KG11-A

CYCLIC REDUNDANCY CHECK

MD-11-DZKGA-A

EP DZKGA A DL A

OCT 1976

FICHE 1 OF 1

digital

Made in U.S.A

.REPT 0

IDENTIFICATION

PRODUCT CODE: MAINDEC-11-DZKGA-A-D

PRODUCT NAME: KG11A - CYCLIC REDUNDANCY CHECK TEST

DATE CREATED: 21 MAY 75

MAINTAINER: DIAGNOSTIC GROUP

AUTHOR: D.K. MACOMBER

NOTE: THIS PROGRAM OBSOLETED MD-11-D8K

CONTENTS

ABSTRACT.

THIS PROGRAM TESTS THE LOGIC OF THE CYCLIC REDUNDANCY CHECK DEVICE (KG11A).

REQUIREMENTS.

A STANDARD PDP-11 (WITH OR WITHOUT A HARDWARE SWITCH REGISTER) AND A KG11

LOADING--STORAGE.

LOADING PROCEDURE FOR NORMAL BINARY TAPES SHOULD BE FOLLOWED.

DEVICE ADDRESS CHANGE.

TO CHANGE THE DEVICE ADDRESS (WHICH WAS LOADED AS 170700), CHANGE THE CONTENTS OF THE LOCATION "DEVADR" SHOWN ON PAGE 24/ SET THIS LOCATION TO THE ADDRESS OF THE CSR DESIRED, THEN START (OR RESTART) AS GIVEN IN OPERATION BELOW.

OPERATION.

1. THIS PROGRAM MAY BE OPERATED IN TWO MODES.

   A. FULL TEST MODE.
   THIS IS THE MAIN BODY OF THE PROGRAM AND SHOULD BE USED TO ACCEPT OR DIAGNOSE A DEVICE.
   TO RUN: START AT LOC. 200 WITH SWR15 SET.
   (DETAIL ON PAGE 5.)

   B. SELECT TEST MODE
   THIS IS A SUBPROGRAM TO ALLOW THE OPERATOR TO RUN A SELECT INSTRUCTION ON A SELECT DATA WORD.
   TO RUN: START AT LOC. 204 WITH SWR15 SET.
   SELECT INSTRUCTION ON SWR5-0.
   SELECT DATA WORD ON SWR11-6.
   (DETAIL ON PAGE 6.)

SWITCH REGISTER.

IF THE DIAGNOSTIC IS RUN ON A CPU WITHOUT A SWITCH REGISTER THEN A SOFTWARE SWITCH REGISTER IS USED WHICH ALLOWS THE USER THE SAME SWITCH OPTIONS AS THE HARDWARE SWITCH REGISTER. IF THE HARDWARE SWITCH REGISTER DOES NOT EXIST OR IF ONE DOES AND IT CONTAINS ALL ONES (177777) THEN THE SOFTWARE SWITCH REGISTER (LOC. 176) IS USED.

CONTROL:

THIS PROGRAM ALSO SUPPORTS THE DYNAMIC LOADING OF THE SOFTWARE SWITCH REGISTER (LOC. 176) FROM THE TTY. THIS CAN BE ACCOMPLISHED BY DOING THE FOLLOWING:

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

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

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

   A) TYPE A NUMBER TO BE LOADED INTO LOC. 176 FOLLOWED BY A (CR). (ONLY NUMBERS BETWEEN 0-7 WILL BE ACCEPTED AND ONLY 6 NUMBERS WILL BE ALLOWED)
   IF A (CR) IS THE FIRST KEY DEPRESSED THE SOFTWARE SWITCH REGISTER CONTENTS WILL NOT BE CHANGED.

   B) IF A CONTROL U (↑U) IS DEPRESSED THEN THE PROGRAM WILL SEND YOU BACK TO STEP 2.

