRAP+2
005372  005400                        5$
005374  004737  011624                JSR     PC,TESTR        ; PRINT TEST NUMBER
                                ;
005400  005005                  5$:   CLR     R5              ; FIRST PICTURE ELEMENT
                                ;
005402  010500                  10$:  MOV     R5,R0           ; GET COLOUR
005404  000300                        SWAB    R0
005406  005200                        INC     R0              ; FIRST COLOUR RED,NOT BLACK
005410  042700  177770                BIC     #177770,R0      ; FOREGROUND
005414  010501                        MOV     R5,R1           ; GET CHARACTER
005416  042701  177700                BIC     #177700,R1
005422  010577  002010                MOV     R5,@DEVCSR      ; SET POSITION
005426  020127  000014                CMP     R1,#12.         ; 1/2 MHZ?
005432  103013                        BCC     20$             ; NO..
005434  042701  000076                BIC     #76,R1          ; EVEN?
005440  001406                        BEQ     12$             ; YES...
005442  010002                        MOV     R0,R2           ; SET F/B SAME..
005444  006302                        ASL     R2              ; COPY TO BACKGROUND
005446  006302                        ASL     R2
005450  006302                        ASL     R2
005452  050200                        BIS     R2,R0           ; COPY BACK..
005454  000422                        BR      77$
                                ;
005456  005000                  12$:  CLR     R0
005460  000420                        BR      77$             ; LOAD IT..
                                ;
005462  020127  000030          20$:  CMP     R1,#24.         ; 1 MHZ?
005466  103001                        BCC     40$             ; NO..
005470  000414                        BR      77$
                                ;
005472  020127  000044          40$:  CMP     R1,#36.         ; 2 MHZ?
005476  103003                        BCC     60$             ; NO..
005500  052700  011400                BIS     #19.*400,R0     ; LOAD 2 MHZ..
005504  000406                        BR      77$
                                ;
005506  020127  000060          60$:  CMP     R1,#48.         ; 4 MHZ?
005512  103005                        BCC     100$            ; NO, DISCARD..
005514  052700  011000                BIS     #18.*400,R0
005520  000400                        BR      77$
                                ;
005522  010077  001712          77$:  MOV     R0,@DEVBUF      ; LOAD CHARACTER
                                ;
005526  005205                  100$: INC     R5
005530  020527  004000                CMP     R5,#4000        ; DONE?
005534  001322                        BNE     10$             ; NO..
                                ;
005536  005737  007462                TST     PROM            ; LOAD CHSR?
005542  001015                        BNE     120$            ; NO..
```

```
1714                                            ;
1715  005544  012700  007624                    MOV     #P02CHR,R0      ; YAS...
1716  005550  012701  002000                    MOV     #2000,R1
1717  005554  012777  140000  001654            MOV     #140000,@DEVCSR
1718                                            ;
1719  005562  112077  001652            102$:   MOVB    (R0)+,@DEVBUF   ; LOAD BYTE INTO CHSR
1720  005566  005277  001644                    INC     @DEVCSR
1721  005572  005301                            DEC     R1
1722  005574  001372                            BNE     102$
1723                                            ;
1724  005576  012777  040000  001632    120$:   MOV     #40000,@DEVCSR  ; TURN ON VIDEO...
1725  005604  000137  001200                    JMP     RSTART
```

```
                                                                E 4
1727                                            .SBTTL  ASCII STRINGS
1728
1729                                            .NLIST  BEX
1730
1731  005610  046533  031467  037466  SET56:  .ASCII  $[M736?/M737?..a$
1732  005627     133  027124  027126  SETENC: .ASCII  /[T.V. ENCODED?(Y OR N)..a/
1733  005660  042133  041505  046511  NUMDEV: .ASCII  /[DECIMAL NUMBER OF UNITS(1)..a/
1734  005716  042533  052116  051105  CHRCOD: .ASCII  /[ENTER IN OCTAL THE CHARACTER/
1735  005753     133  047503  042504          .ASCII  /[CODE TO BE DISPLAYED....a/
1736  006005     133  052126  031526  GOMSG:  .ASCII  /[VTV30K DIAGNOSTIC/
1737  006027     133  052123  051101          .ASCII  /[START ADDRESS 1000, RESTART 1200/
1738  006070  050133  042514  051501          .ASCII  /[PLEASE READ THE LISTING BEFORE PROCEEDING!a/
1739  006144  052133  042510  042040  GOMS1:  .ASCII  /[THE DEVICES TO BE TESTED MUST/
1740  006202  044133  053101  020105          .ASCII  /[HAVE THEIR ADDRESSES IN ASCENDING ORDER, AND/
1741  006257     133  040510  042526          .ASCII  /[HAVE THE SAME CHARACTERISTICS[a/
1742  006317     133  042523  042514  WMSG:   .ASCII  /[SELECT SWITCH REGISTER OPTIONS[a/
1743  006360  041440  051123     100  TS0MSG: .ASCII  / CSRa/
1744  006365     040  046106  020104  TS1MSG: .ASCII  / FLD VIDEO BELL TSTa/
1745  006411     040  047503  040114  TS2MSG: .ASCII  / COLa/
1746  006416  041440  051125  047523  TS3MSG: .ASCII  / CURSORa/
1747  006426  043040  041055     100  TS4MSG: .ASCII  / F-Ba/
1748  006433     040  044103  051123  TS5MSG: .ASCII  / CHSRa/
1749  006441     040  044520  020103  TS6MSG: .ASCII  / PIC STOREa/
1750  006454  042440  042530  040122  TS7MSG: .ASCII  / EXERa/
1751  006462  042533  051122  051440  TS10MS: .ASCII  /[ERR SUMa/
1752  006473     133  051524  040124  TESMSG: .ASCII  /[TSTa/
1753  006500  042533  042116  047440  PASMSG: .ASCII  /[END OF PASS[a/
1754  006516  052133  040522  020120  ILVMSG: .ASCII  /[TRAP TO ILLEGAL VECTOR  a/
1755  006550  043133  047522  020115  FRMMSG: .ASCII  /[FROM ADDRESS  a/
1756  006570  052133  050131  020105  REDMES: .ASCII  /[TYPE CNTRL-C TO CONTINUE a/
1757  006623     133  053523  020122  SWRMSG: .ASCII  /[SWR =   a/
1758  006635     133  020044  040040  MODADM: .ASCII  /[$  a/
1759  006642  027440  040040          MODSPA: .ASCII  ? / a?
1760  006646  025133  020040     100  MODPRM: .ASCII  /[*  a/
1761  006653     133  044506  051522  BAMSG:  .ASCII  /[FIRST BUS ADDRESS IS .....a/
1762  006707     133  047111  040526  ODAMSG: .ASCII  /[INVALID ADDRESS  a/
1763  006732  047133  047117  042440  NXMSG:  .ASCII  /[NON EXISTANT ADDRESS  a/
1764  006762  042133  043105  052501  NODEFM: .ASCII  /[DEFAULT SETTINGS ARE NOT ALLOWED/
1765  007023     133  046120  040505          .ASCII  /[PLEASE RE-ENTER THE VALUE .....a/
1766  007064  042533  040043          EMSG1:  .ASCII  /[E#a/
1767  007070  020040  052101  050040  EMSG2:  .ASCII  /  AT PC  a/
1768  007102  043533  047517  020104  EMSG3:  .ASCII  /[GOOD : a/
1769  007113     040  020040  040502  EMSG4:  .ASCII  /   BAD :a/
1770  007124  042133  052101  020101  EMSG5:  .ASCII  /[DATA : a/
1771  007135     040  020040  042101  EMSG6:  .ASCII  /   ADDRESS  :a/
1772  007153     133  052123  052101  EMSG7:  .ASCII  /[STATUS  :a/
1773  007166  041533  046101  042514  EMSG8:  .ASCII  /[CALLED FROM :a/
1774  007205     040  020040  051105  EMSG9:  .ASCII  /   ERROR COUNT = a/
1775          007230                          .EVEN
1776  007230  000000  000000  000000  OCTNUM: .WORD   0,0,0
1777  007236     100     000                  .BYTE   100,0
1778  007240  040502  042523  030061  BASE11: .ASCII  /BASE10a/
1779          007250                          .EVEN
1780  007250  000000  000000  000000  DECMSG: .WORD   0,0,0
1781  007256  000000  000000  000000  OCTMSG: .WORD   0,0,0,0
1782                                          .EVEN
```

```
1783                                    .LIST   BEX
```

```
                                                .SBTTL  PROGRAM VARIABLES

007266  000021  000042  000104  CHXLST: .WORD   21,42,104,10,40,-1
007274  000010  000040  177777
007302  000000                  DEVFLG: 0
007304  000001                  DEVCNT: 1
007306  174000                  CSR0:   174000
007310  174002                  DBUF0:  174002
007312  000000                  CSR1:   0
007314  000000                  DBUF1:  0
007316  000000                  CSR2:   0
007320  000000                  DBUF2:  0
007322  000000                  CSR3:   0
007324  000000                  DBUF3:  0
007326  000000                  CSR4:   0
007330  000000                  DBUF4:  0
007332  000000                  CSR5:   0
007334  000000                  DBUF5:  0
007336  000000                  CSR6:   0
007340  000000                  DBUF6:  0
007342  000000                  CSR7:   0
007344  000000                  DBUF7:  0
007346  000000                  CSR8:   0
007350  000000                  DBUF8:  0
007352  000000                  CSR9:   0
007354  000000                  DBUF9:  0
007356  000000                  CSR10:  0
007360  000000                  DBUF10: 0
007362  000000                  CSR11:  0
007364  000000                  DBUF11: 0
007366  000000                  CSR12:  0
007370  000000                  DBUF12: 0
007372  000000                  CSR13:  0
007374  000000                  DBUF13: 0
007376  000000                  CSR14:  0
007400  000000                  DBUF14: 0
007402  000000                  CSR15:  0
007404  000000                  DBUF15: 0
007406  000000                  CSR16:  0
007410  000000                  DBUF16: 0
007412  000000                  CSR17:  0
007414  000000                  DBUF17: 0
007416  000000                  CSR18:  0
007420  000000                  DBUF18: 0
007422  000000                  CSR19:  0
007424  000000                  DBUF19: 0
007426  000000                  CSR20:  0
007430  000000                  DBUF20: 0
007432  000000  000000                  .WORD   0,0
007436  000000                  DEVCSR: 0
007440  000000                  DEVBUF: 0
007442  000000                  ERRDI1: 0
007444  000000                  ERRFLG: 0
007446  000000                  XMAX:   0
007450  000000                  VIDEON: 0
007452  000000                  WAIT1:  0
```

```
1840  007454  000000                  TESTNO: 0
1841  007456  000000                  BASE:   0
1842  007460  000000                  BASE1:  0
1843  007462  000000                  PROM:   0
1844  007464  000000                  FORGND: 0
1845  007466  000000                  BAKGND: 0
1846  007470  000000                  BLINK:  0
1847  007472  000000                  FLASH:  0
1848  007474  000000                  CARX:   0
1849  007476  000000                  CARY:   0
1850  007500  000000                  YMAX:   0
1851  007502  177570                  SWR:    HSWR
1852  007504  000000                  SSWR:   0
1853  007506  000000                  REPCNT: 0
1854  007510  000137  001000          JM600:  JMP     @#START
1855  007514  000001                  FSTCNT: 1
1856  007516  000000                  TRPARG: 0
1857  007520  000000                  TRPSEL: 0
1858  007522  000000                  TRPMEM: 0
1859  007524  000000                  SAVPC:  0
1860  007526  00000C                  SAVPC1: 0
1861  007530  000000                  TYPOTA: 0
1862  007532  000000                  RAND:   0
1863  007534  000000                  TYPD1:  0
1864  007536  000000                  MODADR: 0
1865  007540  000000                  MODSAV: 0
1866  007542  000000                  BASADD: 0
1867  007544  000000                  TRPERR: 0
1868  007546  000000                  PARITY: 0
1869  007550  000000                  CHAR:   0
1870  007552  052525                  RANDN:  52525
1871  007554  000001                  RANSEL: 1
1872  007556  000006                  RANMTA: 6
1873  007560  052525                  RANST:  52525
1874  007562  000000                  GOOD:   0
1875  007564  000000                  BAD:    0
1876  007566  000000                  DATA:   0
1877  007570  000000                  STATUS: 0
1878  007572  000000                  ADDRES: 0
1879  007574  000000                  ERRDIS: 0
1880  007576  000000                  ERRARG: 0
1881  007600  000000                  CALLPC: 0
1882  007602  000000                  CNVFLG: 0
1883  007604  000000                  STRADD: 0
1884  007606  000000                  STRLEN: 0
1885  007610  000000                  LOWCHR: 0
1886  007612  000000                  UPPCHR: 0
1887  007614  000000                  RUBFLG: 0
1888  007616  000000                  RANDC:  0
1889  007620  000000                  FSAVPW: 0
1890  007622  000000                  PAL:    0
```

```
                                        .NLIST BEX
                                ;
                                ; THIS CHARACTER SET IS OVERLAYED BY THE RELEVANT CHARACTER SET
                                ; FOR ENCODED OR UNENCODED DEVICES.
007624                          P02CHR:
007624  360  360  360                    .BYTE   360,360,360,360,360,360,360,360
007634  010  010  010                    .BYTE   010,010,010,010,010,010,010,010
007644  030  030  030                    .BYTE   030,030,030,030,030,030,030,030
007654  074  074  074                    .BYTE   074,074,074,074,074,074,074,074
007664  000  000  000                    .BYTE   000,000,000,000,377,000,000,000
007674  000  000  000                    .BYTE   000,000,000,000,377,377,000,000
007704  000  000  377                    .BYTE   000,000,377,377,377,377,000,000
007714  010  010  010                    .BYTE   010,010,010,010,377,010,010,010
007724  030  030  030                    .BYTE   030,030,030,377,377,030,030,030
007734  074  074  377                    .BYTE   074,074,377,377,377,377,074,074 ;10
007744  001  002  004                    .BYTE   001,002,004,010,020,040,100,200
007754  200  100  040                    .BYTE   200,100,040,020,010,004,002,001
007764  000  014  022                    .BYTE   000,014,022,040,170,040,100,176
007774  201  102  044                    .BYTE   201,102,044,030,030,044,102,201
010004  074  176  377                    .BYTE   074,176,377,377,377,377,176,074
010014  030  074  176                    .BYTE   030,074,176,377,377,176,074,034
010024  010  010  024                    .BYTE   010,010,024,042,301,042,024,010
010034  010  010  034                    .BYTE   010,010,034,076,377,076,034,010
010044  252  252  252                    .BYTE   252,252,252,252,252,252,252,252
010054  314  314  314                    .BYTE   314,314,314,314,314,314,314,314 ;20
010064  377  000  377                    .BYTE   377,000,377,000,377,000,377,000
010074  377  377  000                    .BYTE   377,377,000,000,377,377,000,000
010104  377  203  205                    .BYTE   377,203,205,211,221,241,301,377
010114  377  201  201                    .BYTE   377,201,201,201,201,201,201,377
010124  377  376  374                    .BYTE   377,376,374,370,360,340,300,200
010134  377  177  077                    .BYTE   377,177,077,037,017,007,003,001
010144  200  300  340                    .BYTE   200,300,340,360,370,374,376,377
010154  001  003  007                    .BYTE   001,003,007,017,037,077,177,377
010164  003  007  016                    .BYTE   003,007,016,034,070,160,340,300
010174  300  340  260                    .BYTE   300,340,260,070,034,016,007,003 ;30
010204  303  347  176                    .BYTE   303,347,176,074,074,176,347,303
010214  000  160  120                    .BYTE   000,160,120,160,000,000,000,000
010224  000  000  000                    .BYTE   000,000,000,000,000,000,000,000
010234  010  010  010                    .BYTE   010,010,010,010,010,000,010,000
010244  024  024  024                    .BYTE   024,024,024,000,000,000,000,000
010254  024  024  066                    .BYTE   024,024,066,000,066,024,024,000
010264  010  036  040                    .BYTE   010,036,040,034,002,074,010,000
010274  000  062  062                    .BYTE     0, 62, 62,  4, 10, 20, 46, 46
010304  000  020  050                    .BYTE     0, 20, 50, 50, 20, 52, 44, 32
010314  000  030  030                    .BYTE     0, 30, 30, 30,  0,  0,  0,  0 ;40(')
010324  000  010  020                    .BYTE     0, 10, 20, 40, 40, 40, 20, 10
010334  000  010  004                    .BYTE     0, 10,  4,  2,  2,  2,  4, 10
010344  000  052  034                    .BYTE     0, 52, 34, 76, 34, 52,  0,  0
010354  000  000  010                    .BYTE     0,  0, 10, 10, 76, 10, 10,  0
010364  000  000  000                    .BYTE     0,  0,  0,  0, 30, 30, 10, 20
010374  000  000  000                    .BYTE     0,  0,  0,  0, 76,  0,  0,  0
010404  000  000  000                    .BYTE     0,  0,  0,  0,  0,  0, 30, 30
010414  000  002  002                    .BYTE     0,  2,  2,  4, 10, 20, 40, 40
010424  000  034  042                    .BYTE   000,034,042,046,052,062,042,034
010434  000  010  030                    .BYTE   000,010,030,010,010,010,010,034 ;50(1)
010444  000  034  042                    .BYTE   000,034,042,002,034,040,040,076
```

```
1948  010454  000  034  042          .BYTE   000,034,042,002,014,002,042,034
1949  010464  000  004  014          .BYTE   000,004,014,024,044,074,004,004
1950  010474  000  076  040          .BYTE     0, 76, 40, 74,  2,  2, 42, 34
1951  010504  000  014  020          .BYTE     0, 14, 20, 40, 74, 42, 42, 34
1952  010514  000  076  002          .BYTE     0, 76,  2,  4, 10, 20, 20, 20
1953  010524  000  034  042          .BYTE     0, 34, 42, 42, 34, 42, 42, 34
1954  010534  000  034  042          .BYTE     0, 34, 42, 42, 36,  2,  4, 30
1955  010544  000  000  030          .BYTE     0,  0, 30, 30,  0, 30, 30,  0
1956  010554  000  030  030          .BYTE     0, 30, 30,  0, 30, 30, 10, 20 ;60(;)
1957  010564  000  004  010          .BYTE     0,  4, 10, 20, 40, 20, 10,  4
1958  010574  000  000  000          .BYTE     0,  0,  0, 76,  0, 76,  0,  0
1959  010604  000  020  010          .BYTE     0, 20, 10,  4,  2,  4, 10, 20
1960  010614  000  030  044          .BYTE     0, 30, 44,  4, 10, 10,  0, 10
1961  010624  000  074  102          .BYTE     0, 74,102,132,132,104, 40,  0
1962  010634  000  010  024          .BYTE     0, 10, 24, 42, 42, 76, 42, 42
1963  010644  000  074  022          .BYTE     0, 74, 22, 22, 34, 22, 22, 74
1964  010654  000  034  042          .BYTE     0, 34, 42, 40, 40, 40, 42, 34
1965  010664  000  074  022          .BYTE     0, 74, 22, 22, 22, 22, 22, 74
1966  010674  000  076  040          .BYTE     0, 76, 40, 40, 70, 40, 40, 76 ;70(E)
1967  010704  000  076  040          .BYTE     0, 76, 40, 40, 70, 40, 40, 40
1968  010714  000  036  040          .BYTE     0, 36, 40, 40, 46, 42, 42, 36
1969  010724  000  042  042          .BYTE     0, 42, 42, 42, 76, 42, 42, 42
1970  010734  000  034  010          .BYTE     0, 34, 10, 10, 10, 10, 10, 34
1971  010744  000  002  002          .BYTE     0,  2,  2,  2,  2,  2, 42, 34
1972  010754  000  042  044          .BYTE     0, 42, 44, 50, 60, 50, 44, 42
1973  010764  000  040  040          .BYTE     0, 40, 40, 40, 40, 40, 40, 76
1974  010774  000  042  066          .BYTE     0, 42, 66, 52, 42, 42, 42, 42
1975  011004  000  042  062          .BYTE     0, 42, 62, 52, 46, 42, 42, 42
1976  011014  000  034  042          .BYTE     0, 34, 42, 42, 42, 42, 42, 34 ;80(O)
1977  011024  000  074  042          .BYTE     0, 74, 42, 42, 74, 40, 40, 40
1978  011034  000  034  042          .BYTE     0, 34, 42, 42, 42, 52, 44, 32
1979  011044  000  074  042          .BYTE     0, 74, 42, 42, 74, 50, 44, 42
1980  011054  000  036  040          .BYTE     0, 36, 40, 40, 34,  2,  2, 74
1981  011064  000  076  010          .BYTE     0, 76, 10, 10, 10, 10, 10, 10
1982  011074  000  042  042          .BYTE     0, 42, 42, 42, 42, 42, 42, 34
1983  011104  000  042  042          .BYTE     0, 42, 42, 42, 24, 24, 10, 10
1984  011114  000  042  042          .BYTE     0, 42, 42, 42, 42, 52, 66, 42
1985  011124  000  042  042          .BYTE     0, 42, 42, 24, 10, 24, 42, 42
1986  011134  000  042  042          .BYTE     0, 42, 42, 24, 10, 10, 10, 10 ;90(Y)
1987  011144  000  076  002          .BYTE     0, 76,  2,  4, 10, 20, 40, 76
1988  011154  000  070  040          .BYTE   000,070,040,040,040,040,040,070
1989  011164  000  040  040          .BYTE   000,040,040,020,010,004,002,002
1990  011174  000  016  002          .BYTE   000,016,002,002,002,002,002,016
1991  011204  030  074  176          .BYTE   030,074,176,377,030,030,030,030
1992  011214  010  014  016          .BYTE   010,014,016,377,377,016,014,010
1993  011224  030  030  030          .BYTE   030,030,030,030,377,176,074,030
1994  011234  020  060  160          .BYTE   020,060,160,377,377,160,060,020
1995  011244  000  377  377          .BYTE   000,377,377,377,377,377,377,377 ;100
1996  011254  000  000  377          .BYTE   000,000,377,377,377,377,377,377
1997  011264  000  000  000          .BYTE   000,000,000,377,377,377,377,377
1998  011274  000  000  000          .BYTE   000,000,000,000,377,377,377,377
1999  011304  000  000  000          .BYTE   000,000,000,000,000,377,377,377
2000  011314  000  000  000          .BYTE   000,000,000,000,000,000,377,377
2001  011324  000  000  000          .BYTE   000,000,000,000,000,000,000,377
2002  011334  376  376  376          .BYTE   376,376,376,376,376,376,376,376
2003  011344  374  374  374          .BYTE   374,374,374,374,374,374,374,374
```