1. SWR15 — SET, HALT ON ERROR.
   RESET, BYPASS ERROR.

2. SWR14 — SET, SCOPE LOOP ON ERROR.
   RESET, BYPASS ERROR.

3. SWR13 — SET, INHIBIT PRINTOUTS DURING SCOPE LOOP.
   RESET, ALLOW PRINTOUTS DURING SCOPE LOOP.

4. SWR12 — SET, INHIBIT TRACE TRAPPING.
   RESET, ALLOW TRACE TRAPPING.

5. SWR11 — SET, INHIBIT ITERATIONS.
   RESET, ALLOW ITERATIONS.

6. SWR11 - SWR6 AND SWR5 - SWR0 ARE DEFINED IN THE SELECT TEST MODE SECTION ON PG. 6 & 7.

FULL TEST MODE.

1. START OR RESTART.

   A. ZERO THE SWR

   B. LOAD 200 AND START

2. PROGRAM ACTION.

   A. WHENEVER THE PROGRAM IS STARTED, OR RESTARTED, THE TTY WILL TYPE: KG11A.

   B. IF THE SOFTWARE SWITCH REGISTER IS SELECTED THEN THE FOLLOWINIG WILL BE TYPED:
   SWR=XXXXXX NEW=(REFER TO SWITCH REGISTER SECTION FOR OPERATOR ACTIONS)

   C. IF THERE ARE NO ERRORS DETECTED, THE PROGRAM WILL LOOP INDEFINITELY AND WILL RING THE TTY BELL ONCE FOR EACH PASS. TRACE TRAP IS EFFECTIVE AND EACH SUBTEST IS BEING ITERATED 100 TIMES.

   D. IF AN ERROR OCCURS, A ONE LINE ERROR MESSAGE WILL BE TYPED ON THE TTY AND THE PROGRAM WILL HALT. (SEE THE ERROR SECTION ON PAGE 8.)

3. OPERATER CONTROL VIA THE SWR.

   (REFER TO SECTION ON SWITCH REGISTER SETTINGS FOR SOFTWARE SWITCH REGISTER.)

   A. SWR15 SET. (NORMAL)
   HALT ON ERROR AFTER ERROR MESSAGE IS TYPED.

   SWR15 RESET.
   TYPE THE ERROR MESSAGE AND CONTINUE TO THE NEXT ITERATION OF THE CURRENT TEST OR TO THE NEXT SUBTEST.

   B. SWR12 SET.
   INHIBIT TRACE TRAP.

   SWR12 RESET (NORMAL)
   ALLOW TRACE TRAP.

   C. SWR11 SET.
   INHIBIT ITERATIONS

   SWR11 RESET (NORMAL)
   ALLOW ITERATIONS

SELECT TEST MODE.

1. START OR RESTART.

   A. RESET SWR15 THRU SWR0.

   B. LOAD ADDRESS 204

   C. SELECT THE INSTRUCTION TO BE TESTED FROM THE LIST OF INSTRUCTIONS ON PAGE NN OF THE PROGRAM LISTING. SET SWR5 THRU SWR0 TO THE "I" NUMBER GIVEN WITH SAID INSTRUCTION.

   D. SELECT THE DATA WORD TO BE TESTED FROM THE LIST OF DATA WORDS GIVEN ON PAGES NN AND NN OF THE PROGRAM LISTING. SET SWR11 THRU SWR6 TO THE "D" NUMBER GIVEN WITH THE SAID DATA WORD.

   E. START.

   F. ****REFER TO SECTION ON SWITCH SETTINGS FOR SOFTWARE SWITCH REGISTER ACTION.

SPECIAL NOTES ON C. AND D. ABOVE.

1. THE SELECTED INSTRUCTION AND/OR THE SELECTED DATA MAY BE CHANGED WHILE THE PROGRAM IS RUNNING.
2. IF SWR11 THRU SWR6 ARE ALL RESET, THEN THE SELECTED INSTRUCTION WILL RUN ON ALL DATA WORDS.
3. IF SWR5 THRU SWR0 ARE ALL RESET THEN ALL INSTRUCTIONS WILL BE RUN ON THE SELECTED DATA WORD.
4. IF SWR11 THRU SWR6 AND SWR5 THRU SWR0 ARE ALL RESET, THEN ALL INSTRUCTIONS WILL BE RUN ON ALL DATA WORDS.