```
2004  011354  370  370  370          .BYTE   370,370,370,370,370,370,370,370
2005  011364  360  360  360          .BYTE   360,360,360,360,360,360,360,360 ;110
2006  011374  340  340  340          .BYTE   340,340,340,340,340,340,340,340
2007  011404  300  300  300          .BYTE   300,300,300,300,300,300,300,300
2008  011414  200  200  200          .BYTE   200,200,200,200,200,200,200,200
2009  011424  200  200  200          .BYTE   200,200,200,200,200,200,200,377
2010  011434  377  001  001          .BYTE   377,001,001,001,001,001,001,001
2011  011444  001  001  001          .BYTE   001,001,001,001,001,001,001,377
2012  011454  200  200  200          .BYTE   200,200,200,200,200,200,200,377
2013  011464  000  000  000          .BYTE   000,000,000,000,000,000,000,200
2014  011474  200  000  000          .BYTE   200,000,000,000,000,000,000,000
2015  011504  001  000  000          .BYTE   001,000,000,000,000,000,000,000 ;120
2016  011514  000  000  000          .BYTE   000,000,000,000,000,000,000,001
2017  011524  000  010  024          .BYTE   000,010,024,042,343,000,000,000
2018  011534  010  010  030          .BYTE   010,010,030,040,100,040,030,010
2019  011544  000  074  146          .BYTE   000,074,146,303,201,000,000,000
2020  011554  030  060  140          .BYTE   030,060,140,100,100,140,060,030
2021  011564  000  000  000          .BYTE   000,000,000,000,017,010,010,010
2022  011574  010  010  010          .BYTE   010,010,010,010,370,000,000,000
2023  011604  010  010  010          .BYTE   010,010,010,010,013,000,000,000
2024  011614  000  000  000          .BYTE   000,000,000,000,370,010,010,010
2025
```

```
                        .SBTTL  PRINT TEST NUMBER
                ;
                ;
                ;       DESCRIPTION:
                ;
                ;               ROUTINE TO PRINT THE TEST NUMBER IN OCTAL
                ;
                ;       CALLING SEQUENCE:
                ;
                ;               JSR     PC,TESTR
                ;       INPUT PARAMETERS:
                ;
                ;               TESTNO CONTAINS THE OCTAL TEST NUMBER TO BE
                ;               PRINTED
                ;
                ;       IMPLICIT INPUT PARAMETERS:
                ;
                ;               THE LABEL TESMSG IS THE START ADDRESS OF AN
                ;               ASCII STRING 'TEST NO'
                ;
                ;       OUTPUT PARAMETERS:
                ;
                ;               R0 WILL BE CORRUPTED
                ;
                ;       IMPLICIT OUTPUT PARAMETERS:
                ;
                ;               THE MESSAGE 'TEST NO N' WILL BE PRINTED ON THE
                ;               CONSOLE TERMINAL
                ;
                ;       COMPLETION CODES:
                ;
                ;               NONE
                ;
                ;       POSSIBLE ERROR CODES:
                ;
                ;               NONE
                ;
011624  004737  014734  TESTR:  JSR     PC,TYPOUT
011630  006473                  TESMSG                  ;TEST NO
011632  013700  007454          MOV     TESTNO,R0
011636  004737  015024          JSR     PC,PROCT        ;PRINT OCTAL TEST NO
011642  000207                  RTS     PC              ;EXIT
```

```
                        .SBTTL  SYNC UP THE PROGRAM
;
;
;       DESCRIPTION:
;
;       THIS ROUTINE WILL ATTEMPT TO SYNC THE PROGRAM UP
;       TO EITHER A HI-LO, OR LO-HI TRANSITION START
;       OF THE FIELD VIDEO PERIOD.
;       A HURRY UP FEATURE IS AVAILABLE, BY TYPING THE
;       SPACE KEY ON THE CONSOLE TERMINAL. THIS CAUSES
;       THE ROUTINE TO EXIT PREMATURELY, INDICATING THAT
;       IT COULD NOT SYNC UP.
;
;
;       CALLING SEQUENCE:
;
;       JSR     PC,SYNCUP
;       A:
;       B:
;
;
;       INPUT PARAMETERS:
;
;       NONE
;
;
;       IMPLICIT INPUT PARAMETERS:
;
;       DEVCSR CONTAINS THE CURRENT CSR ADDRESS
;
;
;       OUTPUT PARAMETERS:
;
;       TWO POSSIBLE RETURN ADDRESSES CAN BE USED DEPENDING UPON
;       THE SUCEES OF THE SYNC ATTEMPT.
;       A: IMPOSSIBLE TO SYNC UP OR SPACE TYPED ON CONSOLE
;       B: SYNCED UP
;
;
;       IMPLICIT OUTPUT PARAMETERS:
;
;       NONE
;
;
;       COMPLETION CODES:
;
;       NONE
;
;
;       POSSIBLE ERROR CODES:
;
;       ERROR 70- CANNOT FIND AN INITIAL LEVEL
;       ERROR 67- CANNOT CHANGE STATE
;
```

```
2138  011644  004737  013740          SYNCUP: JSR     PC,SAVREG       ; SAVE GOODIES
2139  011650  005005                          CLR     R5              ; SETS TO 1 WHEN HIGH LEVEL DETECTED
2140  011652  005004                          CLR     R4              ; SET SYNC INDETERMINATE
2141  011654  012703  037777                  MOV     #037777,R3      ; SETUP TIMEOUT
2142                                          ;
2143  011660  012702  000040                  MOV     #40,R2          ; SET FILTER TIME CONSTANT
2144                                          ;
2145  011664  017701  175546          10$:    MOV     @DEVCSR,R1      ; GET CONTENTS
2146  011670  042701  157777                  BIC     #157777,R1      ; ISOLATE VIDEO-ON
2147  011674  162701  010000                  SUB     #010000,R1      ; NORMALISE AROUND ZERO.
2148  011700  100405                          BMI     20$             ; UP OR DOWN?
2149  011702  020427  040000                  CMP     R4,#040000      ; AT END STOP?
2150  011706  001406                          BEQ     30$             ; YES..
2151  011710  060104                          ADD     R1,R4           ; ELSE, UPDATE.
2152  011712  000404                          BR      30$
2153                                          ;
2154  011714  020427  140000          20$:    CMP     R4,#140000      ; AT END STOP?
2155  011720  001401                          BEQ     30$             ; YES..
2156  011722  060104                          ADD     R1,R4
2157                                          ;
2158  011724  005704                  30$:    TST     R4              ; SIGN?
2159  011726  100413                          BMI     35$             ; ZERO...
2160  011730  020427  030000                  CMP     R4,#030000      ; VALID ONE?
2161  011734  103417                          BCS     40$             ; NO...
2162  011736  012702  000040                  MOV     #40,R2          ; RESET TIME CONSTANT
2163  011742  020327  037764                  CMP     R3,#037764      ; READY TO TEST?
2164  011746  103012                          BCC     40$             ; NO...
2165  011750  012705  000001                  MOV     #1,R5           ; SET FLAG..
2166  011754  000407                          BR      40$
2167                                          ;
2168  011756  020427  160000          35$:    CMP     R4,#160000      ; VALID ZERO?
2169  011762  103004                          BCC     40$             ; NO..
2170  011764  005705                          TST     R5              ; HIGH LEVEL YET?
2171  011766  001017                          BNE     50$             ; YES, A-OK!
2172  011770  012702  000040                  MOV     #40,R2          ; RESET TIME CONSTANT
2173                                          ;
2174  011774  005302                  40$:    DEC     R2              ; TIME CONSTANT TALLY..
2175  011776  001005                          BNE     45$             ; OK SO FAR IF BRANCH..
2176                                  ; ERROR-
2177                                  ; CHECK 'LEVB CLOCK H'  STABILITY
2178                                  ;       'LEVB VA17 H'
2179  012000  004737  016666                  JSR     PC,ERROR        ; ELSE NOISY SYNC IGNAL!
2180  012004  000070                          70
2181  012006  000137  012032                  JMP     NOSYNC          ; ERROR EXIT
2182                                          ;
2183  012012  005303                  45$:    DEC     R3              ; TIMOUT FOR SYNC?
2184  012014  001323                          BNE     10$             ; NO....
2185                                  ; ERROR-
2186                                  ; CHECK 'LEVB CLOCK H' (8 MHZ)
2187                                  ;       'LEVB CLOCK L'
2188                                  ;       'LEVA VA02 L'
2189                                  ;       'LEVB VA17 H'
2190  012016  004737  016666                  JSR     PC,ERROR        ; SYNC STOPPED'
2191  012022  000067                          67
2192  012024  000402                          BR      NOSYNC          ; ERROR RETURN
2193                                  ;
```

```
2194  012026  062716  000002          50$:    ADD     #2,(SP)         ; UPDATE TO GOOD RETURN
2195                                  ;
2196  012032  004737  013776          NOSYNC: JSR     PC,RSTREG       ; RECOVER REGISTERS.
2197  012036  000207                          RTS     PC              ; ..AND EXIT
```

```
                        .SBTTL  WAIT A NUMBER OF SECONDS

                        ;
                        ;       DESCRIPTION:
                        ;
                        ;       ROUTINE TO WAIT A NUMBER OF UNITS (SECONDS), BASED
                        ;       UPON THE FIELD VIDEO PERIOD.
                        ;
                        ;       CALLING SEQUENCE:
                        ;
                        ;       JSR     PC,WAITS
                        ;       XX
                        ;
                        ;       INPUT PARAMETERS:
                        ;
                        ;       XX IS THE NUMBER OF UNITS (SECONDS) TO WAIT
                        ;
                        ;       IMPLICIT INPUT PARAMETERS:
                        ;
                        ;       NONE
                        ;
                        ;       OUTPUT PARAMETERS:
                        ;
                        ;       NONE
                        ;
                        ;       IMPLICIT OUTPUT PARAMETERS:
                        ;
                        ;       NONE
                        ;
                        ;       COMPLETION CODES:
                        ;
                        ;       NONE
                        ;
                        ;       POSSIBLE ERROR CODES:
                        ;
                        ;       NONE
                        ;
012040  004737  013740  WAITS:  JSR     PC,SAVREG       ; SAVE REGISTERS
012044  017601  000000          MOV     @(SP),R1        ; GET SECOND COUNT
012050  062716  000002          ADD     #2,(SP)         ; PROTECT RETURN
012054  013702  007454          MOV     TESTNO,R2       ; GET TEST NUMBER
012060  105762  001436          TSTB    TABLE2(R2)      ; IS IT STALL-ABLE?
012064  001405                  BEQ     1$              ; NO IF BRANCH
012066  005737  001174          TST     REACT           ; HAS USER OVERRIDDEN TIMER?
012072  001402                  BEQ     1$              ; NO..
012074  013701  001174          MOV     REACT,R1        ; ELSE RESET TIME.
                        ;
012100  013702  007452  1$:     MOV     WAIT1,R2        ; GET TIME FOR ONE SECOND.
```

```
2255
2256  012104  105737  177560          2$:   TSTB    TKS             ; ANY CONSOLE INPUT?
2257  012110  100012                        BPL     3$              ; NO...
2258  012112  004737  014206                JSR     PC,READ         ; ELSE GET CHARACTER..
2259  012116  020027  000040                CMP     R0,#' 	        ; EXIT ON SPACE
2260  012122  001414                        BEQ     7$
2261  012124  020027  000007                CMP     R0,#'G&37       ; 'BELL'?
2262  012130  001002                        BNE     3$              ; NO..
2263  012132  004737  013546                JSR     PC,MONIT        ; ..ELSE CALL UP MONITOR.
2264
2265  012136  004737  011644          3$:   JSR     PC,SYNCUP       ; SYNC UP
2266  012142  000240                        NOP                     ; IGNORE ERRORS
2267  012144  005302                        DEC     R2              ; ONE SECOND?
2268  012146  001356                        BNE     2$              ; NOT YET..
2269  012150  005301                        DEC     R1              ; MORE SECONDS?
2270  012152  001352                        BNE     1$              ; YES, KEEP LOOPING
2271
2272  012154  004737  013776          7$:   JSR     PC,RSTREG       ; EXIT AFTER RECOVERING REGS.
2273  012160  000207                        RTS     PC
```

```
2275                    .SBTTL  SELECT 525/625
2276
2277
2278                    DESCRIPTION:
2279
2280                    THIS ROUTINE PROMPTS THE OPERATOR TO DETERMINE WHAT
2281                    DEVICE(S) ARE BEING TESTED. THE ROUTINE PROMPTS
2282                    'VTV30-K?', AND LOOKS FOR A RESPONSE OF A,B,C,D OR G,
2283                    TO SELECT THE APPROPRIATE DEVICE. HAVING FOUND WHICH
2284                    DEVICE HAS BEEN SELECT, THE ROUTINE THEN SETS UP FLAGS
2285                    AS TO THE SIZE OF THE DISPLAY AREA AND WHETHER IT HAS
2286                    A ROM OR RAM CHARACTER STORE.
2287
2288
2289                    CALLING SEQUENCE:
2290
2291                    JSR     PC,SETDEV
2292
2293
2294                    INPUT PARAMETERS:
2295
2296                    NONE
2297
2298
2299                    IMPLICIT INPUT PARAMETERS:
2300
2301                    NONE
2302
2303
2304                    OUTPUT PARAMETERS:
2305
2306                    PROM=0 FOR RAM CHSR
2307                    PROM=1 FOR PROM CHSR
2308
2309                    XMAX= MAXIMUM X ADDRESS
2310                    YMAX= MAXIMUM Y ADDRESS
2311
2312                    WAIT1= TIMER VALUE FOR 1 SECOND (?)
2313
2314                    RELEVANT RAM CHARACTER SET
2315
2316
2317                    IMPLICIT OUTPUT PARAMETERS:
2318
2319                    NONE
2320
2321
2322                    COMPLETION CODES:
2323
2324                    NONE
2325
2326
2327                    POSSIBLE ERROR CODES:
2328
2329                    NONE
2330
```

```
2331
2332  012162  004737  013740          SETDEV: JSR     PC,SAVREG       ; SAVE OLD ENVIRONMENT
2333
2334  012166  004737  014734          1$:     JSR     PC,TYPOUT       ; ASK MODULE TYPE?
2335  012172  005610                          SET56
2336  012174  004737  014206                  JSR     PC,READ         ; READ REPLY...A/B/C/D/G
2337  012200  012701  012374                  MOV     #DEVLST,R1      ; GET CHECK TABLE ADDRESS
2338
2339  012204  121100                  3$:     CMPB    (R1),R0         ; THIS MODULE?
2340  012206  001404                          BEQ     10$             ; YES...
2341  012210  005721                          TST     (R1)+           ; ELSE SKIP ON TO NEXT
2342  012212  005711                          TST     (R1)            ; END OF TABLE?
2343  012214  001373                          BNE     3$              ; NO, TRY NEXT
2344  012216  000763                          BR      1$              ; ELSE RESTART.
2345
2346  012220  005037  007622          10$:    CLR     PAL             ; PRESET TO NON-TV-ENCODED.
2347  012224  032711  001000                  BIT     #1000,(R1)      ; IS IT 525?
2348  012230  001407                          BEQ     12$             ; NO IF BRANCH
2349  012232  012737  000033  007500          MOV     #27.,YMAX       ; MAXIMUM ROW NO FOR 525
2350  012240  012737  000074  007452          MOV     #60.,WAIT1      ; 60 FRAMES/SEC
2351  012246  000406                          BR      13$
2352
2353  012250  012737  000037  007500  12$:    MOV     #31.,YMAX       ; 32 ROWS IN 625
2354  012256  012737  000062  007452          MOV     #50.,WAIT1      ; 50 FRAMES/SEC
2355
2356  012264  012737  000077  007446  13$:    MOV     #63.,XMAX       ; 48 VISIBLE,16 INVISIBLE CELLS.
2357  012272  012737  000001  007462          MOV     #1,PROM         ; PRESET TO PROM CHAR SET.
2358  012300  032711  000400                  BIT     #400,(R1)       ; PROM?
2359  012304  001030                          BNE     20$             ; YES...
2360  012306  005037  007462                  CLR     PROM            ; ELSE RESET TO RAM CHAR STORE.
2361  012312  004737  014734                  JSR     PC,TYPOUT       ; ASK IF ENCODED FOR TV!
2362  012316  005627                          SETENC
2363  012320  004737  014206                  JSR     PC,READ         ; GET REPLY..
2364  012324  012701  017242                  MOV     #NORCH,R1       ; DEFAULT TO NORMAL CHARACTER SET
2365  012330  120027  000131                  CMPB    R0,#'Y          ; IF YES, THEN WE ARE ENCODED.
2366  012334  001005                          BNE     15$
2367  012336  012737  000001  007622          MOV     #1,PAL          ; SET ENCODED (ONLY RELEVANT FOR RAM)
2368  012344  012701  021242                  MOV     #PALCH,R1       ; GET THIS CHAR SET
2369
2370  012350  012700  007624  15$:    MOV     #P02CHR,R0      ; GET DESTINATION.
2371  012354  012702  001000                  MOV     #1000,R2        ; 512 WORDS=128 CHARS.
2372
2373  012360  012120          16$:    MOV     (R1)+,(R0)+     ; TRANSFER 2 BYTES.
2374  012362  005302                  DEC     R2
2375  012364  001375                  BNE     16$             ; ANY MORE?
2376
2377  012366  004737  013776  20$:    JSR     PC,RSTREG       ; RECOVER REGISTERS.
2378  012372  000207                  RTS     PC
2379
2380                          ; THE FOLLOWING TABLE HAS AN ASCII CHACK BYTE IN EACH WORD,
2381                          ; TOGETHER WITH 400 IF IT IS A PROM UNIT, AND 1000 FOR 525.
2382
2383  012374  000470          DEVLST: '8+400+0000     ; INTERFACE, -KA
2384  012376  001471                  '9+400+1000     ;            -KB
2385  012400  000060                  '0+000+0000     ;            -KC
2386  012402  001061                  '1+000+1000     ;            -KD
```

```
                                                                    G 5
  2387  012404  000462                    '2+400+0000     ;           -KG
  2388  012406  000000                    0
```

```
                        .SBTTL  LOAD A FULL PICTURE
                ;
                ;       DESCRIPTION:
                ;
                ;       ROUTINE TO LOAD A FULL PICTURE WITH A GIVEN
                ;       CHARACTER CODE, COLOUR, BLINK AND FLASH SETTING
                ;
                ;
                ;       CALLING SEQUENCE:
                ;
                ;       JSR     PC.LOADFS
                ;
                ;       INPUT PARAMETERS:
                ;
                ;       FLASH,BLINK,CHAR,FORGND,BAKGND, VIDEON ARE TO AS
                ;       FLASH CODE, BLINK CODE, CHARACTER CODE, FOREGROUND
                ;       COLOUR, BACKGROUND COLOUR, AND THE VIDEO ON ENABLE
                ;       RESPECTIVELY.
                ;
                ;       IMPLICIT INPUT PARAMETERS:
                ;
                ;       NONE
                ;
                ;       OUTPUT PARAMETERS:
                ;
                ;       CARX, AND CARY ARE DESTROYED
                ;
                ;       IMPLICIT OUTPUT PARAMETERS:
                ;
                ;       NONE
                ;
                ;       COMPLETION CODES:
                ;
                ;       NONE
                ;
                ;       POSSIBLE ERROR CODES:
                ;
                ;       NONE
                ;
                ;
012410 004737 013740    LOADFS: JSR     PC,SAVREG
012414 005037 007476            CLR     CARY            ; CLEAR OUR Y COORD
012420 005037 007474            CLR     CARX            ; AND OUR X COORD
012424 013702 007550            MOV     CHAR,R2         ; PRESET THE PICT TO THIS CHAR
012430 000302                   SWAB    R2              ; HIGH ORDER BYTE
012432 053702 007470            BIS     BLINK,R2        ; LOOAD BLINK AND FLASH BITS
012436 053702 007472            BIS     FLASH,R2
```

```
2446  012442  053702  007464                BIS     FORGND,R2       ; LOAD FOREGROUND COLOUR
2447  012446  013701  007466                MOV     BAKGND,R1       ; GET BACKGROUND COLOUR
2448  012452  006301                        ASL     R1              ; TO CORRECT BITS
2449  012454  006301                        ASL     R1
2450  012456  006301                        ASL     R1
2451  012460  050102                        BIS     R1,R2           ; AND LOAD INTO DATUM WORD
2452  012462  013700  007436                MOV     DEVCSR,R0       ; GET THE CSR ADDRESS
2453  012466  013701  007440                MOV     DEVBUF,R1       ; ALSO THE DATA BUFFER
2454  012472  013703  007450                MOV     VIDEON,R3       ; GET THE VIDEO ON BIT..
2455  012476  012704  004000                MOV     #4000,R4        ; PICTURE STORE COUNT
2456                                        ;
2457  012502  010310                2$:     MOV     R3,(R0)         ; LOAD CSR WITH ADDRESS
2458  012504  010211                        MOV     R2,(R1)         ; LOAD PICTURE ELEMENT
2459  012506  005203                        INC     R3              ; NEXT PICTURE ELEMENT
2460  012510  005304                        DEC     R4              ; ANY MORE?
2461  012512  001373                        BNE     2$              ; YES...
2462  012514  004737  013776                JSR     PC,RSTREG       ; RESTORE THE REGISTERS
2463  012520  000207                        RTS     PC              ; AND EXIT.
```