2. PROGRAM ACTION

A. IF THERE ARE NO ERRORS THE PROGRAM WILL LOOP THE SELECTED INSTRUCTION (SWR5-0) USING THE SELECTED DATA (SWR11-6). TRACE TRAP IS EFFECTIVE.

B. IF AN ERROR OCCURS, A ONE LINE ERROR MESSAGE WILL BE TYPED ON THE TTY AND THE PROGRAM WILL HALT. (SEE THE ERROR SECTION ON PAGE 8.)

(REFER TO SWITCH SETTING SECTION FOR USE OF SOFTWARE SWITCH REGISTER)

3. OPERATER CONTROL VIA THE SWR.

(REFER TO SECTION ON SWITCH SETTING'S FOR SOFTWARE SWITCH REGISTER DYNAMIC CHANGING.)

A SWR15 SET. (NORMAL)
HALT ON ERROR AFTER ERROR MESSAGE IS TYPED.

SWR15 RESET.
TYPE THE ERROR MESSAGE AND CONTINUE TESTING THE SELECTED INSTRUCTION (SWR5-0) USING THE SELECTED DATA (SWR11-6)

B. SWR12 SET.
INHIBIT TRACE TRAP.

SWR12 RESET. (NORMAL)
ALLOW TRACE TRAP.

C. SWR11 THRU SWR6.
SELECTED DATA WORD.

D. SWR5 THRU SR0.
SELECTED INSTRUCTION.

ERRORS

1. ERROR MESSAGE

***ROUTINE CHECKS FOR THE DYNAMIC CHANGING OF THE SOFTWARE SWITCH REGISTER REFER TO SWITCH SETTING SECTION FOR OPERATOR ACTION.
TESTX IXX DXX SXXXXXX HXXXXXX

TESTX (X = A OR B)
THIS IS THE NAME (TAG) OF THE TEST THAT WAS IN USE AT THE TIME OF THE ERROR.
TESTA IS ON PAGE 27 OF THE PROG. LIST.
TESTB IS ON PAGE 28 OF THE PROG. LIST.

IXX (XX = A NUMBER FROM 01 THRU 57)

THIS IS THE NAME/NUMBER (TAG) OF THE INSTRUCTION IN USE AT THE TIME OF THE ERROR.
R1 (INST. POINTER) POINTS AT THIS INSTRUCTION.
THE INSTRUCTION TABLE IS ON PAGE 18 OF THE PROG. LIST.

DXX (XX = A NUMBER FROM 01 THRU 77)

THIS IS THE NAME/NUMBER (TAG) OF THE DATA WORD IN USE AT THE TIME OF THE ERROR.
R2 (DATA WORD POINTER) POINTS AT THIS DATA WORD.
THE DATA WORD TABLE IS ON PG. 20 OF THE PROG. LIST.

SXXXXXX (XXXXXX = ANY 6 DIGIT, 16 BIT, OCTAL NUMBER)
THIS IS THE SIMULATED (GOOD) BCC WORD.

HXXXXXX (XXXXXX = ANY 6 DIGIT,16 BIT, OCTAL NUMBER)
THIS IS THE HARDWARE (BAD) BCC WORD.

DONE BIT: S\S (EACH X CAN =0 OR 1)
THIS IS THE STATUS OF THE DONE BIT (BIT 7 OF THE CSR).
THE FIRST NUMBER (X\) IS WHAT THE DONE BIT SHOULD BE (GOOD). THE SECOND NUMBER (\X) IS WHAT THE DONE BIT ACTUALLY WAS.

2. OPTIONS AFTER A HALT ON ERROR.

****IF THE SOFTWARE SWITCH REGISTER IS USED THEN THE OPERATOR CAN CHANGE THE SWREG LOCATION BY TYPING A ↑G AND THEN CONTINUING.***
A. SCOPE LOOP. SEE SCOPE LOOP SECTION.

B. BYPASS THIS ERROR AND CONTINUE TO THE NEXT ITERATION OR SUBTEST.

1. RESET SWR14 AND SWR15.

2. CONTINUE.

C. UTILIZE SELECT TEST MODE (PAGE 6)

SCOPE LOOP

ROUTINE CHECKS FOR ↑G FUNCTION.