```
                        .SBTTL  LOAD A PICTURE ELEMENT
                ;
                ;       DESCRIPTION:
                ;
                ;       ROUTINE TO LOAD A SINGLE PICTURE ELEMENT
                ;;
                ;       CALLING SEQUENCE:
                ;
                ;       JSR     PC,LOELEM
                ;
                ;       INPUT PARAMETERS:
                ;
                ;       CARY= Y POS
                ;       CARX= X POS
                ;       CHAR= CHAR CODE
                ;       FORGND= FOREGROUND COLOUR
                ;       BAKGND= BACKGROUND COLOUR
                ;       BLINK= BLINK STATUS
                ;       FLASH= FLASH STATUS
                ;       VIDEON= VIDEO ENABLE STATUS
                ;       DEVCSR= ADDRESS OF CURRENT CSR
                ;       DEVBUF= ADDRESS OF CURRENT DBUFF
                ;
                ;
                ;       IMPLICIT INPUT PARAMETERS:
                ;
                ;       NONE
                ;
                ;       OUTPUT PARAMETERS:
                ;
                ;       NONE
                ;
                ;       IMPLICIT OUTPUT PARAMETERS:
                ;
                ;       NONE
                ;
                ;       COMPLETION CODES:
                ;
                ;       NONE
                ;
                ;       POSSIBLE ERROR CODES:
                ;
                ;       NONE
                ;
012522 004737 013740    LOELEM: JSR     PC,SAVREG
012526 013702 007474            MOV     CARX,R2         ; SET UP OUR SAR REGISTER
012532 013701 007476            MOV     CARY,R1
```

```
2521  012536  000301                  SWAB    R1              ; GET Y ADDRESS IN TOP BYTE
2522  012540  105001                  CLRB    R1
2523  012542  006201                  ASR     R1
2524  012544  006201                  ASR     R1              ; SHIFT IT DOWN
2525  012546  042701  174000          BIC     #174000,R1      ; CLEAR RUBBISH
2526  012552  053701  007450          BIS     VIDEON,R1       ; SET VIDEO ON
2527  012556  050102                  BIS     R1,R2           ; THEN SET IT UP
2528  012560  010277  174652          MOV     R2,@DEVCSR      ; SET OUR X AND Y ADDRESSES
2529  012564  013702  007464          MOV     FORGND,R2               ; START WITH FOREGROUND
2530  012570  013701  007466          MOV     BAKGND,R1       ; GET BACKGROUND COLOUR
2531  012574  006301                  ASL     R1
2532  012576  006301                  ASL     R1              ; SET IT IN CORRECT POSITION
2533  012600  006301                  ASL     R1
2534  012602  050102                  BIS     R1,R2           ; ADD TO COMPOSITE
2535  012604  053702  007470          BIS     BLINK,R2                ; SET BLINK IF REQUIRED
2536  012610  053702  007472          BIS     FLASH,R2                ; AND FLASH
2537  012614  013701  007550          MOV     CHAR,R1         ; GET CHARACTER
2538  012620  000301                  SWAB    R1              ; THE SET IN THE CORRECT POSITION
2539  012622  105001                  CLRB    R1
2540  012624  050102                  BIS     R1,R2           ; ADD IT IN
2541  012626  010277  174606          MOV     R2,@DEVBUF      ; OUT
2542  012632  004737  013776          JSR     PC,RSTREG
2543  012636  000207                  RTS     PC
```

```
                                                     .SBTTL  'SILLSI' SUBROUTINE
                                            ;
                                            ;
                                            ;        DESCRIPTION:
                                            ;
                                            ;                ROUTINE TO ESTABLISH WHETHER OR NOT THE
                                            ;                DIAGNOSTIC IS RUNNING ON  A  PROCESSOR
                                            ;                WHICH POSSESSES ONLY ONE INTERRUPT  BUS
                                            ;                PRIORITY LEVEL.
                                            ;
                                            ;
                                            ;        CALLING SEQUENCE:
                                            ;
                                            ;                JSR     PC,SILLSI
                                            ;
                                            ;
                                            ;        INPUT PARAMTERS:
                                            ;
                                            ;                NONE
                                            ;
                                            ;
                                            ;        IMPLICIT INPUT PARAMETERS:
                                            ;
                                            ;                NONE
                                            ;
                                            ;
                                            ;        OUTPUT PARAMETERS:
                                            ;
                                            ;                THE VARIABLE 'LSIFLG' WILL BE SET UP TO
                                            ;                REFLECT WHETHER OR NOT THE PROCESSOR HAS
                                            ;                A SINGLE INTERRUPT PRIORITY LEVEL.
                                            ;
                                            ;                LSIFLG  =  0  => MULTIPLE INT. PRIORITIES
                                            ;                        <> 0  => SINGLE INT. PRIORITY
                                            ;
                                            ;
                                            ;        IMPLICIT OUTPUT PARAMETERS:
                                            ;
                                            ;                NONE
                                            ;
                                            ;
                                            ;        COMPLETION CODES:
                                            ;
                                            ;                NONE
                                            ;
                                            ;
                                            ;        POSSIBLE ERROR CODES:
                                            ;
                                            ;                NONE
                                            ;
                                            ;
                                            ;
                                            ;
 012640  005037  012702                     SILLSI: CLR     LSIFLG          ;SET UP FLAG FOR NON-LSI
 012644  012737  012670  000004                     MOV     #1$,4           ;INSTALL TRAP THRU 4 VECTOR
 012652  012737  000340  000006                     MOV     #340,6          ;AND CORRESPONDING PRIORITY
```

```
2601                                    ;
2602  012660  005737  177776            1$:     TST     PSW             ;TRY ADDRESSING THE PSW --
2603  012664  000240                            NOP                     ;IF NOT THERE, TRAP THRU 4
2604  012666  000404                            BR      2$              ;WILL OCCUR, ELSE BRANCH.
2605                                    ;
2606  012670  022626                    1$:     CMP     (SP)+,(SP)+     ;PERFORM A DUMMY RTI
2607  012672  012737  177777  012702            MOV     #-1,LSIFLG      ;PROCESSOR HAS ONE INT.LEVEL
2608                                    ;
2609  012700  000207                    2$:     RTS     PC              ;RETURN TO MAINLINE CALL.
2610                                    ;
2611                                    ;
2612                                    ;
2613  012702  000000                    LSIFLG: 0                       ;0 => MULTIPLE INT.PRIORITIES
2614                                                                    ;-1=> SINGLE INT. PRIORITY
2615                                    ;
2616                                    ;
2617                                    ;
```

```
                        .SBTTL  NON EXISTANT SWR TRAP
                ;
                ;
                ;       DESCRIPTION:
                ;
                ;               THE TRAP WHEN TESTING FOR THE HARDWARE
                ;               SWITCH REGISTER WILL OCCUR HERE
                ;               THE LOACTION SWR WILL BE SET TO CONTAIN THE
                ;               ADDRESS OF THE SOFTWARE SWITCH REGISTER SSWR
                ;
                ;       ENTRY POINT
                ;
                ;               SWRSET
                ;
                ;       INPUT PARAMETERS:
                ;
                ;               OCCURS IF A HARDWARE SWITCH REGISTER IN NOT
                ;               PRESENT
                ;
                ;       IMPLICIT INPUT PARAMETERS:
                ;
                ;               NONE
                ;
                ;       OUTPUT PARAMETERS:
                ;
                ;               THE LOCATION SWR WILL BE SET TO CONTAIN SSWR
                ;
                ;       IMPLICIT OUTPUT PARAMETERS:
                ;
                ;               NONE
                ;
                ;       COMPLETION CODES:
                ;
                ;               AN RTI IS PERFORMED
                ;
                ;       POSSIBLE ERROR CODES:
                ;
                ;               NONE
                ;
                ;
                ;
012704  012737  007504  007502  SWRSET: MOV     #SSWR,SWR
012712  000002                  RTI
```

```
2674                            .SBTTL  SET UP ILLEGAL VECTOR TRAPS
2675                    ;
2676                    ;
2677                    ;
2678                    ;       DESCRIPTION:
2679                    ;
2680                    ;               ROUTINE TO SET CATCHES FOR TRAPS TO ILLEGAL
2681                    ;               VECTORS IN THE RANGE 0 TO 772, DURING THE
2682                    ;               RUNNING OF THE TESTS.
2683                    ;
2684                    ;               THE CATCH IS TO FORCE THE EXECUTION OF AN IOT
2685                    ;               TRAP.
2686                    ;
2687                    ;               THE VECTOR 14 (ODT VECTOR) IS LEFT FREE,
2688                    ;               34 (TRAP VECTOR) IS SET TO THE ADDRESS TRAPSV
2689                    ;               TO SERVICE THE TRAP INSTRUCTION. THE VECTOR
2690                    ;               20 (IOT) IS SET TO ILLVEC TO SERVICE ILLEGAL
2691                    ;               VECTOR TRAPS, AND THE ADDRESSES 200 AND 202
2692                    ;               ARE SET WITH A JUMP TO START, THUS ALLOWING
2693                    ;               THE BE BE RESTARTED FROM ADDRESS 200.
2694                    ;               LOCATIONS 30 AND 32 AND SET TO CATCH EMT CALLS
2695                    ;               AND HENCE READ THE PROCESSOR PRIORITY.
2696                    ;
2697                    ;               LOCATION 40 IS LEFT FREE TO CONTAIN THE LOAD
2698                    ;               MEDIUM INDICATORS, LOCATION IS LEFT FREE TO
2699                    ;               CONTAIN THE XXDP
2700                    ;               RETURN ADDRESS (IF PRESENT). LOCATION 46 IS SET TO
2701                    ;               CONTAIN A POINTER TO THE XXDP RETURN ADDRESS AND
2702                    ;               LOCATION 52 IS SET TO ZERO.
2703                    ;
2704                    ;
2705                    ;
2706                    ;       CALLING SEQUENCE:
2707                    ;
2708                    ;               JSR     PC,VECTOR
2709                    ;
2710                    ;       INPUT PARAMETERS:
2711                    ;
2712                    ;               NONE
2713                    ;
2714                    ;
2715                    ;       IMPLICIT INPUT PARAMETERS:
2716                    ;
2717                    ;               NONE
2718                    ;
2719                    ;
2720                    ;       OUTPUT PARAMETERS:
2721                    ;
2722                    ;               R0 AND R1 WILL BE CORRUPTED
2723                    ;
2724                    ;               ADDRESSES 0 THRU TO 774 WILL BE SET WITH
2725                    ;               APPROPRIATE VALUES
2726                    ;
2727                    ;       IMPLICIT OUTPUT PARAMETERS:
2728                    ;
2729                    ;               NONE
```

```
2730                                    ;
2731                                    ;
2732                                    ;       COMPLETION CODES:
2733                                    ;
2734                                    ;               NONE
2735                                    ;
2736                                    ;
2737                                    ;       POSSIBLE ERROR CODES:
2738                                    ;
2739                                    ;               NONE
2740                                    ;
2741                                    ;
2742                                    ;
2743
2744  012714  005000                    VECTOR: CLR     R0              ;FILL 0-572 WITH IOT TRAPS
2745  012716  012701  000002                    MOV     #2,R1
2746  012722  020027  000014            FILL:   CMP     R0,#14          ;ODT TRAP?
2747  012726  001002                            BNE     1$
2748  012730  022020                            CMP     (R0)+,(R0)+     ;YES BUMP R0
2749  012732  000410                            BR      FILL1
2750  012734  020027  000040            1$:     CMP     R0,#40          ;XXDP RETURN ADDRESS
2751  012740  001002                            BNE     2$              ;NO
2752  012742  022020                            CMP     (R0)+,(R0)+     ;YES BUMP R0
2753  012744  000403                            BR      FILL1
2754  012746  010120                    2$:     MOV     R1,(R0)+        ;'.+2'
2755  012750  012720  000004                    MOV     #4,(R0)+        ;'IOT'
2756  012754  062701  000004            FILL1:  ADD     #4,R1
2757  012760  020027  000774                    CMP     R0,#774
2758  012764  002756                            BLT     FILL
2759  012766  012737  013326  000034            MOV     #TRAPSV,34      ;TRAP (LOOP CONTROL)
2760  012774  012737  000340  000036            MOV     #340,36
2761  013002  012737  013156  000030            MOV     #FADR,30        ; PLUG EMT FOR READING
2762  013010  012737  000340  000032            MOV     #340,32         ; THE PROCESSOR STATUS
2763  013016  012737  013226  000020            MOV     #ILLVEC,20      ;PLUG 20 FOR IOTS
2764  013024  012737  000340  000022            MOV     #340,22
2765  013032  013737  007510  000200            MOV     JM600,200       ;SET UP JMP START IN LOC 200
2766  013040  013737  007512  000202            MOV     JM600+2,202
2767  013046  012737  013142  000046            MOV     #$ENDAD,46      ;POINT TO RETURN TO XXDP
2768  013054  005037  000052                    CLR     52              ;CLEAR 52
2769  013060  000207                            RTS     PC              ;THEN EXIT
```

```
                        .SBTTL  XXDP END OF PASS HOOKS

                ;
                ;       DESCRIPTION:
                ;
                ;               ROUTINE TO SIGNIFY END OF PASS, AND IF THE
                ;       PROGRAM HAS BEEN LOADED USING AN XXDP MONITOR A CALL
                ;       WILL BE MADE BACK TO THE MONITOR. THE LOCATIONS USED BY
                ;       XXDP ARE 40, AND 41 FOR THE LOAD MEDIUM AND 42, 43 FOR
                ;       THE RETURN ADDRESS.
                ;       IF A PRESELECTED TEST IS IN OPERATION THE PROGRAM WILL
                ;       GO AND SELECT THAT TEST.
                ;
                ;       ENTRY POINT:
                ;
                ;               ENDIT
                ;
                ;       INPUT PARAMETERS:
                ;
                ;               LOCATION 42/43 CONTAINS THE XXDP RETURN ADDRESS
                ;
                ;       IMPLICIT INPUT PARAMETERS:
                ;
                ;               NONE
                ;
                ;       OUTPUT PARAMETERS:
                ;
                ;               NONE
                ;
                ;       IMPLICIT OUTPUT PARAMETERS:
                ;
                ;               NONE
                ;
                ;       COMPLETION CODES:
                ;
                ;               IF LOCATIONS 42/43 ARE NON ZERO THEY ARE
                ;       ASSUMMED TO CONTAIN THE XXDP MONITOR RETURN ADDRESS
                ;
                ;       POSSIBLE ERROR CODES:
                ;
                ;               NONE
```

```
2827                                    ;
2828                                    ;
2829  013062  012706  001000            ENDIT:  MOV     #START,SP       ; RESET THE STACK
2830  013066                                  PSWSET  #340            ; AND PROCESSOR PRIORITY
2831  013102  032777  000100  174372          BIT     #100,@SWR       ; IS THERE A PRESELECT ON
2832  013110  001402                          BEQ     1$              ; NO
2833  013112  000137  001326                  JMP     START2          ; YES GO SELECT THE TEST
2834                                    ;
2835                                    ; NO PRESELECT ON SO SIGNAL END OF PASS
2836                                    ;
2837  013116  104402                  1$:     TRAP+2                  ; BYPASS MESSAGE
2838  013120  001306                          START1
2839  013122  004737  014734          2$:     JSR     PC,TYPOUT       ; END OF PASS
2840  013126  006500                          PASMSG
2841  013130  013700  000042                  MOV     @#42,R0         ; GET RETURN ADDRESS TO XXDP
2842  013134  001002                          BNE     $ENDAD          ; IF IT IS ZERO THERE IS NO
2843  013136  000137  001306                  JMP     START1          ; MONITOR SO RESTART DIAG
2844
2845                                    ;
2846                                    ;
2847  013142  004710                  $ENDAD: JSR     PC,(R0)         ; CALLED VIA XXDP SO RETURN
2848  013144  000240                          NOP                     ; THERE
2849  013146  000240                          NOP
2850  013150  000240                          NOP                     ; ALLOW A SLIGHT PAUSE
2851  013152  000137  001306                  JMP     START1          ; THEN RESTART THE DIAGNOSTIC
2852                                    ;
2853                                    ;
2854                                    ;
```

```
                        .SBTTL  READ PROCESSOR PRIORITY

;
;
; DESCRIPTION:
;
;       THIS IS THE EMT HANDLER AND IS USED TO READ
;       THE PROCESSOR PRIORITY OFF THE STACK AND RETURNING
;       IT IN FSAVPW
;
;
; CALLING SEQUENCE:
;
;       CALLED BY ISSUING AN EMT
;
;
; INPUT PARAMETERS:
;
;       NONE
;
; IMPLICIT INPUT PARAMETERS:
;
;       THE LOCATIONS 30 AND 32 MUST HAVE BEEN SET
;       UP TO POINT TO THIS ROUTINE
;
; OUTPUT PARAMETERS:
;
;       THE CONTENTS OF THE PROCESSOR PRIORITY
;       ARE RETURNED IN THE LOCATION FSAVPW
;
; COMPLETION CODES:
;
;       NONE
;
; POSSIBLE ERROR CODES:
;
;       NONE
;
;
013156  016637  000002  007620  FADR:   MOV     2(SP),FSAVPW    ; READ PRIORITY
013164  000002                          RTI                     ; RETURN TO CALLER
;
```

```
                        .SBTTL  RING TTY BELL


                        DESCRIPTION:

                                ROUTINE TO RING THE BELL ON THE CONSOLE
                                TERMINAL, IF BIT 5 IS SET IN THE SWITCH
                                REGISTER.


                        CALLING SEQUENCE:

                                JSR     PC,BELL

                        INPUT PARAMETERS:

                                NONE

                        IMPLICIT INPUT PARAMETERS:

                                THE SWITCH REGISTER MUST HAVE BEEN
                                SET UP

                        OUTPUT PARAMETERS:

                                THE TELETYPE BELL WILL BE RUNG IF
                                APPROPRIATE

                        IMPLICIT OUTPUT PARAMETERS

                                NONE

                        COMPLETION CODES:

                                NONE

                        POSSIBLE ERROR CODES:

                                NONE

013166  032777  000040  174306  BELL:   BIT     #40,@SWR
013174  001401                  BEQ     BELL1
013176  000207                  RTS     PC
013200  004737  013276          BELL1:  JSR     PC,TPREDY       ;WAIT FOR PRINTER READY
013204  112737  000007  177566          MOVB    #7,TPB
013212  004737  013276                  JSR     PC,TPREDY       ;WAIT FOR PRINTER READY
```

```
                                                                    H 6
  2954  013216  112737  000000  177566          MOVB    #0,TPB          ;PRINT NULL
  2955  013224  000207                          RTS     PC              ;GO OUT
```

```
                        .SBTTL  ILLEGAL VECTOR TRAP CATCH


;       DESCRIPTION:

;               TRAPS TO ILLEGAL VECTORS WILL BE
;               REPORTED HERE. THE VECTOR TO WHICH
;               THE TRAP OCCURRED WILL BE PRINTED
;               AS WELL AS THE ADDRESS IN THE MAIN
;               LINE CODE FROM WHICH THE TRAP OCCURRED.
;               A PROGRAM RESTART IS THEN PERFORMED,
;               UNLESS A NEW TEST HAS BEEN SELECTED
;               WHILE RUNNING UNDER A SOFTWARE
;               SWITCH REGISTER.


;       ENTRY POINT

;               ILLVEC


;       INPUT PARAMETERS:

;               ENTRY IS CAUSED BY AN ILLEGAL
;               VECTOR TRAP


;       IMPLICIT INPUT PARAMETERS:

;               NONE


;       OUTPUT PARAMETERS:

;               THE VECTOR AND MAINLINE ADDRESS
;               WILL BE PRINTED


;       IMPLICIT OUTPUT PARAMETERS:

;               NONE


;       COMPLETION CODES:

;               A PROGRAM RESTART OR A NEW
;               TEST SELECTION .


;       POSSIBLE ERROR CODES:
;               NONE
```

```
3013                                    ;
3014                                            ;
3015                                            ;
3016                                            ;A TRAP TO AN UNRECOGNISED VECTOR WILL
3017                                            ;BE REPORTED FROM HERE.
3018                                            ;
3019  013226  004737  014734          ILLVEC: JSR     PC,TYPOUT
3020  013232  006516                          ILVMSG
3021  013234  012600                          MOV     (SP)+,R0
3022  013236  162700  000004                  SUB     #4,R0
3023  013242  004737  015024                  JSR     PC,PROCT        ;PRINT VECTOR
3024  013246  004737  014734                  JSR     PC,TYPOUT
3025  013252  006550                          FRMMSG                  ;PRINT MAINLINE ADDRES
3026  013254  005726                          TST     (SP)+
3027  013256  012600                          MOV     (SP)+,R0
3028  013260  004737  015024                  JSR     PC,PROCT
3029  013264  005726                          TST     (SP)+
3030  013266  004737  013546                  JSR     PC,MONIT
3031  013272  000137  001200                  JMP     RSTART
```

```
                        .SBTTL  WAIT FOR PRINTER READY
                ;
                ;
                ;       DESCRIPTION:
                ;
                ;               ROUTINE TO WAIT UNTIL THE PRINTER
                ;               ON THE CONSOLE TERMINAL IS READY,
                ;               IE: IT IS READY TO PRINT THE NEXT
                ;               CHARACTER.
                ;
                ;       CALLING SEQUENCE:
                ;
                ;               JSR     PC,TPREDY
                ;
                ;       INPUT PARAMETERS:
                ;
                ;               NONE
                ;
                ;
                ;       IMPLICIT INPUT PARAMETERS:
                ;
                ;               NONE
                ;
                ;
                ;       OUTPUT PARAMETERS:
                ;
                ;               NONE
                ;
                ;       IMPLICIT OUTPUT PARAMETERS:
                ;
                ;               NONE
                ;
                ;       COMPLETION CODES:
                ;
                ;               NONE
                ;
                ;       POSSIBLE ERROR CODES:
                ;
                ;               NONE
                ;
                ;
013276  105737  177564 TPREDY: TSTB    TPS     ;ROUTINE TO WAIT FOR PRINTER READY
013302  100375          BPL     TPREDY
013304  000207          RTS PC
```

```
                        .SBTTL  SET ITERATION COUNT


                        DESCRIPTION:

                                ROUTINE TO SET UP THE TEST ITERATION
                                COUNT. A PROPOSED COUNT IS SET IN R4
                                THEN UNLESS BIT 13 IN THE SWITCH REGISTER
                                IS SET, THE SAME VALUE IS RETURNED.
                                IF BIT 13 IS SET THEN FAST ITERATION IS
                                ASSUMED AND A VALUE OF 1 IS RETURNED IN
                                R4


                        CALLING SEQUENCE:

                                JSR     PC,FASTSW

                        INPUT PARAMETERS:

                                R4 CONTAINS THE PROPOSED ITERATION
                                COUNT


                        IMPLICIT INPUT PARAMETERS:

                                SETTING BIT 13 IN THE SWR WILL INDICATE
                                FAST ITERATION, AND A SINGLE PASS
                                WILL BE REQUESTED


                        OUTPUT PARAMETERS:

                                R4 WILL CONTAIN THE ACTUAL ITERATION
                                COUNT


                        IMPLICIT OUTPUT PARAMETERS:

                                NONE


                        COMPLETION CODES:

                                NONE


                        POSSIBLE ERROR CODES:

                                NONE



013306  032777  020000  174166  FASTSW: BIT     #20000,@SWR
```

```
 3140  013314  001001                      BNE     1$
 3141  013316  000207                      RTS     PC
 3142  013320  013704  007514      1$:     MOV     FSTCNT,R4
 3143  013324  000207                      RTS     PC
```

```
                        .SBTTL  TRAP SERVICE ROUTINE



                        DESCRIPTION:

                        TRAP HANDLING ROUTINE. THE TRAP HANDLER IS
                        ENTERED UPON THE EXECUTION OF ANY TRAP
                        INSTRUCTION. IT COMPARES THE LOWER BYTE OF THE
                        TRAP INSTRUCTION WITH THE CONTENTS ON THE SWITCH
                        REGISTER, AND IF A MATCH IS FOUND TAKES THE CONTENTS
                        OF THE ADDRESS FOLLOWING THE TRAP INSTRUCTION AS THE
                        RETURN ADDRESS.

                        THE EXPECTED FORMAT IS:

                                        TRAP+N
                                        ADDR

                        WHERE ADDR IS THE ADDRESS TO PROCEED TO IF N MATCHES
                        THE SWITCH REGISTER SETTINGS. THE TRAP ARGUEMENT IS
                        RELATED TO THE SWITCH REGISTER SETTINGS THUS:

                        TRAP ARG                        SWR SETTING

                        2                               200
                        4                               400
                        10                              1000
                        20                              2000
                        30                              3000
                        40                              4000
                        50                              5000
                        60                              6000
                        70                              7000


                        THE SETTING OF SWR BIT 12, WILL FORCE THE TRAP
                        HANDLER TO USE THE SWR SETTINGS THAT WERE IN
                        FORCE WHEN THE LAST TRAP INSTRUCTION WAS EXECUTED.

                        IF A CNTRL-G IS OUTSTANDING ON THE CONSOLE TERMINAL
                        WHEN THE TRAP WAS EXECUTED, THEN MONIT IS CALLED. IF
                        CNTRL-O WAS OUTSTANDING THEN MODIFY IS CALLED



                        ENTRY POINT

                                TRAPSV


                        INPUT PARAMETERS:
```

```
                        ;               ON EXECUTION OF ANY TRAP INSTRUCTION
                        ;
                        ;
                        ;       IMPLICIT INPUT PARAMETERS:
                        ;
                        ;               THE SWR HAS BEEN SET UP
                        ;
                        ;       OUTPUT PARAMETERS:
                        ;
                        ;               EXIT TO THE CONTENTS OF THE ADDRESS FOLLOWING
                        ;       THE TRAP INSTRUCTION IF A MATCH WAS FOUND, ELSE THE
                        ;       PROGRAM WILL CONTINUE FROM THE ADDRESS AFTER THAT.
                        ;
                        ;       IMPLICIT OUTPUT PARAMETERS:
                        ;
                        ;               NONE
                        ;
                        ;       COMPLETION CODES:
                        ;
                        ;               NONE
                        ;
                        ;       POSSIBLE ERROR CODES:
                        ;
                        ;               NONE
                        ;
                        ;
013326  004737  013740          TRAPSV: JSR     PC,SAVREG       ;SAVE REGS
013332  011600                          MOV     (SP),R0
013334  016037  177776  007516          MOV     -2(R0),TRPARG   ;GET TRAP CALL
013342  105737  177560                  TSTB    TKS             ;LOOK FOR MONITOR CALL
013346  100015                          BPL     3$
013350  004737  014206                  JSR     PC,READ
013354  120027  000017                  CMPB    R0,#17          ;IS IT CNTRL-O ?
013360  001003                          BNE     1$              ;NO
013362  004737  015450                  JSR     PC,MODIFY       ;YES CALL MODIFIER ROUTINE
013366  000405                          BR      3$
013370  120027  000007          1$:     CMPB    R0,#7           ;IS IT CTRL-G?
013374  001002                          BNE     3$
013376  004737  013546                  JSR     PC,MONIT        ;YES, GO TO SWR MONITOR
013402  017737  174074  007520  3$:     MOV     @SWR,TRPSEL
013410  132737  000020  007521          BITB    #20,TRPSEL+1    ;IS IT PRESERVE SCOPE
013416  001012                          BNE     TRPSCP          ;YES
013420  013737  007520  007522          MOV     TRPSEL,TRPMEM   ;NO SO SAVE SWITCH SETTING
013426  042737  170777  007522          BIC     #170777,TRPMEM  ;GET IT SO WE CAN COMPARE
013434  132737  000016  007521          BITB    #16,TRPSEL+1    ;ANY SCOPE LEVELS SET
013442  001412                          BEQ     TRPLP           ;NO
013444  013700  007516          TRPSCP: MOV     TRPARG,R0       ;YES
013450  006000                          ROR     R0              ;GET TO POSITION FOR COMPARE
013452  006000                          ROR     R0              ;FOR 10 & ABOVE
013454  000300                          SWAB    R0              ;ONLY FOR SCOPE BITS(9-11)
```

```
3257  013456  042700  170777              BIC     #170777,R0      ;ARGUMENT SCOPE BITS
3258  013462  020037  007522              CMP     R0,TRPMEM       ;AS SELECTED ?
3259  013466  001422                      BEQ     TRPBAK          ;YES, GO BACK
3260  013470  013700  007520    TRPLP:    MOV     TRPSEL,R0       ;NO, TEST LOOP
3261  013474  006100                      ROL     R0              ;FOR BITS 7&8
3262  013476  006100                      ROL     R0
3263  013500  000300                      SWAB    R0
3264  013502  142700  000371              BICB    #371,R0         ;CUT OUT SW06
3265  013506  142737  000370  007516      BICB    #370,TRPARG     ;ONLY SWITCHES 7 OR 8 NOW
3266  013514  130037  007516              BITB    R0,TRPARG       ;ANY SELECTED ?
3267  013520  001005                      BNE     TRPBAK          ;YES
3268  013522  004737  013776              JSR     PC,RSTREG
3269  013526  062716  000002              ADD     #2.(SP)         ;NO SCOPE OR LOOP,SO RUN
3270  013532  000002                      RTI                     ;PAST ARGUMENT AND RETURN
3271  013534  004737  013776    TRPBAK:   JSR     PC,RSTREG       ;RESTORE REGS
3272  013540  017616  000000              MOV     @(SP),(SP)      ;RETURN ADDRESS TO STACK
3273  013544  000002                      RTI                     ;EXIT, LOOPING
```

```
3275                            .SBTTL  SWITCH REGISTER MONITOR
3276                    ;
3277                    ;
3278                    ;
3279                    ;       DESCRIPTION:
3280                    ;
3281                    ;       SWITCH REGISTER MONITOR.  CALLED BY AN ERROR
3282                    ;       WITH SWR BIT 15 CLEAR, OR BY TYPING CTRL-G
3283                    ;       ON THE CONSOLE TELETYPE.  IF USING HARDWARE
3284                    ;       SWR, SIMPLY ASKS FOR CTRL-C TO CONTINUE.
3285                    ;       OTHERWISE, IT PRINTS THE CURRENT
3286                    ;       CONTENTS OF THE SOFTWARE SWITCH REGISTER,
3287                    ;       FOLLOWED BY A PROMPT (>). THE NEW SWITCH
3288                    ;       REGISTER SETTINGS SHOULD THEN BE ENTERED AS
3289                    ;       AN OCTAL NUMBER, TERMINATED BY CARRIAGE RETURN.
3290                    ;       TYPING CARRIAGE RETURN ALONE WILL CAUSE THE
3291                    ;       SWITCH REGISTER CONTENTS TO REMAIN UNCHANGED.
3292                    ;       IF THE SWITCH REGISTER IS UPDATED TO SELECT
3293                    ;       A TEST (BIT 6 SET) THE NEW TEST WILL BE
3294                    ;       ENTERED IMMEDIATELY.
3295                    ;
3296                    ;       CALLING SEQUENCE:
3297                    ;
3298                    ;               JSR     PC,MONIT
3299                    ;
3300                    ;       INPUT PARAMETERS:
3301                    ;
3302                    ;               BY TYPING CNTRL-G DURING THE RUNNING
3303                    ;       OF THE TESTS.
3304                    ;
3305                    ;
3306                    ;       IMPLICIT INPUT PARAMETERS:
3307                    ;
3308                    ;               THE SOFTWARE SWITCH REGISTER, IF BEING USED
3309                    ;       MUST HAVE BEEN SET UP.
3310                    ;
3311                    ;
3312                    ;       OUTPUT PARAMETERS:
3313                    ;
3314                    ;               IF RUNNING UNDER SOFTWARE SWITCH REGISTER MODE
3315                    ;       A NEW SETTING OF THE SWR COULD HAVE BEEN SET UP.
3316                    ;
3317                    ;
3318                    ;       IMPLICIT OUTPUT PARAMETERS:
3319                    ;
3320                    ;               NONE
3321                    ;
3322                    ;
3323                    ;       COMPLETION CODES:
3324                    ;
3325                    ;               NONE
3326                    ;
3327                    ;
3328                    ;       POSSIBLE ERROR CODES:
3329                    ;
3330                    ;               NONE
```

```
                                        ;
                                        ;
                                        ;
3334  013546  010046                    MONIT:  MOV     R0,-(SP)        ;SAVE R0
3335  013550  023727  007502  177570            CMP     SWR,#HSWR       ;HARDWARE SWR?
3336  013556  001430                            BEQ     MONITA          ;IF YES, GO TO END
3337  013560  004737  014734                    JSR     PC,TYPOUT       ;SWR=
3338  013564  006623                            SWRMSG
3339  013566  013700  007504                    MOV     SSWR,R0
3340  013572  004737  015024                    JSR     PC,PROCT
3341  013576  012700  000076                    MOV     #76,R0
3342  013602  004737  015012                    JSR     PC,PCHR         ;PRINT '>''
3343  013606  004737  014034                    JSR     PC,OCTIN        ;GET NEW SETTING
3344  013612  005737  007532                    TST     RAND            ;ANY INPUT?
3345  013616  001413                            BEQ     MONITX
3346  013620  010037  007504                    MOV     R0,SSWR         ;YES UPDATE SSWR
3347  013624  032737  000100  007504            BIT     #100,SSWR       ;TEST SELECTED?
3348  013632  001405                            BEQ     MONITX
3349  013634  000137  001326                    JMP     START2          ;YES GO DO IT
3350  013640  004737  013656          MONITA:  JSR     PC,TYPCTC       ;CTRL-C TO CONTINUE
3351  013644  000775                            BR      MONITA
3352  013646  004737  014700          MONITX:  JSR     PC,CRLF
3353  013652  012600                            MOV     (SP)+,R0        ;RESTORE R0
3354  013654  000207                            RTS     PC
```

```
                        .SBTTL  WAIT FOR CNTRL-C


                        DESCRIPTION:

                                ROUTINE TO WAIT FOR THE USER TO TYPE
                        CNTRL-C ON THE CONSOLE. IF CNTRL-O IS HIT MODIFY
                        IS CALLED, AND IF CNTRL-G IS HIT MONIT IS CALLED.

                        IF NONE OF THESE ARE HIT, THE ROUTINE WILL RETURN
                        TO THE NEXT LOCATION AFTER THE CALL. IF CNTRL-C WAS
                        HIT THE ROUTINE WILL RETURN TO THE NEXT LOCATION+2.


                        CALLING SEQUENCE:

                                JSR     PC,TYPCTC

                        INPUT PARAMETERS:

                                NONE


                        IMPLICIT INPUT PARAMETERS:

                                INPUT IS REQUESTED FROM THE CONSOLE


                        OUTPUT PARAMETERS:

                                R0 IS CORRUPTED


                        IMPLICIT OUTPUT PARAMETERS:

                                NONE


                        COMPLETION CODES:

                                A RETURN TO THE FIRST OR SECOND LOCATION AFTER
                        THE CALL IS PERFORMED.


                        POSSIBLE ERROR CODES:

                                NONE


013656  004737  014734  TYPCTC: JSR     PC,TYPOUT       ;PRINTS TYPE CTRL/C WHEN READY
013662  006570                  REDMES
013664  004737  014206          JSR     PC,READ         ;CTRL/C ENTERED
013670  020027  000003          CMP     R0,#3
013674  001005                  BNE     QEXIT2          ;NO
```

```
3412  013676  004737  014700                  JSR     PC,CRLF
3413  013702  062716  000002                  ADD     #2,(SP)         ;YES SO JUMP OVER NO FIND RETURN
3414  013706  000207                  QEXIT1: RTS     PC              ;GO BACK
3415  013710  020027  000017          QEXIT2: CMP     R0,#17          ;CNTRL-O ?
3416  013714  001003                          BNE     QEXIT3          ;NO
3417  013716  004737  015450                  JSR     PC,MODIFY       ;YES CALL MODIFY PROGRAM
3418  013722  000755                          BR      TYPCTC          ;THEN GO BACK TO START
3419  013724  020027  000007          QEXIT3: CMP     R0,#7           ;CTRL-G?
3420  013730  001366                          BNE     QEXIT1
3421  013732  004737  013546                  JSR     PC,MONIT        ;GO TO SWR MONITOR
3422  013736  000747                          BR      TYPCTC          ;LOOK FOR CTRL-C AGAIN
3423
3424
```

```
                        .SBTTL  SAVE REGISTERS
                ;
                ;
                ;       DESCRIPTION:
                ;
                ;               ROUTINE TO SAVE ALL THE GENERAL PURPOSE
                ;       REGISTERS ON THE STACK, AND LEAVE THE ADDRESS OF THE
                ;       CALLING ROUTINE ON THE STACK. THE ROUTINE WILL RUN AT
                ;       PRIORITY 7 TO AVOID ANY INTERRUPTS
                ;
                ;       CALLING SEQUENCE:
                ;
                ;               JSR     PC,SAVREG
                ;
                ;       INPUT PARAMETERS:
                ;
                ;               NONE
                ;
                ;       IMPLICIT INPUT PARAMETERS:
                ;
                ;               NONE
                ;
                ;       OUTPUT PARAMETERS:
                ;
                ;               REGISTERS 0 THRU 5 ARE SAVED ON THE STACK
                ;       AND THE RETURN ADDRESS OF THE CALLING ROUTINE IS
                ;       SET AS THE LAST ENTRY ON THE STACK
                ;
                ;
                ;       IMPLICIT OUTPUT PARAMETERS:
                ;
                ;               NONE
                ;
                ;       COMPLETION CODES:
                ;
                ;               NONE
                ;
                ;       POSSIBLE ERROR CODES:
                ;
                ;               NONE
                ;
013740  012637  007524  SAVREG: MOV     (SP)+,SAVPC     ;SAVE PC FOR RETURN FROM THIS ROUTINE
013744  012637  007526          MOV     (SP)+,SAVPC1
013750  010546                  MOV     R5,-(SP)
013752  010446                  MOV     R4,-(SP)
013754  010346                  MOV     R3,-(SP)
```

```
3482  013756  010246                    MOV     R2,-(SP)
3483  013760  010146                    MOV     R1,-(SP)
3484  013762  010046                    MOV     R0,-(SP)
3485  013764  013746  007526            MOV     SAVPC,-(SP)
3486  013770  013746  007524            MOV     SAVPC,-(SP)     ;PUT PC READY FOR
3487  013774  000207                    RTS     PC              ;RETURN
3488
3489
3490
```

```
3492                                    .SBTTL  RESTORE REGISTERS
3493                                    ;
3494                                    ;
3495                                    ;
3496                                    ;       DESCRIPTION:
3497                                    ;
3498                                    ;               RESTORE TO RESTORE THE GENERAL PURPOSE
3499                                    ;       REGISTERS. THE STACK IS LEFT IN THE SAME STATE AS IT
3500                                    ;       WAS WHEN SAVREG WAS CALLED.
3501                                    ;
3502                                    ;       CALLING SEQUENCE:
3503                                    ;
3504                                    ;               JSR     PC,RSTREG
3505                                    ;
3506                                    ;
3507                                    ;       INPUT PARAMETERS:
3508                                    ;
3509                                    ;               NONE
3510                                    ;
3511                                    ;
3512                                    ;       IMPLICIT INPUT PARAMETERS:
3513                                    ;
3514                                    ;               NONE
3515                                    ;
3516                                    ;
3517                                    ;       OUTPUT PARAMETERS:
3518                                    ;
3519                                    ;               R0 THRU R5 RESTORED
3520                                    ;
3521                                    ;
3522                                    ;       IMPLICIT OUTPUT PARAMETERS:
3523                                    ;
3524                                    ;               NONE
3525                                    ;
3526                                    ;
3527                                    ;       COMPLETION CODES:
3528                                    ;
3529                                    ;               NONE
3530                                    ;
3531                                    ;
3532                                    ;       POSSIBLE ERROR CODES:
3533                                    ;
3534                                    ;               NONE
3535                                    ;
3536                                    ;
3537                                    ;
3538  013776  012637  007524   RSTREG: MOV     (SP)+,SAVPC
3539  014002  012637  007526           MOV     (SP)+,SAVPC1
3540  014006  012600                   MOV     (SP)+,R0
3541  014010  012601                   MOV     (SP)+,R1
3542  014012  012602                   MOV     (SP)+,R2
3543  014014  012603                   MOV     (SP)+,R3
3544  014016  012604                   MOV     (SP)+,R4
3545  014020  012605                   MOV     (SP)+,R5
3546  014022  013746  007526           MOV     SAVPC1,-(SP)
3547  014026  013746  007524           MOV     SAVPC,-(SP)     ;PUT PC READY FOR
```

```
                                                                    K 7
  3548  014032  000207                        RTS     PC              ;RETURN
```

```
3550                            .SBTTL  ENTER AN OCTAL NUMBER
3551                    ;
3552                    ;
3553                    ;
3554                    ;       DESCRIPTION:
3555                    ;
3556                    ;               ROUTINE TO ENTER AN OCTAL NUMBER ON THE CONSOLE.
3557                    ;       THE NUMBER ENTERED IS RETURNED IN R0, AND THE VALUE RAND
3558                    ;       IS SET TO NON ZERO IF ANY CHARACTERS WERE ENTERED.
3559                    ;       TYPING CARRIAGE RETURN, LINE FEED OR ESCAPE WILL
3560                    ;       TERMINATE THE LINE BEING ENTERED.
3561                    ;       RUBOUT WILL DELETE THE LAST CHARACTER ENTERED,
3562                    ;       CNTRL-U WILL RUBOUT THE WHOLE LINE, AND CNTRL-R
3563                    ;       WILL TYPE OUT THE CHARACTERS SO FAR ENTERED.
3564                    ;       RAND WILL BE SET TO NON ZERO IF ANY CHARACTERS
3565                    ;       WERE HIT AND RANDC WILL CONTAIN THE TERMINATING
3566                    ;       CHARACTER.
3567                    ;
3568                    ;       A '!' WILL BE PRINTED IF AN OVERFLOW CONDITION IS
3569                    ;       DETECTED AND A '?' IF AN INVALID CHARACTER WAS
3570                    ;       ENTERED.
3571                    ;
3572                    ;
3573                    ;       CALLING SEQUENCE:
3574                    ;
3575                    ;               JSR     PC,OCTIN
3576                    ;
3577                    ;       INPUT PARAMETERS:
3578                    ;
3579                    ;               NONE
3580                    ;
3581                    ;
3582                    ;       IMPLICIT INPUT PARAMETERS:
3583                    ;
3584                    ;               NONE
3585                    ;
3586                    ;
3587                    ;       OUTPUT PARAMETERS:
3588                    ;
3589                    ;               R0 CONTAINS THE NUMBER ENTERED.
3590                    ;               RAND=0 IF NO CHARACTERS WERE ENTERED.
3591                    ;
3592                    ;
3593                    ;       IMPLICIT OUTPUT PARAMETERS:
3594                    ;
3595                    ;               NONE
3596                    ;
3597                    ;
3598                    ;       COMPLETION CODES:
3599                    ;
3600                    ;               NONE
3601                    ;
3602                    ;
3603                    ;       POSSIBLE ERROR CODES:
3604                    ;
3605                    ;               NONE
```