1. SET UP.

   A. SET SWR14.

   B. RESET SWR15.

   C. CONTINUE.

2. PROGRAM ACTION.

   THE PROGRAM WILL SCOPE LOOP ON THE FAILING TEST FOR AS LONG AS SWR14 IS SET, AND SWR15 IS RESET.

3. OPERATOR CONTROL VIA THE SWR.

   A. SWR13 SET.
      INHIBIT ERROR TYPEOUTS.

      SWR13 RESET.
      ALLOW ERROR TYPEOUTS.

   B. SWR12 SET.
      INHIBIT TRACE TRAPS.

      SWR12 RESET.
      ALLOW TRACE TRAPS.

FORCED ERROR TYPEOUT.

IN THE EVENT OF AN UNEXPECTED OR ILLEGAL TRAP, OR AT ANY TIME THE OPERATOR DEEMS IT USEFUL, THE PROGRAM CAN BE HALTED (IF IT HASN'T ALREADY) AND A TYPEOUT CAN BE OBTAINED AS TO THE STATUS OF THE PROGRAM.

THIS TYPEOUT IS THE SAME ONE USED IN THE EVENT OF AN ACTUAL ERROR. (SEE ERROR MESSAGE ON PG. 8.)

1. HALT THE PROGRAM
2. START AT LOC. 210. (SWR SETTINGS ARE IMMATERIAL.)

THE TYPEOUT WILL BE MADE AND THE PROGRAM WILL HALT. THE PROGRAM CAN NOW BE RESTARTED. (SEE OPERATION, PG. 3.)