```
                                        ;
                                        ;
                                        ;
3609  014034  004737  013740            OCTIN:  JSR     PC,SAVREG       ;SAVE THE REGISTERS
3610  014040  005000                    TYPOTB: CLR     R0              ;CLEAR R0
3611  014042  005037  007532                    CLR     RAND            ;CLEAR FLAG WORD
3612  014046  012737  007256  007604            MOV     #OCTMSG,STRADD  ; SET START ADDRESS OF STRING
3613  014054  012737  000006  007606            MOV     #6,STRLEN       ; AND ITS SIZE
3614  014062  012737  000060  007610            MOV     #60,LOWCHR      ; MINIMUM CHAR
3615  014070  012737  000067  007612            MOV     #67,UPPCHR      ; MAXIMUM CHAR
3616  014076  005037  007602                    CLR     CNVFLG          ; DON'T CONVERT TO UPPER CASE
3617  014102  004737  014232                    JSR     PC,GETSTR       ; GET A STRING
3618  014106  013701  007606                    MOV     STRLEN,R1       ; ZERO LENGTH ?
3619  014112  001420                            BEQ     TYPOTD          ; YES
3620  014114  012702  007256                    MOV     #OCTMSG,R2      ; NO GET START ADDRES OF STRING
3621  014120  112203                    TYPOTC: MOVB    (R2)+,R3        ; GET A CHARACTER
3622  014122  162703  000060                    SUB     #60,R3          ; PUT IN RANGE
3623  014126  000241                            CLC
3624  014130  006300                            ASL     R0              ; SHIFT OUT RESULT
3625  014132  103417                            BCS     TYPOTE          ; C BIT SET ERROR
3626  014134  006300                            ASL     R0              ; TIMES 4
3627  014136  103415                            BCS     TYPOTE          ; C BIT ERROR
3628  014140  006300                            ASL     R0              ; TIMES 8
3629  014142  050300                            BIS     R3,R0           ; SET NEW BITS IN
3630  014144  005237  007532                    INC     RAND            ; SET GOOD
3631  014150  005301                            DEC     R1
3632  014152  001362                            BNE     TYPOTC          ; LOOP IF MORE TO COME
3633  014154  010037  007530            TYPOTD: MOV     R0,TYPOTA       ; SAVE FINAL NUMBER
3634  014160  004737  013776                    JSR     PC,RSTREG       ; RESTORE REGISTERS
3635  014164  013700  007530                    MOV     TYPOTA,R0       ; GET RESULT
3636  014170  000207                            RTS     PC
3637  014172  012700  000041            TYPOTE: MOV     #41,R0          ; OVERFLOW
3638  014176  004737  015012                    JSR     PC,PCHR         ; PRINT A !
3639  014202  000137  014040                    JMP     TYPOTB          ; THEN GO AGAIN
3640                                    ;
```

```
                        .SBTTL  READ A SINGLE CHARACTER
                ;
                ;
                ;       DESCRIPTION:
                ;
                ;               ROUTINE TO READ A SINGLE CHARACTER
                ;       FROM THE CONSOLE. THE CHARACTER IS RETURN IN R0
                ;       AND HAS THE 200 BIT STRIPPED OFF.
                ;
                ;       CALLING SEQUENCE:
                ;
                ;               JSR     PC,READ
                ;
                ;       INPUT PARAMETERS:
                ;
                ;               NONE
                ;
                ;
                ;       IMPLICIT INPUT PARAMETERS:
                ;
                ;               NONE
                ;
                ;
                ;       OUTPUT PARAMETERS:
                ;
                ;               R0 CONTAINS THE CHARACTER READ IN.
                ;
                ;
                ;       IMPLICIT OUTPUT PARAMETERS:
                ;
                ;               THE CHARACTER IS ECHOED ON THE TERMINAL
                ;
                ;
                ;       COMPLETION CODES:
                ;
                ;               NONE
                ;
                ;
                ;       POSSIBLE ERROR CODES:
                ;
                ;               NONE
                ;
                ;
                ;
014206  105737  177560 READ:   TSTB    TKS
014212  100375          BPL     READ
014214  013700  177562          MOV     TKB,R0
014220  042700  177600          BIC     #177600,R0
014224  004737  015012          JSR     PC,PCHR
014230  000207                  RTS     PC
```

```
                        .SBTTL  ENTERING A CHARACTER STRING


;
; DESCRIPTION:
;
;       ROUTINE TO ENTER A STRING OF CHARACTERS ON
;       THE CONSOLE TERMINAL. VARIOUS CONTROL CODES
;       ARE USED TO CONTROL HOW THE CHARACTERS ARE
;       INTERPTETED:
;
;       ESCAPE, CARRIAGE RETURN AND LINE FEED ARE USED
;       TO TERMINATE THE STRING. RUBOUT WILL DELETE THE
;       LAST CHARACTER ENTERED, CNTRL-U WILL DELETE THE
;       ALL THE CHARACTERS ENTERED, AND CNTRL-R WILL ECHO
;       THOSE CHARACTERS ALREADY ENTERED.
;
;       ON ENTRY THE FOLLOWING POINTERS ARE USED:
;       STRADD TO INDICATE THE START OF THE CHARACTER STRING
;       STRLEN TO INDICATE ITS SIZE
;       CVNFLG SET TO CONVERT LOWER CASE TO UPPER CASE
;       UPPCHR TO INDICATE THE HIGHEST CHARACTER CODE
;       LOWCHR TO INDICATE THE LOWEST CHARACTER CODE
;
;       ON EXIT THE  LOCATION STRLEN WILL INDICATE THE
;       NUMBER OF CHARACTERS ENTERED AND RANDC WILL CONTAIN
;       THE TERMINATING CHARACTER
;
;       IF AN INVALID CHARACTER WAS HIT A '?' IS PRINTED
;
; CALLING SEQUENCE:
;
;       JSR     PC,GETSTR
;
; INPUT PARAMETERS:
;
;       STRADD THE START ADDRESS OF THE STRING
;       STRLEN THE NUMBER OF CHARACTERS TO READ
;       UPPCHR THE HIGHEST CHARACTER CODE ALLOWED
;       LOWCHR THE LOWEST CHARACTER CODE ALLOWED
;       CNVFLG TO INDICATE LOWER TO UPPER CASE CONVERSION
;
;
; IMPLICIT INPUT PARAMETERS:
;
;       NONE
;
; OUTPUT PARAMETERS:
;
;       STRLEN THE NUMBERS OF CHARACTERS READ
;       RANDC THE TERMINATING CHARACTER
;
```

```
                        ;
                        ; IMPLICIT OUTPUT PARAMETERS:
                        ;
                        ;       NONE
                        ;
                        ;
                        ; COMPELETION CODES:
                        ;
                        ;       NONE
                        ;
                        ;
                        ; POSSIBLE ERROR CONDITIONS:
                        ;
                        ;       A '?' IS PRINTED IF AN INVALID CHARACTER IS ENTERED
                        ;
                        ;
                        ;
                        ;
                        ;
                        ;
014232  004737  015740  GETSTR: JSR     PC,SAVREG       ;SAVE REGISTERS
014236  005037  007614  GETCH1: CLR     RUBFLG          ; CLEAR RUBOUT FLAG
014242  013702  007604          MOV     STRADD,R2       ; GET STARTING POINTER
014246  005001                  CLR     R1              ; SET INTITAL LENGTH
014250  105737  177560  GETCH2: TSTB    TKS             ; ANY TTY INPUT
014254  100375                  BPL     GETCH2          ; NO WAIT FOR IT
014256  013700  177562          MOV     TKB,R0          ; GET CHARACTER
014262  042700  177600          BIC     #177600,R0      ; CLEAR RUBBISH
                        ;
                        ; CHECK FOR CONTROL CODES
                        ;
014266  020027  000015          CMP     R0,#15          ; WAS IT <CR> ?
014272  001002                  BNE     1$              ; NO
014274  000137  014656          JMP     CHRFIN
014300  020027  000012  1$:     CMP     R0,#12          ; WAS IT <LF>
014304  001002                  BNE     3$              ; NO
014306  000137  014656          JMP     CHRFIN
014312  020027  000033  3$:     CMP     R0,#33          ; WAS IT <ESC>
014316  001002                  BNE     5$              ; NO
014320  000137  014656          JMP     CHRFIN
014324  020027  000177  5$:     CMP     R0,#177         ; RUBOUT ?
014330  001002                  BNE     7$              ; NO
014332  000137  014504          JMP     RUBCHR          ; YES
014336  020027  000022  7$:     CMP     R0,#22          ; CNTRL-R
014342  001002                  BNE     9$              ; NO
014344  000137  014602          JMP     LINECH          ; YES EXCO LINE
014350  020027  000025  9$:     CMP     R0,#25          ; CNTRL-U
014354  001002                  BNE     GETCH3          ; NO
014356  000137  014552          JMP     LINDEL          ; YES DELETE LINE
                        ;
                        ; IT WAS NOT A CONTROL CODE CHECK
                        ; FOR LEGALITY ?
                        ;
                        ;
014362  020027  000140  GETCH3: CMP     R0,#140         ; IS IT LOWER CASE
014366  002405                  BLT     3$              ; NO
```

```
3807  014370  005737  007602          TST     CNVFLG          ; YES DO WE CONVERT TO UPPER
3808  014374  001402                  BEQ     3$              ; NO
3809  014376  042700  000040          BIC     #40,R0          ; YES STRIP 40 OFF
3810  014402  020037  007610  3$:     CMP     R0,LOWCHR       ; IS THE CHAR TOO SMALL
3811  014406  002002                  BGE     5$              ; NO
3812  014410  000137  014636          JMP     ILLCHR          ; YES
3813  014414  020037  007612  5$:     CMP     R0,UPPCHR       ; IS THE CHAR TOO BIG ?
3814  014420  003402                  BLE     GETCH4          ; NO
3815  014422  000137  014636          JMP     ILLCHR          ; YES ITS ILLEGAL
3816                                  ;
3817                                  ; WE HAVE A LEGAL CHARACTER
3818                                  ;
3819  014426  010003          GETCH4: MOV     R0,R3           ; SAVE CHAR
3820  014430  005737  007614          TST     RUBFLG          ; IS RUBOUT SET
3821  014434  001406                  BEQ     3$              ; NO
3822  014436  012700  000057          MOV     #57,R0          ; YES PRINT A '/'
3823  014442  004737  015012          JSR     PC,PCHR
3824  014446  005037  007614          CLR     RUBFLG          ; CLEAR RUBOUT FLAG
3825  014452  005201          3$:     INC     R1              ; UPDATE CHAR COUNT
3826  014454  020137  007606          CMP     R1,STRLEN       ; END OF STRING SEEN
3827  014460  003403                  BLE     5$              ; NO
3828  014462  005000                  CLR     R0              ; YES, FORCE A NULL TERMINATOR
3829  014464  000137  014656          JMP     CHRFIN          ; AND COMPLETE
3830  014470  010300          5$:     MOV     R3,R0           ; RESTORE CHAR
3831  014472  004737  015012          JSR     PC,PCHR         ; ECHO IT
3832  014476  110022                  MOVB    R0,(R2)+        ; SAVE IT IN BUFFER
3833  014500  000137  014250          JMP     GETCH2          ; NO GET NEXT ONE
3834                                  ;
3835                                  ; RUBOUT WAS HIT
3836                                  ;
3837  014504  005701          RUBCHR: TST     R1              ; ANY CHARACTERS TO RUBOUT
3838  014506  001002                  BNE     3$              ; YES
3839  014510  000137  014572          JMP     LINDL1          ; NO
3840  014514  005737  007614  3$:     TST     RUBFLG          ; IS RUBOUT SET ALREADY ?
3841  014520  001006                  BNE     5$              ; YES
3842  014522  012700  000057          MOV     #57,R0          ; NO PRINT A '/'
3843  014526  004737  015012          JSR     PC,PCHR
3844  014532  005237  007614          INC     RUBFLG          ; SET RUBOUT
3845  014536  114200          5$:     MOVB    -(R2),R0        ; GET LAST CHAR ENTERED
3846  014540  004737  015012          JSR     PC,PCHR         ; PRINT IT
3847  014544  005301                  DEC     R1              ; REDUCE COUNT
3848  014546  000137  014250          JMP     GETCH2          ; GET ANOTHER CHAR
3849                                  ;
3850                                  ; RUBOUT LINE WAS HIT
3851                                  ;
3852  014552  012700  000136  LINDEL: MOV     #136,R0         ; PRINT A ^
3853  014556  004737  015012          JSR     PC,PCHR
3854  014562  012700  000125          MOV     #125,R0         ; THEN U
3855  014566  004737  015012          JSR     PC,PCHR
3856  014572  004737  014700  LINDL1: JSR     PC,CRLF         ; START ON A NEWLINE
3857  014576  000137  014236          JMP     GETCH1          ; A GO BACK TO BEGINNING
3858                                  ;
3859                                  ; CNTRL-R WAS HIT
3860                                  ;
3861  014602  112712  000100  LINECH: MOVB    #'@,(R2)        ; PUT IN A TERMINATOR
3862  014606  004737  014700          JSR     PC,CRLF         ; START ON A NEW LINE
```

```
 3863  014612  013737  007604  014630          MOV     STRADD,3$       ; SET START ADDRESS
 3864  014620  005037  007614                  CLR     RUBFLG          ; CLEAR RUBOUTS
 3865  014624  004737  01473'                  JSR     PC,TYPOUT       ; PRINT LINE
 3866  014630  000000                  3$:     0
 3867  014632  000137  014250                  JMP     GETCH2          ; AND GET ANOTHER CHAR
 3868                                  ;
 3869                                  ; ILLEGAL CHARACTER ENTERED
 3870                                  ;
 3871  014636  004737  015012          ILLCHR: JSR     PC,PCHR         ; ECHO IT
 3872  014642  012700  000077                  MOV     #'?,R0          ; PRINT A ?
 3873  014646  004737  015012                  JSR     PC,PCHR
 3874  014652  000137  014602                  JMP     LINECH          ; THE ECHO LINE
 3875                                  ;
 3876                                  ; A TERMINATOR WAS FOUND
 3877                                  ;
 3878  014656  010037  007616          CHRFIN: MOV     R0,RANDC        ; SAVE TERMINATOR
 3879  014662  163702  007604                  SUB     STRADD,R2       ; CALCULATE BYTE COUNT
 3880  014666  010237  007606                  MOV     R2,STRLEN       ; SET IT FOR RETURN
 3881  014672  004737  013776                  JSR     PC,RSTREG       ; RESTORE REGISTERS
 3882  014676  000207                          RTS     PC              ; AND EXIT
```

```
                        .SBTTL  CARRIAGE RETURN LINE FEED
                ;
                ;
                ;       DESCRIPTION:
                ;
                ;               ROUTINE TO DO A <CR> <LF> ON THE
                ;       CONSOLE TERMINAL
                ;
                ;       CALLING SEQUENCE:
                ;
                ;               JSR     PC,CRLF
                ;       INPUT PARAMETERS:
                ;
                ;               NONE
                ;
                ;       IMPLICIT INPUT PARAMETERS:
                ;
                ;               NONE
                ;
                ;       OUTPUT PARAMETERS:
                ;
                ;               NONE
                ;
                ;       IMPLICIT OUTPUT PARAMETERS:
                ;
                ;               THE CARRIAGE WILL BE PLACED ON A NEW LINE
                ;
                ;       COMPLETION CODES:
                ;
                ;               NONE
                ;
                ;       POSSIBLE ERROR CODES:
                ;
                ;               NONE
                ;
                ;
                ;
014700  010046          CRLF:   MOV     R0,-(SP)
014702  012700  000015          MOV     #15,R0          ;PRINT A RETURN - LINE FEED
014706  004737  015012          JSR     PC,PCHR
014712  005000                  CLR     R0              ;DUMMY
014714  004737  015012          JSR     PC,PCHR
014720  012700  000012          MOV     #12,R0
014724  004737  015012          JSR     PC,PCHR
014730  012600                  MOV     (SP)+,R0
014732  000207                  RTS     PC
                ;
```

```
3940
```

```
                        .SBTTL  PRINT AN ASCII MESSAGE
;
;
;       DESCRIPTION:
;
;               ROUTINE TO PRINT A STRING OF ASCII
;       CHARACTERS ON THE CONSOLE TERMINAL. CERTAIN
;       CHARACTERS WITHIN THE STRING ARE INTERPRETED
;       AS CONTROL CODES, THESE ARE:
;
;       133 ([)         WILL GENERATE A <CR>,<LF>
;       100 (@)         WILL SIGNIFY END OF MESSAGE
;
;       THE ADDRESS OF THE MESSAGE STRING TO BE PRINTED
;       WILL BE HELD IN THE LOCATION FOLLOWING THE CALL
;       TO THE ROUTINE, IE:
;
;               JSR     PC,TYPOUT
;               ADDR
;
;
;       CALLING SEQUENCE:
;
;               JSR     PC,TYPOUT
;
;       INPUT PARAMETERS:
;
;               THE ADDRESS OF THE MESSAGE STRING FOLLOWS
;       THE SUBROUTINE CALL.
;
;       IMPLICIT INPUT PARAMETERS:
;
;               NONE
;
;       OUTPUT PARAMETERS:
;
;               NONE
;
;       IMPLICIT OUTPUT PARAMETERS:
;
;               THE SPECIFIED MESSAGE WILL BE PRINTED
;
;       COMPLETION CODES:
;
;               NONE
;
;       POSSIBLE ERROR CODES:
;
;               NONE
```

```
 3998                                   ;
 3999                                   ;
 4000                                   ;
 4001  014734  004737  013740  TYPOUT: JSR     PC,SAVREG       ;SAVE REGS
 4002  014740  017601  000000          MOV     @(SP),R1        ;R1 POINTS AT STRING
 4003  014744  062716  000002          ADD     #2,(SP)         ;JUMPS OVER ARGUMENT
 4004  014750  111100          PMSG1:  MOVB    @R1,R0          ;PRINT THE MESSAGE POINTED
 4005  014752  022700  000100          CMP     #100,R0         ;TO BY R1 UNTIL @, WHICH IS END.
 4006  014756  001412                  BEQ     PMSG4           ;[ MEANS CR-LF
 4007  014760  022700  000133          CMP     #133,R0
 4008  014764  001003                  BNE     PMSG2
 4009  014766  004737  014700          JSR     PC,CRLF
 4010  014772  000402                  BR      PMSG3
 4011  014774  004737  015012  PMSG2:  JSR     PC,PCHR
 4012  015000  005201  PMSG3:  INC     R1
 4013  015002  000762                  BR      PMSG1
 4014  015004  004737  013776  PMSG4:  JSR     PC,RSTREG       ;RESTORE REGS
 4015  015010  000207                  RTS     PC
```

```
                        .SBTTL  PRINT A CHARACTER
                ;
                ;
                ;       DESCRIPTION:
                ;
                ;               ROUTINE TO PRINT A CHARACTER ON THE
                ;       CONSOLE. R0 CONTAINS THE CHARACTER TO BE PRINTED
                ;
                ;       CALLING SEQUENCE:
                ;
                ;               JSR     PC,PCHR
                ;       INPUT PARAMETERS:
                ;
                ;               R0 CONTAINS THE CHARACTER TO BE PRINTED
                ;
                ;       IMPLICIT INPUT PARAMETERS:
                ;
                ;               NONE
                ;
                ;       OUTPUT PARAMETERS:
                ;
                ;               NONE
                ;
                ;       IMPLICIT OUTPUT PARAMETERS:
                ;
                ;               THE CHARACTER SELECTED WILL BE PRINTED
                ;
                ;       COMPLETION CODES:
                ;
                ;               NONE
                ;
                ;       POSSIBLE ERROR CODES:
                ;
                ;               NONE
                ;
                ;
015012 004737 013276    PCHR:   JSR     PC,TPREDY       ;PRINTER READY
015016 010037 177566            MOV     R0,TPB
015022 000207                   RTS     PC
```

```
                        .SBTTL  PRINT AN OCTAL NUMBER


                        DESCRIPTION:

                                ROUTINE TO PRINT AN OCTAL NUMBER ON
                        THE CONSOLE TERMINAL. R0 CONTAINS THE BINARY
                        REPRESENTATION ON THE NUMBER THAT IS TO BE
                        PRINTED.

                        CALLING SEQUENCE:

                                JSR     PC,PROCT

                        INPUT PARAMETERS:

                                R0 CONTAINS THE NUMBER THAT IS TO BE
                        PRINTED


                        IMPLICIT INPUT PARAMETERS:
                                NONE


                        OUTPUT PARAMETERS:

                                NONE

                        IMPLICIT OUTPUT PARAMETERS:

                                THE NUMBER SPECIFIED WILL BE PRINTED

                        COMPLETION CODES:

                                NONE

                        POSSIBLE ERROR CODES:

                                NONE


015024  004737  013740  PROCT:  JSR     PC,SAVREG       ;SAVE REGS
015030  012701  007230          MOV     #OCTNUM,R1      ;POINTER TO MESSAGE
015034  112721  000040  PROCT1: MOVB    #40,(R1)+       ;FILL WITH SPACES
015040  020127  007236          CMP     R1,#OCTNUM+6    ;ALL DONE
015044  001373                  BNE     PROCT1          ;NO
015046  000241          PRCT1A: CLC                     ;CLEAR AT START
015050  010002          PROCT2: MOV     R0,R2   ;SAVE CHARA
015052  042702  177770          BIC     #177770,R2      ;CLEAR ALL BUT BOTTOM 3 BITS
015056  062702  000060          ADD     #60,R2          ;NOW ASCII
```

```
 4122  015062  110241                        MOVB    R2,-(R1)        ;STORE IT IN MESSAGE
 4123  015064  042700  000007                BIC     #7,R0           ;NOW CLEAR BOTTOM 3 BITS
 4124  015070  001404                        BEQ     PROCT3          ;ALL DONE
 4125  015072  006000                        ROR     R0              ;ROTATE NEXT 3 BITS
 4126  015074  006000                        ROR     R0
 4127  015076  006000                        ROR     R0
 4128  015100  000763                        BR      PROCT2          ;GO DO NEXT
 4129  015102  004737  014734        PROCT3: JSR     PC,TYPOUT       ;TYPE MESSAGE
 4130  015106  007230                        OCTNUM                  ;MESSAGE ADD.
 4131  015110  004737  013776                JSR     PC,RSTREG               ;RESTORE REGS
 4132  015114  000207                        RTS     PC
 4133                                        ;
 4134                                        ;
 4135                                        ;ROUTINE TO PRINT LEAST SIG.9 BITS OF R0
 4136
 4137
 4138  015116  004737  013740        PRNT3:  JSR     PC,SAVREG
 4139  015122  042700  177000                BIC     #177000,R0      ;CLEAR UNWANTER
 4140  015126  012737  002040  007230        MOV     #2040,OCTNUM    ;SET UP MESSAGE
 4141  015134  012737  040040  007232        MOV     #40040,OCTNUM+2 ;WITH END CODE
 4142  015142  012701  007233                MOV     #OCTNUM+3,R1    ;& POINTER
 4143  015146  000737                        BR      PRCT1A          ;JUMP INTO MAIN ROUTINE
 4144                                                                ;WITH POINTERS SET UP
```

```
                        .SBTTL  ENTER A DECIMAL NUMBER


;
;
;       DESCRIPTION:
;
;               ROUTINE TO ENTER A DECIMAL NUMBER ON
;       THE CONSOLE TERMINAL. R0 WILL CONTAIN THE NUMBER
;       ENTERED AS A BINARY VALUE. RAND WILL BE NON ZERO
;       IF ANY CHARACTERS WERE READ IN. THE INCOMING STRING
;       CAN BE TERMINATED BY <CR>, <LF> OR <ESC>.
;       TYPING CNTRL-U WILL DELETE ALL CHARACTERS ENTERED,
;       CNTRL-R WILL ECHO THE CHARACTERS ENTERED AND RUBOUT
;       WILL DELETE THE LAST CHARACTER ENTERED
;
;       CALLING SEQUENCE:
;
;               JSR     PC,TYPDEC
;
;       INPUT PARAMETERS:
;
;               NONE
;
;       IMPLICIT INPUT PARAMETERS:
;
;               NONE
;
;       OUTPUT PARAMETERS:
;
;               R0 CONTAINS THE BINARY REPRESENTATION
;       OF THE DECIMAL NUMBER ENTERED, AND RAND WILL
;       INDICATE WHETHER ANY CHARACTERS HAVE BEEN ENTERED.
;
;       IMPLICIT OUTPUT PARAMETERS:
;
;               NONE
;
;       COMPLETION CODES:
;
;               NONE
;
;       POSSIBLE ERROR CODES:
;
;               NONE
;
;
015150  004737  013740  TYPDEC: JSR     PC,SAVREG       ;SAVE REGISTERS
015154  005000          TPDEC1: CLR     R0
015156  005037  007532          CLR     RAND            ;CLEAR INDICATOR
```

```
4202  015162  012737  007250  007604          MOV     #DECMSG,STRADD  ; SET START ADDRESS
4203  015170  012737  000005  007606          MOV     #5,STRLEN       ; ONLY 5 CHARS
4204  015176  012737  000060  007610          MOV     #60,LOWCHR      ; MINIMUM CHAR
4205  015204  012737  000071  007612          MOV     #71,UPPCHR      ; MAXIMUM CHAR
4206  015212  005037  007602                  CLR     CNVFLG          ; DON'T CONVERT TO UPPER
4207  015216  004737  014232                  JSR     PC,GETSTR       ; GET A STRING
4208  015222  013704  007606                  MOV     STRLEN,R4       ; GET LENGHT READ IN
4209  015226  001433                          BEQ     TPDEC5          ; ZERO MEANS COMLPETE
4210  015230  012702  007250                  MOV     #DECMSG,R2      ; POINT TO STRING
4211  015234  112201                  TPDEC2: MOVB    (R2)+,R1        ; GET A CHARACTER
4212  015236  000241                          CLC
4213  015240  006300                          ASL     R0              ; RESULT TIMES 2
4214  015242  103413                          BCS     TPDEC3          ; C BIT SET MEANS ERROR
4215  015244  010003                          MOV     R0,R3           ; ASVE IT
4216  015246  006300                          ASL     R0              ; TIMES 4
4217  015250  103410                          BCS     TPDEC3          ; C BIT MEANS ERROR
4218  015252  006300                          ASL     R0              ; TIMES 8
4219  015254  103406                          BCS     TPDEC3          ; C BIT MEANS OVERFLOW
4220  015256  060300                          ADD     R3,R0           ; ADD IN TO BE TIMES 12
4221  015260  103404                          BCS     TPDEC3          ; C BIT MEANS ERROR
4222  015262  042701  177760                  BIC     #177760,R1      ; CLEAR UNWANTED BITS
4223  015266  060100                          ADD     R1,R0           ; ADD IN NEW VALUE
4224  015270  103006                          BCC     TPDEC4          ; C BIT
4225  015272  012700  000041          TPDEC3: MOV     #41,R0          ; OVERFLOW PRINT A !
4226  015276  004737  015012                  JSR     PC,PCHR
4227  015302  000137  015154                  JMP     TPDEC1          ; AND GO BAK TO START
4228  015306  005237  007532          TPDEC4: INC     RAND            ; SET CHAR SEEN
4229  015312  005304                          DEC     R4              ; REDUCE COUNT
4230  015314  001347                          BNE     TPDEC2          ; NON ZERO MEANS MORE
4231  015316  010037  007534          TPDEC5: MOV     R0,TYPD1        ; ALL DONE SAVE RESULT
4232  015322  004737  013776                  JSR     PC,RSTREG       ; RESTORE REGISTERS
4233  015326  013700  007534                  MOV     TYPD1,R0        ; RESTORE RESULT
4234  015332  000207                          RTS     PC              ; AND EXIT
4235                                  ;
```

```
                                        .SBTTL  PRINT A DECIMAL NUMBER
                                ;
                                ;
                                ;       DESCRIPTION:
                                ;               ROUTINE TO PRINT A SIGNED OR UNSIGNED
                                ;       DECIMAL NUMBER ON THE CONSOLE. R0 HOLDS THE
                                ;       NUMBER TO BE PRINTED.
                                ;
                                ;       CALLING SEQUENCE:
                                ;               JSR     PC,BASE10       ; FOR UNSIGNED
                                ;               JSR     PC,BASM10       ; FOR SIGNED
                                ;
                                ;       INPUT PARAMETERS:
                                ;               R0 HOLDS THE NUMBER TO BE PRINTED
                                ;
                                ;       IMPLICIT INPUT PARAMETERS:
                                ;               NONE.
                                ;
                                ;       OUTPUT PARAMETERS:
                                ;               NONE
                                ;
                                ;       IMPLICIT OUTPUT PARAMETERS:
                                ;               THE NUMBER IN R0 IS PRINTED.
                                ;
                                ;       COMPLETION CODES:
                                ;               NONE
                                ;
                                ;       POSSIBLE ERROR CODES:
                                ;               NONE
                                ;
                                ;
015334  005700                  BASM10: TST     R0              ; GET SIGN OF R0
015336  100005                          BPL     BASE10          ; POSITIVE..
015340  005400                          NEG     R0              ; IF MINUS,MAKE POSITIVE..
015342  112737  000055  007240          MOVB    #55,BASE11      ; AND PRINT '-'
015350  000403                          BR      BAS10A          ; THEN CONTINUE..
                                ;
015352  112737  000040  007240  BASE10: MOVB    #' ,BASE11      ; PRINT LEADING SPACE
                                ;
015360  004737  013740          BAS10A: JSR     PC,SAVREG       ; NOW SAVE OLD REGS..
015364  012703  007241                  MOV     #BASE11+1,R3    ; SETUP OUTPUT POINTER..
015370  112723  000040          BASE1A: MOVB    #' ,(R3)+       ; PRELOAD STRING WITH SPACES.
015374  022703  007246                  CMP     #BASE11+6,R3    ; ALL DONE?
015400  001373                          BNE     BASE1A          ; NO..
                                ;
015402  005001                  BASE1D: CLR     R1              ; R1 IS RECEIVER...
                                ;
015404  020027  000012          BASE1B: CMP     R0,#12          ; MORE THAN 10?
015410  103404                          BLO     BASE1C          ; YES IF BRANCH
015412  162700  000012                  SUB     #12,R0          ; DIV BY REPEAT SUB
015416  005201                          INC     R1              ; TALLY COUNT
015420  000771                          BR      BASE1B          ; DO NEXT
                                ;
015422  062700  000060          BASE1C: ADD     #'0,R0          ; MAKE INTO NUMBER
015426  110043                          MOVB    R0,-(R3)        ; SAVE IN STRING
015430  010100                          MOV     R1,R0
```

```
 4293  015432  001363                    BNE     BASE1D
 4294  015434  004737  013776            JSR     PC,RSTREG       ; RESTORE REGISTERS..
 4295  015440  004737  014734            JSR     PC,TYPOUT       ; TYPE MESSAGE
 4296  015444  007240                    BASE11                  ; THIS ONE...
 4297  015446  000207                    RTS     PC              ; AND EXIT
```

```
                        .SBTTL  MODIFY THE PROGRAM
;
;
;       DESCRIPTION:
;
;       ROUTINE TO MODIFY A LOCATION IN MEMORY
;
;       ENTERED BY TYPING CNTRL-O ON THE CONSOLE
;       TERMINAL.
;
;       PROMPTS ($) FOR AN ADDRESS TO EXAMINE
;       AND PRINTS IT IN THE FORM
;
;       ADDR CONTENTS /
;
;       THEN A NEW VALUE CAN BE ENTERED
;
;       VIS:
;
;       ADDR CONTENTS / NEW VALUE
;
;
;       THE NEW VALUE CAN BE TERMINATED USING
;       <CR>, <LF> , OR <ESC>
;
;
;
;       <LF>    TO EXAMINE THE NEXT LOC
;       <CR>    TO SELECT ANOTHER ADDRESS
;       <ESC>   TO EXIT
;
;
;
;       CALLING SEQUENCE:
;
;               JSR     PC,MODIFY
;
;       INPUT PARAMETERS:
;
;               NONE
;
;
;       IMPLICIT INPUT PARAMETERS:
;
;               ENTERED BY TYPING CNTRL-O DURING
;       THE RUNNING OF THE TESTS
;
;       OUTPUT PARAMETERS:
;
;               NONE
;
```

```
                        ;
                        ;       IMPLICIT OUTPUT PARAMETERS:
                        ;
                        ;               THE LOCATIONS SPECIFIED WILL HAVE BEEN
                        ;       MODIFIED
                        ;
                        ;
                        ;       COMPLETION CODES:
                        ;
                        ;               NONE
                        ;
                        ;
                        ;       POSSIBLE ERROR CODES:
                        ;
                        ;               NONE
                        ;
                        ;
015450  004737  013740          MODIFY: JSR     PC,SAVREG       ;SAVE REGISTERS
015454                                  PSWREA  MODSAV
015464                                  PSWSET  #340
015500  004737  014734          MODI1:  JSR     PC,TYPOUT       ;PROMPT $ FOR AN ADDRESS
015504  006635                          MODADM                  ;TO HAVE A LOOK AT
015506  004737  014034                  JSR     PC,OCTIN        ;READ REPLY
015512  005737  007532                  TST     RAND            ;ANYTHONG READ ?
015516  001506                          BEQ     MODXIT          ;NO, SO EXIT
015520  010037  007536                  MOV     R0,MODADR       ;ELSE SAVE OUR ADDRESS
015524  032737  000001  007536  MODI2:  BIT     #1,MODADR       ;IS IT EVEN ?
015532  001404                          BEQ     MODI3           ;YES WE CAN USE IT
015534  004737  014734                  JSR     PC,TYPOUT       ;ELSE SAY IT IS AN ODD
015540  006707                          ODAMSG                  ;ADDRESS, AND REPROMPT
015542  000756                          BR      MODI1
015544  012737  016354  000004  MODI3:  MOV     #NXMTRP,4       ;PLUG TRAP THRU 4
015552  012737  000340  000006          MOV     #340,6          ;FOR NXM TESTS
015560  005037  007544                  CLR     TRPERR          ;CLEAR NXM FLAG
015564  005777  171746                  TST     @MODADR         ;TEST OUR ADDRESS
015570  005737  007544                  TST     TRPERR          ;DOES IT EXIST
015574  001341                          BNE     MODI1           ;NO TRY AGAIN
015576  004737  014700                  JSR     PC,CRLF         ;START ON A NEW LINE
015602  013700  007536                  MOV     MODADR,R0       ;PRINT OUR ADDRESS
015606  004737  015024                  JSR     PC,PROCT
015612  012700  000040                  MOV     #40,R0          ;THEN A SPACE
015616  004737  015012                  JSR     PC,PCHR         ;AS A SEPARATOR
015622  017700  171710                  MOV     @MODADR,R0      ;THEN PRINT THE CONTENTS
015626  004737  015024                  JSR     PC,PROCT
015632  004737  014734                  JSR     PC,TYPOUT       ;PROMPT FOR THE NEW
015636  006642                          MODSPA                  ;CONTENTS '/'
015640  004737  014034                  JSR     PC,OCTIN        ;READ REPLY
015644  005737  007532                  TST     RAND            ;ANY THING GIVEN
015650  001402                          BEQ     MODI4           ;NO, DON'T UPDATE
015652  010077  171660                  MOV     R0,@MODADR      ;ELSE SET NEW VALUE
015656  013700  007616          MODI4:  MOV     RANDC,R0        ; GET TERMINATOR
015662  001706                          BEQ     MODI1           ; NULL MEANS <CR>
015664  020027  000015                  CMP     R0,#15          ;WAS IT <CR> ?
015670  001703                          BEQ     MODI1           ;YES GET NEXT ADDRESS
015672  020027  000012                  CMP     R0,#12          ;WAS IT <LF> ?
015676  001006                          BNE     MODI5           ;NO
```

```
 4411  015700  004737  014700                 JSR     PC,CRLF         ; NEWLINE
 4412  015704  062737  000002  007536         ADD     #2,MODADR       ;UPDATE THE ADDRESS BY 2
 4413  015712  000704                         BR      MODI2           ; THEN TRY THIS ADDRESS
 4414  015714  020027  000033         MODI5:  CMP     R0,#33          ;WAS IT EXIT ?
 4415  015720  001405                         BEQ     MODXIT          ;YES DISSAPPEAR
 4416  015722  012700  000077                 MOV     #77,R0          ;ELSE GIVE A ?
 4417  015726  004737  015012                 JSR     PC,PCHR         ;AS AN ERROR
 4418  015732  000751                         BR      MODI4           ;THEN TRY AGAIN
 4419  015734  012737  000006  000004  MODXIT: MOV     #6,4            ;PLUG BACK TRAP THRU 4
 4420  015742  012737  000004  000006         MOV     #4,6            ;WITH WHAT IS WAS
 4421  015750  004737  014700                 JSR     PC,CRLF         ;PUT OURSELVES ON A NEW LINE
 4422  015754                                 PSWSET  MODSAV
 4423  015770  004737  013776                 JSR     PC RSTREG       ;RESTORE REGISTERS
 4424  015774  000207                         RTS     PC              ;AND GO AWAY
 4425
```

```
4427                    .SBTTL  SELECT BUS ADDRESSES
4428
4429
4430                    DESCRIPTION:
4431
4432                            THIS ROUTINE PROMPTS THE OPERATOR FOR THE
4433                    BUS ADDRESS OF THE FIRST VTV30K ON THE SYSTEM, AND ALSO
4434                    THE NUMBER OF DEVICES THAT ARE ON THE SYSTEM. THE PROGRAM
4435                    WILL ALLOW UP TO TWENTY (DECIMAL) DEVICES TO BE SELECTED,
4436                    HOWEVER THE DEVICES MUST BE CONFIGURED IN ASCENDING ORDER.
4437                    FOR EXAMPLE: THE FIRST DEVICE WOULD BE AT 1XXX00, 1XXX02,
4438                    THEN THE SECOND ONE WOULD BE AT 1XXX10, AND 1XXX12, ETC.
4439
4440
4441                    CALLING SEQUENCE:
4442
4443                            JSR PC,SELBUS
4444
4445
4446                    INPUT PARAMETERS:
4447
4448                            NONE
4449
4450
4451                    IMPLICIT INPUT PARAMETERS:
4452
4453                            NONE
4454
4455
4456                    OUTPUT PARAMETERS:
4457
4458                            THE ADDRESSES OF THE CSR AND DATA BUFFERS SELECTED
4459                    WILL BE LOADED INTO LOCATIONS FOLLOWING THE ADDRESS ''CSR0''.
4460                    THE LOCATION ''DEVCNT'' IS SET TO SAY HOW MANY DEVICES WERE
4461                    SELECTED.
4462
4463
4464                    IMPLICIT OUTPUT PARAMETERS:
4465
4466                            EACH OF THE ADDRESSES SELECTED ARE TESTED FOR NXM,
4467                    AND AN ERROR REPORT IS GENERATED IF THE SELECTED ADDRESS
4468                    REPORTS AS NXM. ERROR 77 FOR A NON EXISTANT CSR AND 76 FOR
4469                    THE DATA BUFFER.
4470
4471
4472                    COMPLETION CODES:
4473
4474                            NONE
4475
4476
4477                    POSSIBLE ERROR CODES:
4478
4479                            ERROR 77 WILL OCCUR IF A SELECTED CSR IS NOT ON
4480                    THE BUS. ERROR 76 WILL OCCUR FOR A NON EXISTANT DATA BUFFER
4481                    ADDRESS. SETTING TRAP+10 WILL LOOP ON THIS ADDRESS.
4482
```

```
4483                                        ;
4484  015776  005037  007454          SELBUS: CLR     TESTNO
4485  016002  004737  013740                  JSR     PC,SAVREG           ; SAVE REGISTERS
4486  016006  012737  016354  000004        MOV     #NXMTRP,4           ; PLUG TRAP THRU 4
4487  016014  012737  000340  000006        MOV     #340,6
4488  016022  004737  014734          1$:     JSR     PC,TYPOUT           ; ASK FOR NUMBER OF DEVICES
4489  016026  005660                        NUMDEV
4490  016030  004737  015150                JSR     PC,TYPDEC           ; READ DECIMAL REPLY
4491  016034  005737  007532                TST     RAND                ; NULL REPLY MEANS 1
4492  016040  001002                        BNE     2$
4493  016042  012700  000001                MOV     #1,R0
4494  016046  020027  000024          2$:     CMP     R0,#20.             ; IS THE NUMBER TOO BIG ?
4495  016052  003363                        BGT     1$                  ; YES
4496  016054  005700                        TST     R0                  ; OR TOO SMALL
4497  016056  003761                        BLE     1$                  ; OOPS, REPROMPT
4498  016060  010037  007304                MOV     R0,DEVCNT           ; ELSE SAVE COUNT AWAY
4499  016064  023727  007304  000001        CMP     DEVCNT,#1           ; ONE DEVICE SELECTED
4500  016072  001406                        BEQ     BUSSE1              ; YES
4501  016074  004737  014734                JSR     PC,TYPOUT
4502  016100  006144                        GOMS1                       ; NO- ALL DEVICES MUST BE
4503  016102  004737  013656          3$:     JSR     PC,TYPCTC           ; SEQUENTIAL
4504  016106  000775                        BR      3$
4505                                        ;
4506                                        ; NOW GET OUR FIRST ADDRESS
4507                                        ;
4508  016110  004737  014734          BUSSE1: JSR     PC,TYPOUT           ; FIRST BUS ADDRESS =
4509  016114  006653                        BAMSG
4510  016116  004737  014034          1$:     JSR     PC,OCTIN            ; READ OCTAL REPLY
4511  016122  005737  007532                TST     RAND                ; DON'T ALLOW DEFAULTS
4512  016126  001004                        BNE     2$
4513  016130  004737  014734                JSR     PC,TYPOUT
4514  016134  006762                        NODEFM
4515  016136  000767                        BR      1$
4516  016140  032700  000005          2$:     BIT     #5,R0               ; THESE BITS CLEAR
4517  016144  001406                        BEQ     3$                  ; YES
4518  016146  004737  014734          4$:     JSR     PC,TYPOUT
4519  016152  006707                        ODAMSG                      ; NO ITS AN INVALID ADDRESS
4520  016154  004737  015024                JSR     PC,PROCT
4521  016160  000753                        BR      BUSSE1
4522  016162  032700  100000          3$:     BIT     #100000,R0          ; IT MUST BE ON THE IO PAGE
4523  016166  001767                        BEQ     4$
4524  016170  010037  007542          BUSSE2: MOV     R0,BASADD           ; SAVE START ADDRESS
4525  016174  013701  007304                MOV     DEVCNT,R1           ; GET DEVICE COUNT
4526  016200  012702  007306                MOV     #CSR0,R2            ; AND WHERE DATA GOES
4527  016204  013737  007542  007566        MOV     BASADD,DATA
4528  016212  005037  007544          1$:     CLR     TRPERR              ; CLEAR NXM FLAG
4529  016216  005777  171344                TST     @DATA               ; CHECKIT
4530  016222  005737  007544                TST     TRPERR              ; OK ?
4531  016226  001411                        BEQ     2$                  ; YES
4532                                        ; ERROR-
4533                                        ; CHECK 'LEVB CLOCK H'
4534                                        ;       'LEVB VA02 H'
4535                                        ; BUS CYCLE TIMING ON LEVA.
4536                                        ; 8136 ADDRESS COMPARATORS ON LEVA
4537  016230  013737  007566  007572        MOV     DATA,ADDRES
4538  016236  004737  016666                JSR     PC,ERROR            ; NO- THIS IS NAUGHTY
```

```
4539  016242  020077                        77+A
4540  016244  104410                        TRAP+10
4541  016246  016212                        1$
4542  016250  000717                        BR      BUSSE'
4543  016252  013722  007566          2$:   MOV     DATA,(R2)+      ; SAVE DATA AWAY
4544  016256  062737  000002  007566        ADD     #2,DATA         ; POINT TO DBUFF ADDRESS
4545  016264  005037  007544          3$:   CLR     TRPERR          ; CLEAR NXM FLAG
4546  016270  005777  171272                TST     @DATA           ; CHECK FOR NXM
4547  016274  005737  007544                TST     TRPERR          ; IS IT ?
4548  016300  001403                        BEQ     4$              ; NO- ALL IS WELL
4549                                ; ERROR-
4550                                ; CHECK E4 ON LEVA
4551                                ; BUS CYCLE TIMING ON LEVA
4552  016302  004737  016666                JSR     PC,ERROR        ; OOPS- NAUGHTY
4553  016306  040076                        76+D
4554  016310  104410                4$:     TRAP+10                 ; LOOP ON
4555  016312  016264                        3$
4556  016314  013722  007566                MOV     DATA,(R2)+      ; SAVE DBUFF ADDRESS
4557  016320  062737  000006  007566        ADD     #6,DATA         ; POINT TO NEXT CSR
4558  016326  005301                        DEC     R1              ; ALL CSRS DONE
4559  016330  001330                        BNE     1$              ; NO
4560  016332  012737  000006  000004        MOV     #6,4            ; RESET TRAP POINTERS
4561  016340  012737  000004  000006        MOV     #4,6            ; WITH THE IOT TRAP
4562  016346  004737  013776                JSR     PC,RSTREG
4563  016352  000207                        RTS     PC              ; YES EXIT
4564                                ;
```