.ENDR

```
                        .LIST SEQ
                        .ENABLE ABS

                        ;KG11A CYCLIC REDUNDANCY CHECK DEVICE TEST.
                        ;COPYRIGHT 1976, DIGITAL EQUIPMENT CORP., MAYNARD, MASS. 01754.

                        ;PROGRAM OBSOLETES MD-11-D8K
                        ;RELEASED 21 MAY 76 BY SAM CARPENTER
                                ;SUPPORTS THE SOFTWARE SWITCH REGISTER LOC.176
                                ;ALSO SUPPORTS THE DYNAMIC LOADING OF LOC.  176

                                ;TRAP CATCHER (LOC. 0 TO LOC. 776)***********

                                .REPT   30
                                .+2
                                HALT                    ;TRAPPED TO PREVIOUS ADDRESS.
                                .ENDR


                                .REPT   30
                                .+2
                                HALT                    ;TRAPPED TO PREVIOUS ADDRESS.
                                .ENDR

                                .REPT   30
                                .+2
                                HALT                    ;TRAPPED TO PREVIOUS ADDRESS.
                                .ENDR

                                .REPT   30
                                .+2
                                HALT                    ;TRAPPED TO PREVIOUS ADDRESS.
                                .ENDR

                                .REPT   30
                                .+2
                                HALT                    ;TRAPPED TO PREVIOUS ADDRESS.
                                .ENDR

                                .REPT   10
                                .+2
                                HALT                    ;TRAPPED TO PREVIOUS ADDRESS.
                                .ENDR
```

```
                                .=14
000014  003654                  TRTRTN
000016  000340                  340
                                .=30
000030  002776                  ERR
000032  000340                  340
                                .=34
000034  003642                  SCORCD
000036  000340                  340

                                ;;SOFTWARE SWITCH REGISTER*********

                                .=176
000176  000000                  SWREG:  0               ;SOFTWARE SWITCH REGISTER

                                ;;PROGRAM STARTS**********

                                .=200
000200  000167  001452  NORMAL: JMP     IDENT
                                .=204
000204  000167  001476  SELECT: JMP     INTA
                                .=210
000210  000167  002734  FORERR: JMP     FORCER
```

```
                                        ;INSTRUCTION TABLE
                001000                          .=1000
        001000  000402                  I01:    000402          ;LRC8 1 STEP.
        001002  003716                          SMLRCF
        001004  001002                  I02:    001002          ;LRC8 2 STEPS.
        001006  003716                          SMLRCF
        001010  001402                  I03:    001402          ;LRC8 3 STEPS.
        001012  003716                          SMLRCF
        001014  002002                  I04:    002002          ;LRC8 4 STEPS.
        001016  003716                          SMLRCF
        001020  002402                  I05:    002402          ;LRC8 5 STEPS.
        001022  003716                          SMLRCF
        001024  003002                  I06:    003002          ;LRC8 6 STEPS.
        001026  003716                          SMLRCF
        001030  003402                  I07:    003402          ;LRC8 7 STEPS.
        001032  003716                          SMLRCF
        001034  004002                  I10:    004002          ;LRC8 10 STEPS.
        001036  003716                          SMLRCF
        001040  000403                  I11:    000403          ;LRC16 1 STEP.
        001042  003672                          SMLRCC
        001044  001003                  I12:    001003          ;LRC16 2 STEPS.
        001046  003672                          SMLRCC
        001050  001403                  I13:    001403          ;LRC16 3 STEPS.
        001052  003672                          SMLRCC
        001054  002003                  I14:    002003          ;LRC16 4 STEPS.
        001056  003672                          SMLRCC
        001060  002403                  I15:    002403          ;LRC16 5 STEPS.
        001062  003672                          SMLRCC
        001064  003003                  I16:    003003          ;LRC16 6 STEPS.
        001066  003672                          SMLRCC
        001070  003403                  I17:    003403          ;LRC16 7 STEPS.
        001072  003672                          SMLRCC
        001074  004003                  I20:    004003          ;LRC16 10 STEPS.
        001076  003672                          SMLRCC
        001100  000401                  I21:    000401          ;CRC16 1 STEP.
        001102  004026                          SMC16C
        001104  001001                  I22:    001001          ;CRC16 2 STEPS.
        001106  004026                          SMC16C
        001110  001401                  I23:    001401          ;CRC16 3 STEPS.
        001112  004026                          SMC16C
        001114  002001                  I24:    002001          ;CRC16 4 STEPS.
        001116  004026                          SMC16C
        001120  002401                  I25:    002401          ;CRC16 5 STEPS.
        001122  004026                          SMC16C
        001124  003001                  I26:    003001          ;CRC16 6 STEPS.
        001126  004026                          SMC16C
        001130  003401                  I27:    003401          ;CRC16 7 STEPS.
        001132  004026                          SMC16C
        001134  004001                  I30:    004001          ;CRC16 10 STEPS.
        001136  004026                          SMC16C
        001140  000405                  I31:    000405          ;CCITT 1 STEP.
        001142  004164                          SMCITC
        001144  001005                  I32:    001005          ;CCITT 2 STEPS.
        001146  004164                          SMCITC
```

```
533
534  001150  001405                 I33:    001405          ;CCITT 3 STEPS.
535  001152  004164                         SMCITC
536  001154  002005                 I34:    002005          ;CCITT 4 STEPS.
537  001156  004164                         SMCITC
538  001160  002405                 I35:    002405          ;CCITT 5 STEPS.
539  001162  004164                         SMCITC
540  001164  003005                 I36:    003005          ;CCITT 6 STEPS.
541  001166  004164                         SMCITC
542  001170  003405                 I37:    003405          ;CCITT 7 STEPS.
543  001172  004164                         SMCITC
544  001174  004005                 I40:    004005          ;CCITT 10 STEPS.
545  001176  004164                         SMCITC
546  001200  000400                 I41:    000400          ;CRC12 1 STEP.
547  001202  004314                         SMC12B
548  001204  001000                 I42:    001000          ;CRC12 2 STEPS.
549  001206  004314                         SMC12B
550  001210  001400                 I43:    001400          ;CRC12 3 STEPS.
551  001212  004314                         SMC12B
552  001214  002000                 I44:    002000          ;CRC12 4 STEPS.
553  001216  004314                         SMC12B
554  001220  002400                 I45:    002400          ;CRC12 5 STEPS.
555  001222  004314                         SMC12B
556  001224  003000                 I46:    003000          ;CRC12 6 STEPS.
557  001226  004314                         SMC12B
558  001230  000102                 I47:    000102          ;LRC8 ONE BYTE DATA.
559  001232  003710                         SMLRCE
560  001234  000112                 I50:    000112          ;LRC8 TWO BYTE DATA.
561  001236  003702                         SMLRCD
562  001240  000103                 I51:    000103          ;LRC16 ONE BYTE DATA.
563  001242  003664                         SMLRCB
564  001244  000113                 I52:    000113          ;LRC16 TWO BYTE DATA.
565  001246  003656                         SMLRCA
566  001250  000101                 I53:    000101          ;CRC16 ONE BYTE DATA.
567  001252  004020                         SMC16B
568  001254  000111                 I54:    000111          ;CRC16 TWO BYTE DATA.
569  001256  004012                         SMC16A
570  001260  000105                 I55:    000105          ;CCITT ONE BYTE DATA.
571  001262  004156                         SMCITB
572  001264  000115                 I56:    000115          ;CCITT TWO BYTE DATA
573  001266  004150                         SMCITA
574  001270  000100                 I57:    000100          ;CRC12 ONE BYTE DATA.
575  001272  004306                         SMC12A
576  001274  000102                 I60:    000102          ;RESERVED.
577  001276  003710                         SMLRCE
578  001300  000102                 I61:    000102          ;RESERVED.
579  001302  003710                         SMLRCE
580  001304  000102                 I62:    000102          ;RESERVED.
581  001306  003710                         SMLRCE
582  001310  000102                 I63:    000102          ;RESERVED.
583  001312  003710                         SMLRCE
584  001314  000102                 I64:    000102          ;RESERVED.
585  001316  003710                         SMLRCE
586  001320  000102                 I65:    000102          ;RESERVED
587  001322  003710                         SMLRCE
```

```
   588  001324  000102                  I66:    000102          ;RESERVED
   589  001326  003710                          SMLRCE
   590  001330  000102                  I67:    000102          ;RESERVED
   591  001332  003710                          SMLRCE
   592  001334  000102                  I70:    000102          ;RESERVED
   593  001336  003710                          SMLRCE
   594  001340  000102                  I71:    000102          ;RESERVED
   595  001342  003710                          SMLRCE
   596  001344  000102                  I72:    000102          ;RESERVED
   597  001346  003710                          SMLRCE
   598  001350  000102                  I73:    000102          ;RESERVED
   599  001352  003710                          SMLRCE
   600  001354  000102                  I74:    000102          ;RESERVED
   601  001356  003710                          SMLRCE