```
 4566  016354  004737  014734          NXMTRP: JSR     PC,TYPOUT
 4567  016360  006732                          NXMSG
 4568  016362  005237  007544                  INC     TRPERR
 4569  016366  000002                          RTI
```

```
4571                            .SBTTL  NUMBER GENERATOR
4572                    ;
4573                    ;
4574                    ;
4575                    ;       DESCRIPTION:
4576                    ;
4577                    ;               ROUTINE TO GENERATE DATA PATTERNS,
4578                    ;       THE TYPE OF PATTERN IS SELECTED BY R3, AND THE
4579                    ;       PATTERN GENERATED IS RETURNED IN R0 AND LOCATION
4580                    ;       GOOD.
4581                    ;
4582                    ;       CALLING SEQUENCE:
4583                    ;
4584                    ;               JSR     PC,GENER
4585                    ;
4586                    ;       INPUT PARAMETERS:
4587                    ;
4588                    ;       R3 CONTAINS THE PATTERN NUMBER
4589                    ;
4590                    ;       R3=0            ALL ZEROES
4591                    ;       1               ALL ONES
4592                    ;       2               010101 ETC BIT PATTERN
4593                    ;       3               101010 ETC BIT PATTERN
4594                    ;       4               ROTATING 1 IN A ZERO WORD
4595                    ;       5               ROTATING 0 IN AN ALL ONE WORD
4596                    ;       6               PSEUDO RANDOM NUMBER
4597                    ;       7               INCREMENTING DATA PATTERN, GOOD
4598                    ;                       CONTAINS THE VALUE TO BE UPDATED
4599                    ;
4600                    ;
4601                    ;
4602                    ;       IMPLICIT INPUT PARAMETERS:
4603                    ;
4604                    ;               NONE
4605                    ;
4606                    ;       OUTPUT PARAMETERS:
4607                    ;
4608                    ;               THE NUMBER GENERATED IS HELD IN
4609                    ;       R0 AND GOOD.
4610                    ;
4611                    ;       IMPLICIT OUTPUT PARAMETERS:
4612                    ;
4613                    ;               NONE
4614                    ;
4615                    ;       COMPLETION CODES:
4616                    ;
4617                    ;               NONE
4618                    ;
4619                    ;       POSSIBLE ERROR CODES:
4620                    ;
4621                    ;               NONE
4622
4623
4624
4625
4626
```

```
4627                                    ;
4628                                    ;
4629                                    ;
4630  016370  042703  177770            GENER:  BIC     #177770,R3
4631  016374  004737  013740                    JSR     PC,SAVREG
4632  016400  006303                            ASL     R3
4633  016402  000173  016406                    JMP     @GENSEL(R3)
4634  016406  016426                    GENSEL: GEN0                    ;ALL ZERO WORD
4635  016410  016432                            GEN1                    ;ALL ONE WORD
4636  016412  016440                            GEN52                   ;52 PATTERN
4637  016414  016446                            GEN25                   ;25 PATTERN
4638  016416  016454                            GENR1                   ;ROTATE '1' EACH CALL
4639  016420  016464                            GENR0                   ;ROTATE '0' EACH CALL
4640  016422  016522                            GENRAN                  ;RANDOM NUMBER
4641  016424  016642                            GENINC                  ;INCREMENTING COUNT
4642  016426  005000                    GEN0:   CLR     R0              ;0>R0
4643  016430  000507                            BR      GENEX
4644  016432  005000                    GEN1:   CLR     R0              ;NOT0>R0
4645  016434  005100                            COM     R0
4646  016436  000504                            BR      GENEX
4647  016440  012700  052525            GEN52:  MOV     #52525,R0       ;5252>R0
4648  016444  000501                            BR      GENEX
4649  016446  012700  125252            GEN25:  MOV     #125252,R0      ;125252>R0
4650  016452  000476                            BR      GENEX
4651  016454  000241                    GENR1:  CLC
4652  016456  004737  016476                    JSR     PC,GENROT       ;SHIFT 1 > R0
4653  016462  000472                            BR      GENEX
4654  016464  000241                    GENR0:  CLC
4655  016466  004737  016476                    JSR     PC,GENROT       ;
4656  016472  005100                            COM     R0              ;SHIFT 0 > R0
4657  016474  000465                            BR      GENEX
4658  016476  006037  016520            GENROT: ROR     GENISH          ;ROTATE  1 PATTERN
4659  016502  001003                            BNE     GENER1          ;= 0?
4660  016504  012737  100000  016520            MOV     #100000,GENISH  ;YES, SET MSB
4661  016512  013700  016520            GENER1: MOV     GENISH,R0       ;PUT 1 IN R0
4662  016516  000207                            RTS     PC              ;AND EXIT
4663  016520  000001                    GENISH: 1
4664  016522  012737  000005  007554    GENRAN: MOV     #5,RANSEL       ;SET SELECT VALUE TO 5
4665  016530  004737  016542                    JSR     PC,RANGEN       ;GENERATE RANDOM NUMBER IN R0
4666  016534  013700  007552                    MOV     RANDN,R0        ;
4667  016540  000443                            BR      GENEX           ;
4668  016542  013702  007552            RANGEN: MOV     RANDN,R2        ;
4669  016546  001002                            BNE     RAN1            ;IS RANDOM = 0
4670  016550  013702  007560                    MOV     RANST,R2        ;YES, PUT RANDOM START VALUE IN
4671  016554  032737  000777  007554    RAN1:   BIT     #777,RANSEL     ;NO;IS RANSEL SELECT VALUE = 0
4672  016562  001003                            BNE     RAN2            ;NO
4673  016564  012737  000001  007554            MOV     #1,RANSEL       ;YES: SET RANSEL = 1
4674  016572  013703  007554            RAN2:   MOV     RANSEL,R3       ;
4675  016576  013702  007552                    MOV     RANDN,R2
4676  016602  033702  007556                    BIT     RANMTA,R2       ;GET R2 <0 AND 1>
4677  016606  001405                            BEQ     RANCLC          ;
4678  016610  005102                            COM     R2
4679  016612  033702  007556                    BIT     RANMTA,R2
4680  016616  001401                            BEQ     RANCLC
4681  016620  000402                            BR      RANSEC
4682  016622  000241                    RANCLC: CLC
```

```
 4683  016624  000401                      BR      RAN4
 4684  016626  000261              .ANSEC: SEC
 4685  016630  006037  007552      RAN4:   ROR     RANDN           ;ROTATE C TO B15
 4686  016634  005303                      DEC     R3              ;IS THIS NUMBER REQUIRED?
 4687  016636  001357                      BNE     RAN2+4          ;NO, GET ANOTHER
 4688  016640  000207                      RTS     PC              ;YES, EXIT
 4689  016642  013700  007562      GENINC: MOV     GOOD,R0         ;INCREMENTS LOC. 'GOOD'
 4690  016646  005200                      INC     R0
 4691  016650  010037  007562      GENEX:  MOV     R0,GOOD
 4692  016654  010066  000002              MOV     R0,2(SP)        ;LOAD R0 MAINROUTINE
 4693  016660  004737  013776              JSR     PC,RSTREG
 4694  016664  000207                      RTS     PC
```

```
                        .SBTTL  PRINT  ERROR MESSAGES


;
;
;       DESCRIPTION:
;
;       ROUTINE TO PRINT ERROR MESSAGES
;       IF BIT 14 IN THE SWR IS SET NO MESSAGES WILL BE
;       PRINTED, IF BIT 15 IS SET THE PROGRAM WILL NO WAIT
;       AFTER AN ERROR HAS BEEN PRINTED. IT IS CALLED THUS:
;
;       JSR     PC,ERROR
;       ARG
;
;       WHERE ARG CONTAINS THE ERROR CODE AND IS OF THE FORM
;       X+N, WHERE N IS THE ERROR NUMBER IN THE RANGE 0-177
;       AND X IS A COMPINATION OF FLAGS THAT INDICATE WHAT
;       VALUES ARE TO BE PRINTED. THESE VALUES SHOULD BE LOADED
;       BEFORE THE ERROR ROUTINE IS CALLED AND ARE DEFINED
;       AS FOLLOWS:
;
;       FLAG SETTING    NUMBER  LOCATION        MESSAGE
;       ------------    ------  --------        -------
;
;       C               4000    CALLPC          CALLED FROM
;       S               10000   STATUS          STATUS
;       A               20000   ADDRES          ADDRESS
;       D               40000   DATA            DATA
;       G               100000  GOOD, BAD       GOOD= BAD =
;
;       IN ADDITION THE ERROR NUMBER WILL BE COMBINED WITH
;       THE TEST NUMBER TO INDICATE IN WHICH TEST THE ERROR
;       OCCURRED.
;       AN ERROR COUNT IS MAINTAINED AN ON EACH ERROR THE
;       COUNT IS UPDATED. IF RUNNING UNDER A SOFTWARE SWITCH
;       REGISTER, IT IS POSSIBLE TO SELECT NEW OPTIONS
;
;
;       CALLING SEQUENCE:
;
;               JSR     PC,ERROR
;
;       INPUT PARAMETERS:
;
;               THE LOACTION FOLLOWING THE CALL
;       CONTAINS THE ERROR CODE AND FLAG SETTINGS
;
;
;       IMPLICIT INPUT PARAMETERS:
;
;               NONE
;
;
;
;       OUTPUT PARAMETERS:
```

```
                                        ;               NONE
                                        ;
                                        ;
                                        ;       IMPLICIT OUTPUT PARAMETERS:
                                        ;
                                        ;               THE APPROPRAITE ERROR MESSAGE WILL BE PRINTED
                                        ;       IF PERMITTED.
                                        ;
                                        ;       COMPLETION CODES:
                                        ;
                                        ;               NONE
                                        ;
                                        ;       POSSIBLE ERROR CODES:
                                        ;
                                        ;               NONE
                                        ;
                                        ;
                                        ;               20-FEB-80
016666 004737 013740            ERROR:  JSR     PC,SAVREG
016672 012737 000001 007444             MOV     #1,ERRFLG       ; SET ERROR FLAG
016700 005237 007574                    INC     ERRDIS          ;INC COUNT
016704 001002                           BNE     1$              ; CHECK FOR OVERFLOW
016706 005237 007442                    INC     ERRDI1          ; THEN INC OVERFLOW COUNT
016712 032777 040000 170562     1$:     BIT     #40000,@SWR     ;SUPPRESS PRINTOUT
016720 001133                           BNE     ERHALT                          ;YES
016722 017637 000000 007576             MOV     @(SP),ERRARG    ;NO
016730 004737 014734                    JSR     PC,TYPOUT       ;TYPE MESSAGE
016734 007064                           EMSG1
016736 013700 007454                    MOV     TESTNO,R0
016742 000300                           SWAB    R0
016744 006300                           ASL     R0
016746 153700 007576                    BISB    ERRARG,R0
016752 004737 015024                    JSR     PC,PROCT
016756 004737 014734                    JSR     PC,TYPOUT
016762 007070                           EMSG2
016764 011600                           MOV     (SP),R0
016766 004737 015024                    JSR     PC,PROCT                ;PRINT 6 DIGITS
016772 132737 000200 007577             BITB    #200,ERRARG+1
017000 001416                           BEQ     ERRSV1
017002 004737 014734                    JSR     PC,TYPOUT
017006 007102                           EMSG3
017010 013700 007562                    MOV     GOOD,R0
017014 004737 015024                    JSR     PC,PROCT
017020 004737 014734                    JSR     PC,TYPOUT
017024 007113                           EMSG4
017026 013700 007564                    MOV     BAD,R0
017032 004737 015024                    JSR     PC,PROCT
017036 132737 000100 007577 ERRSV1:     BITB    #100,ERRARG+1   ;D SET ?
017044 001407                           BEQ     ERRSV2          ;NO
017046 004737 014734                    JSR     PC,TYPOUT
017052 007124                           EMSG5
017054 013700 007566                    MOV     DATA,R0
017060 004737 015024                    JSR     PC,PROCT
```

```
4808  017064  132737  000040  007577  ERRSV2: BITB    #40,ERRARG+1    ;A SET ?
4809  017072  001407                  BEQ     ERRSV3          ;NO
4810  017074  004737  014734          JSR     PC,TYPOUT
4811  017100  007135                  EMSG6
4812  017102  013700  007572          MOV     ADDRES,R0
4813  017106  004737  015024          JSR     PC,PROCT
4814  017112  132737  000020  007577  ERRSV3: BITB    #20,ERRARG+1    ;S SET ?
4815  017120  001407                  BEQ     ERRSV4          ;NO
4816  017122  004737  014734          JSR     PC,TYPOUT
4817  017126  007153                  EMSG7
4818  017130  013700  007570          MOV     STATUS,R0
4819  017134  004737  015024          JSR     PC,PROCT
4820  017140  132737  000010  007577  ERRSV4: BITB #10,ERRARG+1       ;C SET
4821  017146  001407                  BEQ     ERRSV5          ;NO
4822  017150  004737  014734          JSR     PC,TYPOUT
4823  017154  007166                  EMSG8
4824  017156  013700  007600          MOV     CALLPC,R0
4825  017162  004737  015024          JSR     PC,PROCT
4826  017166  004737  014700  ERRSV5: JSR     PC,CRLF
4827  017172  004737  014734          JSR     PC,TYPOUT
4828  017176  007205                  EMSG9
4829  017200  013700  007574          MOV     ERRDIS,R0
4830  017204  004737  015352          JSR     PC,BASE10
4831  017210  032777  100000  170264  ERHALT: BIT     #100000,@SWR
4832  017216  001004                  BNE     NOHALT
4833  017220  013700  007574          MOV     ERRDIS,R0
4834  017224  004737  013546          JSR     PC,MONIT        ; GO TO SWR
4835  017230  004737  013776  NOHALT: JSR     PC,RSTREG
4836  017234  062716  000002          ADD     #2,(SP)
4837  017240  000207                  RTS     PC
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                                        .SBTTL  NORMAL CHARACTER SET.
                                        .NLIST  BEX
                                ;THIS IS THE VTV30K CHARACTER SET IN ITS MAIN
                                ;VERSION, WITH A POUND SIGN AT ADDRESS 13,& A
                                ;DEGREE SIGN AT ADDRESS 32.