   602  001360  000102                  I75:    000102          ;RESERVED
   603  001362  003710                          SMLRCE
   604  001364  000102                  I76:    000102          ;RESERVED
   605  001366  003710                          SMLRCE
   606  001370  000102                  I77:    000102          ;RESERVED
   607  001372  003710                          SMLRCE
   608
```

```
609
610                                             ;DATA WORD TABLE
611  001374  000001                             D01:    000001
612  001376  000002                             D02:    000002
613  001400  000004                             D03:    000004
614  001402  000010                             D04:    000010
615  001404  000020                             D05:    000020
616  001406  000040                             D06:    000040
617  001410  000100                             D07:    000100
618  001412  000200                             D10:    000200
619  001414  000400                             D11:    000400
620  001416  001000                             D12:    001000
621  001420  002000                             D13:    002000
622  001422  004000                             D14:    004000
623  001424  010000                             D15:    010000
624  001426  020000                             D16:    020000
625  001430  040000                             D17:    040000
626  001432  100000                             D20:    100000
627  001434  177776                             D21:    177776
628  001436  177775                             D22:    177775
629  001440  177773                             D23:    177773
630  001442  177767                             D24:    177767
631  001444  177757                             D25:    177757
632  001446  177737                             D26:    177737
633  001450  177677                             D27:    177677
634  001452  177577                             D30:    177577
635  001454  177377                             D31:    177377
636  001456  176777                             D32:    176777
637  001460  175777                             D33:    175777
638  001462  173777                             D34:    173777
639  001464  167777                             D35:    167777
640  001466  157777                             D36:    157777
641  001470  137777                             D37:    137777
642  001472  077777                             D40:    077777
```

```
  643  001474  052525                  D41:    052525
  644  001476  125252                  D42:    125252
  645  001500  031463                  D43:    031463
  646  001502  146314                  D44:    146314
  647  001504  070707                  D45:    070707
  648  001506  107070                  D46:    107070
  649  001510  007417                  D47:    007417
  650  001512  170360                  D50:    170360
  651  001514  041045                  D51:    041045
  652  001516  136732                  D52:    136732
  653  001520  154321                  D53:    154321
  654  001522  023456                  D54:    023456
  655  001524  133333                  D55:    133333
  656  001526  044444                  D56:    044444
  657  001530  000000                  D57:    000000
  658  001532  177777                  D60:    177777
  659  001534  000000                  D61:    000000
  660  001536  111111                  D62:    111111
  661  001540  022222                  D63:    022222
  662  001542  133333                  D64:    133333
  663  001544  044444                  D65:    044444
  664  001546  155555                  D66:    155555
  665  001550  066666                  D67:    066666
  666  001552  177777                  D70:    177777
  667  001554  101010                  D71:    101010
  668  001556  111111                  D72:    111111
  669  001560  121212                  D73:    121212
  670  001562  131313                  D74:    131313
  671  001564  141414                  D75:    141414
  672  001566  151515                  D76:    151515
  673  001570  161616                  D77:    161616
```

```
                                        ;;EQUATES, CONSTANTS AND VARIABLES


                 000000                 R0=%0                  ;WORK.
                 000001                 R1=%1                  ;INSTRUCTION POINTER.
                 000002                 R2=%2                  ;DATA POINTER.
                 000003                 R3=%3                  ;DEVICE ADDRESS POINTER (BCC).
                 000004                 R4=%4                  ;WORK
                 000005                 R5=%5                  ;SUBROUTINES.
                 000006                 SP=%6                  ;STACK POINTER
                 000007                 PC=%7                  ;PC
                 000007                 R7=PC
 001572          177570                 SWR:    177570         ;SWITCH REGISTER.
                 177776                 PS=177776              ;PROCESSOR STATUS
                 104400                 SCOPE=TRAP
                 104000                 HLT=EMT
                 000240                 NOP=240
                 177560                 TKCSR=  177560         ;TTY KEYBOARD STATUS