017242  360  360  360  NORCH:  .BYTE  360,360,360,360,360,360,360,360
017252  010  010  010          .BYTE  010,010,010,010,010,010,010,010
017262  030  030  030          .BYTE  030,030,030,030,030,030,030,030
017272  074  074  074          .BYTE  074,074,074,074,074,074,074,074
017302  000  000  000          .BYTE  000,000,000,000,377,000,000,000
017312  000  000  000          .BYTE  000,000,000,000,377,377,000,000
017322  000  000  377          .BYTE  000,000,377,377,377,377,000,000
017332  010  010  010          .BYTE  010,010,010,010,377,010,010,010
017342  030  030  030          .BYTE  030,030,030,377,377,030,030,030
017352  074  074  377          .BYTE  074,074,377,377,377,377,074,074 ;10
017362  001  002  004          .BYTE  001,002,004,010,020,040,100,200
017372  200  100  040          .BYTE  200,100,040,020,010,004,002,001
017402  000  014  022          .BYTE  000,014,022,040,170,040,100,176
017412  201  102  044          .BYTE  201,102,044,030,030,044,102,201
017422  074  176  377          .BYTE  074,176,377,377,377,377,176,074
017432  030  074  176          .BYTE  030,074,176,377,377,176,074,030
017442  010  010  024          .BYTE  010,010,024,042,301,042,024,010
017452  010  010  034          .BYTE  010,010,034,076,377,076,034,010
017462  252  252  252          .BYTE  252,252,252,252,252,252,252,252
017472  314  314  314          .BYTE  314,314,314,314,314,314,314,314 ;20
017502  377  000  377          .BYTE  377,000,377,000,377,000,377,000
017512  377  377  000          .BYTE  377,377,000,000,377,377,000,000
017522  377  203  205          .BYTE  377,203,205,211,221,241,301,377
017532  377  201  201          .BYTE  377,201,201,201,201,201,201,377
017542  377  376  374          .BYTE  377,376,374,370,360,340,300,200
017552  377  177  077          .BYTE  377,177,077,037,017,007,003,001
017562  200  300  340          .BYTE  200,300,340,360,370,374,376,377
017572  001  003  007          .BYTE  001,003,007,017,037,077,177,377
017602  003  007  016          .BYTE  003,007,016,034,070,160,340,300
017612  300  340  160          .BYTE  300,340,160,070,034,016,007,003 ;30
017622  303  347  176          .BYTE  303,347,176,074,074,176,347,303
017632  000  160  120          .BYTE  000,160,120,160,000,000,000,000
017642  000  000  000          .BYTE  000,000,000,000,000,000,000,000
017652  010  010  010          .BYTE  010,010,010,010,010,000,010,000
017662  024  024  024          .BYTE  024,024,024,000,000,000,000,000
017672  024  024  066          .BYTE  024,024,066,000,066,024,024,000
017702  010  036  040          .BYTE  010,036,040,034,002,074,010,000
017712  000  062  062          .BYTE    0, 62, 62,  4, 10, 20, 46, 46
017722  000  020  050          .BYTE    0, 20, 50, 50, 20, 52, 44, 32
017732  000  030  030          .BYTE    0, 30, 30, 30,  0,  0,  0,  0 ;40(*)
017742  000  010  020          .BYTE    0, 10, 20, 40, 40, 40, 20, 10
017752  000  010  004          .BYTE    0, 10,  4,  2,  2,  2,  4, 10
017762  000  052  034          .BYTE    0, 52, 34, 76, 34, 52,  0,  0
017772  000  000  010          .BYTE    0,  0, 10, 10, 76, 10, 10,  0
020002  000  000  000          .BYTE    0,  0,  0,  0, 30, 30, 10, 20
020012  000  000  000          .BYTE    0,  0,  0,  0, 76,  0,  0,  0
020022  000  000  000          .BYTE    0,  0,  0,  0,  0,  0, 30, 30
020032  000  002  002          .BYTE    0,  2,  2,  4, 10, 20, 40, 40
020042  000  034  042          .BYTE  000,034,042,046,052,062,042,034
020052  000  010  030          .BYTE  000,010,030,010,010,010,010,034 ;50(1)
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4895  020062  000  034  042          .BYTE   000,034,042,002,034,040,040,076
4896  020072  000  034  042          .BYTE   000,034,042,002,014,002,042,034
4897  020102  000  004  014          .BYTE   000,004,014,024,044,076,004,004
4898  020112  000  076  040          .BYTE     0, 76, 40, 74,  2,  2, 42, 34
4899  020122  000  014  020          .BYTE     0, 14, 20, 40, 74, 42, 42, 34
4900  020132  000  076  002          .BYTE     0, 76,  2,  4, 10, 20, 20, 20
4901  020142  000  034  042          .BYTE     0, 34, 42, 42, 34, 42, 42, 34
4902  020152  000  034  042          .BYTE     0, 34, 42, 42, 36,  2,  4, 30
4903  020162  000  000  030          .BYTE     0,  0, 30, 30,  0, 30, 30,  0
4904  020172  000  030  030          .BYTE     0, 30, 30,  0, 30, 30, 10, 20 ;60(;)
4905  020202  000  004  010          .BYTE     0,  4, 10, 20, 40, 20, 10,  4
4906  020212  000  000  000          .BYTE     0,  0,  0, 76,  0, 76,  0,  0
4907  020222  000  020  010          .BYTE     0, 20, 10,  4,  2,  4, 10, 20
4908  020232  000  030  044          .BYTE     0, 30, 44,  4, 10, 10,  0, 10
4909  020242  000  074  102          .BYTE     0, 74,102,132,132,104, 40,  0
4910  020252  000  010  024          .BYTE     0, 10, 24, 42, 42, 76, 42, 42
4911  020262  000  074  022          .BYTE     0, 74, 22, 22, 34, 22, 22, 74
4912  020272  000  034  042          .BYTE     0, 34, 42, 40, 40, 40, 42, 34
4913  020302  000  074  022          .BYTE     0, 74, 22, 22, 22, 22, 22, 74
4914  020312  000  076  040          .BYTE     0, 76, 40, 40, 70, 40, 40, 76 ;70(E)
4915  020322  000  076  040          .BYTE     0, 76, 40, 40, 70, 40, 40, 40
4916  020332  000  036  040          .BYTE     0, 36, 40, 40, 46, 42, 42, 36
4917  020342  000  042  042          .BYTE     0, 42, 42, 42, 76, 42, 42, 42
4918  020352  000  034  010          .BYTE     0, 34, 10, 10, 10, 10, 10, 34
4919  020362  000  002  002          .BYTE     0,  2,  2,  2,  2,  2, 42, 34
4920  020372  000  042  044          .BYTE     0, 42, 44, 50, 60, 50, 44, 42
4921  020402  000  040  040          .BYTE     0, 40, 40, 40, 40, 40, 40, 76
4922  020412  000  042  066          .BYTE     0, 42, 66, 52, 42, 42, 42, 42
4923  020422  000  042  062          .BYTE     0, 42, 62, 52, 46, 42, 42, 42
4924  020432  000  034  042          .BYTE     0, 34, 42, 42, 42, 42, 42, 34 ;80(O)
4925  020442  000  074  042          .BYTE     0, 74, 42, 42, 74, 40, 40, 40
4926  020452  000  034  042          .BYTE     0, 34, 42, 42, 42, 52, 44, 32
4927  020462  000  074  042          .BYTE     0, 74, 42, 42, 74, 50, 44, 42
4928  020472  000  036  040          .BYTE     0, 36, 40, 40, 34,  2,  2, 74
4929  020502  000  076  010          .BYTE     0, 76, 10, 10, 10, 10, 10, 10
4930  020512  000  042  042          .BYTE     0, 42, 42, 42, 42, 42, 42, 34
4931  020522  000  042  042          .BYTE     0, 42, 42, 42, 24, 24, 10, 10
4932  020532  000  042  042          .BYTE     0, 42, 42, 42, 42, 52, 66, 42
4933  020542  000  042  042          .BYTE     0, 42, 42, 24, 10, 24, 42, 42
4934  020552  000  042  042          .BYTE     0, 42, 42, 24, 10, 10, 10, 10 ;90(Y)
4935  020562  000  076  002          .BYTE     0, 76,  2,  4, 10, 20, 40, 76
4936  020572  000  070  040          .BYTE   000,070,040,040,040,040,040,070
4937  020602  000  040  040          .BYTE   000,040,040,020,010,004,002,002
4938  020612  000  016  002          .BYTE   000,016,002,002,002,002,002,016
4939  020622  030  074  176          .BYTE   030,074,176,377,030,030,030,030
4940  020632  010  014  016          .BYTE   010,014,016,377,377,016,014,010
4941  020642  030  030  030          .BYTE   030,030,030,030,377,176,074,030
4942  020652  020  060  160          .BYTE   020,060,160,377,377,160,060,020
4943  020662  000  377  377          .BYTE   000,377,377,377,377,377,377,377
4944  020672  000  000  377          .BYTE   000,000,377,377,377,377,377,377 ;100
4945  020702  000  000  000          .BYTE   000,000,000,377,377,377,377,377
4946  020712  000  000  000          .BYTE   000,000,000,000,377,377,377,377
4947  020722  000  000  000          .BYTE   000,000,000,000,000,377,377,377
4948  020732  000  000  000          .BYTE   000,000,000,000,000,000,377,377
4949  020742  000  000  000          .BYTE   000,000,000,000,000,000,000,377
4950  020752  376  376  376          .BYTE   376,376,376,376,376,376,376,376
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 4951  020762  374  374  374          .BYTE   374,374,374,374,374,374,374,374
 4952  020772  370  370  370          .BYTE   370,370,370,370,370,370,370,370
 4953  021002  360  360  360          .BYTE   360,360,360,360,360,360,360,360
 4954  021012  340  340  340          .BYTE   340,340,340,340,340,340,340,340 ;110
 4955  021022  300  300  300          .BYTE   300,300,300,300,300,300,300,300
 4956  021032  200  200  200          .BYTE   200,200,200,200,200,200,200,200
 4957  021042  200  200  200          .BYTE   200,200,200,200,200,200,200,377
 4958  021052  377  001  001          .BYTE   377,001,001,001,001,001,001,001
 4959  021062  001  001  001          .BYTE   001,001,001,001,001,001,001,377
 4960  021072  377  200  200          .BYTE   377,200,200,200,200,200,200,200
 4961  021102  000  000  000          .BYTE   000,000,000,000,000,000,000,200
 4962  021112  200  000  000          .BYTE   200,000,000,000,000,000,000,000
 4963  021122  001  000  000          .BYTE   001,000,000,000,000,000,000,000
 4964  021132  000  000  000          .BYTE   000,000,000,000,000,000,000,001 ;120
 4965  021142  000  010  024          .BYTE   000,010,024,042,343,000,000,000
 4966  021152  010  010  030          .BYTE   010,010,030,040,100,040,030,010
 4967  021162  000  074  146          .BYTE   000,074,146,303,201,000,000,000
 4968  021172  030  060  140          .BYTE   030,060,140,100,100,140,060,030
 4969  021202  000  000  000          .BYTE   000,000,000,000,017,010,010,010
 4970  021212  010  010  010          .BYTE   010,010,010,010,370,000,000,000
 4971  021222  010  010  010          .BYTE   010,010,010,010,017,000,000,000
 4972  021232  000  000  000          .BYTE   000,000,000,000,370,010,010,010
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                                        .SBTTL  T.V.-ENCODED CHARACTER SET.
                                ; THIS CHARACTER SET IS SPECIALLY SELECTED TO REDUCE THE
                                ; BANDWIDTH REQUIREMENTS FOR PAL ENCODING PURPOSES.
                                ;
021242  360  360  360  PALCH:   .BYTE 360,360,360,360,360,360,360,360
021252  030  030  030           .BYTE 030,030,030,030,030,030,030,030
021262  030  030  030           .BYTE 030,030,030,030,030,030,030,030
021272  074  074  074           .BYTE 074,074,074,074,074,074,074,074
021302  000  000  000           .BYTE 000,000,000,000,377,000,000,000
021312  000  000  000           .BYTE 000,000,000,000,377,377,000,000
021322  000  000  377           .BYTE 000,000,377,377,377,377,000,000
021332  030  030  030           .BYTE 030,030,030,030,377,030,030,030
021342  030  030  030           .BYTE 030,030,030,377,377,030,030,030
021352  074  074  377           .BYTE 074,074,377,377,377,377,074,074   ; 9
021362  003  006  014           .BYTE 003,006,014,030,060,140,300,200
021372  200  300  140           .BYTE 200,300,140,060,030,014,006,003
021402  000  034  062           .BYTE 000,034,062,060,170,060,140,176
021412  203  306  154           .BYTE 203,306,154,070,070,154,306,203
021422  074  176  377           .BYTE 074,176,377,377,377,377,176,074
021432  030  074  176           .BYTE 030,074,176,377,377,176,074,030
021442  030  030  074           .BYTE 030,030,074,146,303,146,074,030
021452  030  030  074           .BYTE 030,030,074,176,377,176,074,030
021462  146  146  146           .BYTE 146,146,146,146,146,146,146,146
021472  314  314  314           .BYTE 314,314,314,314,314,314,314,314
021502  377  000  377           .BYTE 377,000,377,000,377,000,377,000   ; 20
021512  377  377  000           .BYTE 377,377,000,000,377,377,000,000
021522  377  303  307           .BYTE 377,303,307,317,333,363,343,377
021532  377  303  303           .BYTE 377,303,303,303,303,303,303,377
021542  377  376  374           .BYTE 377,376,374,370,360,340,300,200
021552  377  377  177           .BYTE 377,377,177,077,037,017,007,003
021562  200  300  340           .BYTE 200,300,340,360,370,374,376,377
021572  003  007  017           .BYTE 003,007,017,037,077,177,377,377
021602  003  007  016           .BYTE 003,007,016,034,070,160,340,300
021612  300  340  160           .BYTE 300,340,160,070,034,016,007,003
021622  303  347  176           .BYTE 303,347,176,074,074,176,347,303
021632  000  160  120           .BYTE 000,160,120,160,000,000,000,000
021642  000  000  000           .BYTE 000,000,000,000,000,000,000,000
021652  000  030  030           .BYTE 000,030,030,030,030,030,000,030
021662  000  066  066           .BYTE 000,066,066,000,000,000,000,000
021672  066  066  167           .BYTE 066,066,167,000,167,066,066,000
021702  030  076  140           .BYTE 030,076,140,074,006,076,030,000
021712  000  146  146           .BYTE 000,146,146,014,030,060,146,146
021722  000  060  154           .BYTE 000,060,154,154,060,156,154,076
021732  000  030  030           .BYTE 000,030,030,030,000,000,000,000
021742  000  030  060           .BYTE 000,030,060,140,140,140,060,030   ; 40
021752  000  030  014           .BYTE 000,030,014,006,006,006,014,030
021762  000  066  034           .BYTE 000,066,034,076,034,066,000,000
021772  000  000  030           .BYTE 000,000,030,030,076,030,030,000
022002  000  000  000           .BYTE 000,000,000,000,000,030,030,060
022012  000  000  000           .BYTE 000,000,000,000,076,000,000,000
022022  000  000  000           .BYTE 000,000,000,000,000,000,030,030
022032  000  006  006           .BYTE 000,006,006,014,030,060,140,140
022042  000  074  146           .BYTE 000,074,146,146,146,146,146,074
022052  000  030  070           .BYTE 000,030,070,030,030,030,030,074
022062  000  074  146           .BYTE 000,074,146,006,036,060,140,176   ; 50
022072  000  074  146           .BYTE 000,074,146,006,030,006,146,074
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5030  022102  000  014  034  .BYTE 000,014,034,074,154,176,014,014
5031  022112  000  176  140  .BYTE 000,176,140,174,006,006,146,074
5032  022122  000  034  060  .BYTE 000,034,060,140,174,146,146,074
5033  022132  000  176  006  .BYTE 000,176,006,014,030,060,060,060
5034  022142  000  074  146  .BYTE 000,074,146,146,030,146,146,074
5035  022152  000  074  146  .BYTE 000,074,146,146,036,006,014,070
5036  022162  000  000  030  .BYTE 000,000,030,030,000,030,030,000
5037  022172  000  000  030  .BYTE 000,000,030,030,000,030,030,060
5038  022202  000  014  030  .BYTE 000,014,030,060,140,060,030,014   ; 60
5039  022212  000  000  000  .BYTE 000,000,000,076,000,076,000,000
5040  022222  000  060  030  .BYTE 000,060,030,014,006,014,030,060
5041  022232  000  074  146  .BYTE 000,074,146,006,034,030,000,030
5042  022242  000  030  146  .BYTE 000,030,146,156,156,146,060,000
5043  022252  000  030  066  .BYTE 000,030,066,146,146,176,146,146
5044  022262  000  174  146  .BYTE 000,174,146,146,170,146,146,174
5045  022272  000  074  146  .BYTE 000,074,146,140,140,140,146,074
5046  022302  000  174  146  .BYTE 000,174,146,146,146,146,146,174
5047  022312  000  176  140  .BYTE 000,176,140,140,170,140,140,176
5048  022322  000  176  140  .BYTE 000,176,140,140,170,140,140,140   ;70
5049  022332  000  076  140  .BYTE 000,076,140,140,156,146,146,076
5050  022342  000  146  146  .BYTE 000,146,146,146,176,146,146,146
5051  022352  000  074  030  .BYTE 000,074,030,030,030,030,030,074
5052  022362  000  006  006  .BYTE 000,006,006,006,006,006,146,074
5053  022372  000  146  154  .BYTE 000,146,154,170,160,170,154,146
5054  022402  000  140  140  .BYTE 000,140,140,140,140,140,140,176
5055  022412  000  146  176  .BYTE 000,146,176,176,146,146,146,146
5056  022422  000  146  146  .BYTE 000,146,146,166,156,146,146,146
5057  022432  000  074  146  .BYTE 000,074,146,146,146,146,146,074
5058  022442  000  174  146  .BYTE 000,174,146,146,174,140,140,140
5059  022452  000  074  146  .BYTE 000,074,146,146,146,156,156,166
5060  022462  000  174  146  .BYTE 000,174,146,146,174,170,154,146
5061  022472  000  076  140  .BYTE 000,076,140,140,074,006,006,174
5062  022502  000  176  030  .BYTE 000,176,030,030,030,030,030,030
5063  022512  000  146  146  .BYTE 000,146,146,146,146,146,146,074
5064  022522  000  146  146  .BYTE 000,146,146,146,146,074,074,030
5065  022532  000  146  146  .BYTE 000,146,146,146,146,176,176,146
5066  022542  000  146  146  .BYTE 000,146,146,074,030,074,146,146
5067  022552  000  146  146  .BYTE 000,146,146,074,030,030,030,030
5068  022562  000  176  006  .BYTE 000,176,006,014,030,060,140,176
5069  022572  000  170  140  .BYTE 000,170,140,140,140,140,140,170
5070  022602  000  140  140  .BYTE 000,140,140,060,030,014,006,006
5071  022612  000  036  006  .BYTE 000,036,006,006,006,006,006,036
5072  022622  030  074  176  .BYTE 030,074,176,377,030,030,030,030
5073  022632  030  034  036  .BYTE 030,034,036,377,377,036,034,030
5074  022642  030  030  030  .BYTE 030,030,030,030,377,176,074,030
5075  022652  030  070  170  .BYTE 030,070,170,377,377,170,070,030
5076  022662  000  377  377  .BYTE 000,377,377,377,377,377,377,377
5077  022672  000  000  377  .BYTE 000,000,377,377,377,377,377,377
5078  022702  000  000  000  .BYTE 000,000,000,377,377,377,377,377
5079  022712  000  000  000  .BYTE 000,000,000,000,377,377,377,377
5080  022722  000  000  000  .BYTE 000,000,000,000,000,377,377,377
5081  022732  000  000  000  .BYTE 000,000,000,000,000,000,377,377
5082  022742  000  000  000  .BYTE 000,000,000,000,000,000,000,377
5083  022752  374  374  374  .BYTE 374,374,374,374,374,374,374,374
5084  022762  374  374  374  .BYTE 374,374,374,374,374,374,374,374
5085  022772  370  370  370  .BYTE 370,370,370,370,370,370,370,370
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 5086  023002      360     360     360          .BYTE 360,360,360,360,360,360,360,360
 5087  023012      340     340     340          .BYTE 340,340,340,340,340,340,340,340
 5088  023022      300     300     300          .BYTE 300,300,300,300,300,300,300,300   ; 110
 5089  023032      300     300     300          .BYTE 300,300,300,300,300,300,300,300
 5090  023042      300     300     300          .BYTE 300,300,300,300,300,300,300,377
 5091  023052      377     003     003          .BYTE 377,003,003,003,003,003,003,003
 5092  023062      003     003     003          .BYTE 003,003,003,003,003,003,003,377
 5093  023072      377     300     300          .BYTE 377,300,300,300,300,300,300,300
 5094  023102      000     000     000          .BYTE 000,000,000,000,000,000,000,300
 5095  023112      300     000     000          .BYTE 300,000,000,000,000,000,000,000
 5096  023122      003     000     000          .BYTE 003,000,000,000,000,000,000,000
 5097  023132      000     000     000          .BYTE 000,000,000,000,000,000,000,003
 5098  023142      000     030     074          .BYTE 000,030,074,146,347,000,000,000
 5099  023152      030     030     070          .BYTE 030,030,070,060,140,060,070,030
 5100  023162      000     074     146          .BYTE 000,074,146,303,303,000,000,000
 5101  023172      030     070     160          .BYTE 030,070,160,140,140,160,070,030
 5102  023202      000     000     000          .BYTE 000,000,000,000,037,030,030,030
 5103  023212      030     030     030          .BYTE 030,030,030,030,370,000,000,000
 5104  023222      030     030     030          .BYTE 030,030,030,030,037,000,000,000
 5105  023232      000     000     000          .BYTE 000,000,000,000,370,030,030,030
 5106            001000                       .END    START
```

```
A      = 020000
ADDRES  007572
BAD     007564
BAKGND  007466
BAMSG   006653
BASADD  007542
BASE    007456
BASE1   007460
BASE1A  015370
BASE1B  015404
BASE1C  015422
BASE1D  015402
BASE10  015352
BASE11  007240
BASM10  015334
BAS10A  015360
BELL    013166
BELL1   013200
BLINK   007470
BUSSE1  016110
BUSSE2  016170
CALLPC  007600
CARX    007474
CARY    007476
CHAR    007550
CHRCOD  005716
CHRFIN  014656
CHXLST  007266
CNVFLG  007602
CRLF    014700
CSR0    007306
CSR1    007312
CSR10   007356
CSR11   007362
CSR12   007366
CSR13   007372
CSR14   007376
CSR15   007402
CSR16   007406
CSR17   007412
CSR18   007416
CSR19   007422
CSR2    007316
CSR20   007426
CSR3    007322
CSR4    007326
CSR5    007332
CSR6    007336
CSR7    007342
CSR8    007346
CSR9    007352
D      = 040000
DATA    007566
DBUF0   007310
DBUF1   007314
DBUF10  007360
DBUF11  007364
DBUF12  007370
DBUF13  007374
DBUF14  007400
DBUF15  007404
DBUF16  007410
DBUF17  007414
DBUF18  007420
DBUF19  007424
DBUF2   007320
DBUF20  007430
DBUF3   007324
DBUF4   007330
DBUF5   007334
DBUF6   007340
DBUF7   007344
DBUF8   007350
DBUF9   007354
DECMSG  007250
DEVBUF  007440
DEVCNT  007304
DEVCSR  007436
DEVFLG  007302
DEVLST  012374
EMSG1   007064
EMSG2   007070
EMSG3   007102
EMSG4   007113
EMSG5   007124
EMSG6   007135
EMSG7   007153
EMSG8   007166
EMSG9   007205
ENDIT   013062
ERHALT  017210
ERRARG  007576
ERRDIS  007574
ERRDI1  007442
ERRFLG  007444
ERROR   016666
ERRSV1  017036
ERRSV2  017064
ERRSV3  017112
ERRSV4  017140
ERRSV5  017166
FADR    013156
FASTSW  013306
FILL    012722
FILL1   012754
FLASH   007472
FORGND  007464
FRMMSG  006550
FSAVPW  007620
FSTCNT  007514
G      = 100000
GENER   016370
GENER1  016512
GENEX   016650
GENINC  016642
GENISH  016520
GENRAN  016522
GENROT  016475
GENR0   016464
GENR1   016454
GENSEL  016406
GEN0    016426
GEN1    016432
GEN25   016446
GEN52   016440
GETCH1  014236
GETCH2  014250
GETCH3  014362
GETCH4  014426
GETSTR  014232
GOMSG   006005
GOMS1   006144
GOOD    007562
HSWR   = 177570
ILLCHR  014636
ILLVEC  013226
ILVMSG  006516
JM600   007510
LINDEL  014552
LINDL1  014572
LINECH  014602
LOADFS  012410
LOELEM  012522
LOWCHR  007610
LSIFLG  012702
MODADM  006635
MODADR  007536
MODIFY  015450
MODI1   015500
MODI2   015524
MODI3   015544
MODI4   015656
MODI5   015714
MODPRM  006646
MODSAV  007540
MODSPA  006642
MODXIT  015734
MONIT   013546
MONITA  013640
MONITX  013646
NODEFM  006762
NOHALT  017230
NORCH   017242
NOSYNC  012032
NUMDEV  005660
NXMSG   006732
NXMTRP  016354
OCTIN   014034
OCTMSG  007256
OCTNUM  007230
ODAMSG  006707
PAL     007622
PALCH   021242
PARITY  007546
PASMSG  006500
PCHR    015012
PMSG1   014750
PMSG2   014774
PMSG3   015000
PMSG4   015004
PRCT1A  015046
PRNT3   015116
PROCT   015024
PROCT1  015034
PROCT2  015050
PROCT3  015102
PROM    007462
PSW    = 177776
P02CHR  007624
QEXIT1  013706
QEXIT2  013710
QEXIT3  013724
RANCLC  016622
RAND    007532
RANDC   007616
RANDN   007552
RANGEN  016542
RANMTA  007556
RANSEC  016626
RANSEL  007554
RANST   007560
RAN1    016554
RAN2    016572
RAN4    016630
REACT   001174
READ    014206
REDMES  006570
REPCNT  007506
RSTART  001200
RSTREG  013776
RUBCHR  014504
RUBFLG  007614
S      = 010000
SAVPC   007524
SAVPC1  007526
SAVREG  013740
SELBUS  015776
SETDEV  012162
SETENC  005627
SET56   005610
SILLSI  012640
SSWR    007504
START   001000
START1  001306
START2  001326
START3  001362
STATUS  007570
STRADD  007604
STRLEN  007606
SWR     007502
SWRMSG  006623
SWRSET  012704
SYNCUP  011644
TABLE   001366
TABLE1  001412
TABLE2  001436
TESTNG  006473
TESTNO  007454
TESTR   011624
TEST0   001450
TEST1   002040
TEST10  005264
TEST11  005362
TEST2   002174
TEST3   002354
TEST4   002616
TEST5   003110
TEST5A  003142
TEST6   004234
TEST7   004660
TKB    = 177562
TKS    = 177560
TPB    = 177566
TPDEC1  015154
TPDEC2  015234
TPDEC3  015272
TPDEC4  015306
TPDEC5  015316
TPREDY  013276
TPS    = 177564
TRAPSV  013326
TRPARG  007516
TRPBAK  013534
TRPERR  007544
TRPLP   013470
```

```
TRPMEM  007522        TYPOTD  014154        T0106   002130        T0518   003342        T0710   005074
TRPSCP  013444        TYPOTE  014172        T0201   002220        T0519   003374        T0711   005102
TRPSEL  007520        TYPOUT  014734        T0202   002276        T0520   003270        T0712   005220
TS0MSG  006360        T0001   001472        T0301   002400        T0601   004260        T0715   005254
TS1MSG  006365        T0002   001506        T0302   002470        T0602   004304        T1001   005310
TS1OMS  006462        T0003   001514        T0303   002442        T0603   004306        UPPCHR  007612
TS2MSG  006411        T0004   001532        T0304   002520        T0604   004372        VECTOR  012714
TS3MSG  006415        T0005   001600        T0305   002546        T0605   004430        VIDEON  007450
TS4MSG  006426        T0007   001634        T0401   002642        T0606   004436        WAITS   012040
TS5MSG  006433        T0009   001654        T0402   002656        T0607   004444        WAIT1   007452
TS6MSG  006441        T0010   001672        T0403   002720        T0615   004570        WMSG    006317
TS7MSG  006454        T0011   001740        T0406   002735        T0701   004704        XMAX    007446
TYPCTC  013656        T0013   001774        T0407   002776        T0702   004730        XXDPGO  001176
TYPDEC  015150        T0101   002064        T0409   003026        T0703   004732        XXDP2   001252
TYPD1   007534        T0102   002072        T0410   003052        T0704   005016        YMAX    007500
TYPOTA  007530        T0103   002102        T05XIT  004214        T0705   005032        SENDAD  013142
TYPOTB  014040        T0104   002110        T0501   003134        T0706   005044        .       = 023242
TYPOTC  014120        T0105   002122        T0502   003226        T0707   005056

. ABS.  023242      000

 ERRORS DETECTED:  0

 CVVTCA.BIN,CVVTCA.LPT/NL:TOC=CVVTCA.SRC
 RUN-TIME: 14 28 1 SECONDS
 RUN-TIME RATIO: 85/44=1.^
 CORE USED:  13K  (25 PAGES)
```