                 177562                 TKDBR=  177562         ;TTY KEYBOARD BUFFER
                 177564                 TPCSR=  177564         ;PRINTER STATUS
                 177566                 TPDBR=  177566         ;PRINTER BUFFER
                 001000                 INTBEG=I01
                 001270                 INTEND=I57
                 001374                 DATBEG=D01
                 001570                 DATEND=D77
 001574  170700                 DEVADR: 170700
 001576  000000                 DFLG:   0
 001600  000000                 DFLGA:  0
 001602  000000                 EFLG:   0
 001604  000000                 HBCC:   0
 001606  000000                 HDONE:  0
 001610  000000                 IFLG:   0
 001612  000000                 IFLGA:  0
 001614  000000                 ITACNT: 0
 001616  000100                 ITANO:  100
 001620  000000                 OPSTAT: 0
 001622  000000                 OTACNT: 0
 001624  000000                 OTAWKA: 0
 001626  000000                 OTAWKB: 0
 001630  000000                 SELFLG: 0
 001632  000000                 SCORTN: 0
 001634  000000                 SMBCC:  0
 001636  000000                 SMBCCA: 0
 001640  000000                 SMCNT:  0
 001642  000000                 SMDATA: 0
 001644  000000                 SMDONE: 0
 001646  000000                 SMWKA:  0
 001650  000000                 SMWKB:  0
 001652  000000                 STCNT:  0
 001654  000000                 TEWK:   0
```

```
                                        ;;INIALIZATION
                                
001656  000005          IDENT:  RESET
001660  012706  001000          MOV     #1000,SP        ;SET SP TO 1000.
001664  004567  001602          JSR     R5,TYPE         ;TYPE THE PROG. NAME.
001670  045536  030507  040461  .ASCII  /↑KG11A↑←/
001676  057536
                                .EVEN
001700  005067  177724  INIT:   CLR     SELFLG          ;CLEAR SELFLG (START WAS FROM LOC. 200.)
001704  000402                  BR      INTB            ;BRANCH.
001706  005267  177716  INTA:   INC     SELFLG          ;SET SELFLG (START WAS FROM LOC. 204.)
001712  000005          INTB:   RESET
001714  005067  177662          CLR     EFLG
001720  012706  001000          MOV     #1000,SP
001724  004767  002532          JSR     PC,SUSWR        ;CHECK FOR HARDWARE SWITCH REGISTER
001730  016703  177640          MOV     DEVADR,R3       ;R3 ← DEVICE ADDRESS.
001734  005723                  TST     (R3)+           ;ADJUST R3 TO POINT AT BCC.
001736  004567  000012          JSR     R5,OPCHG        ;READ SWR & SET UP PROG. ACCORDINGLY.
001742  005767  177662          TST     SELFLG          ;WAS START FROM LOC. 200?
001746  001434                  BEQ     FULMOD          ;YES - BRANCH.
001750  000167  000266          JMP     SELMOD          ;NO. - JUMP.

001754  017767  177612  177636  OPCHG:  MOV     @SWR,OPSTAT     ;STORE SWR.
001762  052767  000020  176006          BIS     #20,PS          ;SET "T" BIT IN PS.
001770  032767  010000  177622          BIT     #10000,OPSTAT   ;INHIBIT TRACE TRAP?
001776  001403                  BEQ     OPCA            ;NO. - BRANCH
002000  042767  000020  175770          BIC     #20,PS          ;YES. - CLEAR "T" BIT IN PS.
002006  005767  177616  OPCA:   TST     SELFLG          ;SELECT MODE (START WAS FROM 202)?
002012  001011                  BNE     OPCB            ;YES. - BRANCH.
002014  016767  177576  177572  MOV     ITANO,ITACNT    ;NO. - SET ITERATE CNT. TO ITERATE NO.
002022  032767  004000  177570  BIT     #4000,OPSTAT    ;INHIBIT ITERATIONS?
002030  001402                  BEQ     OPCB            ;NO. - BRANCH.
002032  005067  177556          CLR     ITACNT          ;YES. - CLEAR ITERATE COUNTER
002036  000205          OPCB:   RTS     R5              ;RETURN.
```

```
                                        ;FULL TEST MODE. CONTROL THE TESTING OF ALL KG11 INSTRUCTIONS
                                        ;IN THE INSTRUCTION TABLE USING ALL DATA WORDS IN THE DATA
                                        ;WORD TABLE WITH EACH INSTRUCTION.

002040  012701  001000          FULMOD: MOV     #INTBEG,R1      ;INST. POINTER (R1) SET TO BEGIN OF INST. TABLE.
002044  012702  001374          FULA:   MOV     #DATBEG,R2      ;DATA POINTER (R2) SET TO BEGIN OF DATA TABLE.
002050  116167  000001  177562  FULB:   MOVB    +1(R1),SMCNT    ;STEP COUNT (IF ANY) SET FOR SIMULATE.
002056  004767  002474          JSR     PC,CKSWR        ;CHECK FOR CNTL G TO LOAD SWR
002062  005067  177546          CLR     SMBCC           ;SIMULATED BCC SET TO 0.
002066  052767  000200  177550  BIS     #200,SMDONE     ;SET THE SIMULATED DONE BIT.
002074  004571  000002          JSR     R5,@+2(R1)      ;SIMULATE INST. (VIA R1) ON DATA (VIA R2).
002100  105761  000001          FULC:   TSTB    +1(R1)          ;IS THE INST. A STEP TYPE?
002104  001413                  BEQ     FULE            ;NO - BRANCH.
002106  031127  004000          BIT     (R1),#4000      ;YES. - IS THE INST. I10,I20,I30, OR I40?
002112  001005                  BNE     FULD            ;YES. - BRANCH.
002114  021167  177104          CMP     (R1),I46        ;NO. - IS THE INST. I46?
002120  001402                  BEQ     FULD            ;YES. - BRANCH.
002122  005067  177516          CLR     SMDONE          ;NO. - CLEAR THE SIMULATED DONE BIT.
002126  004567  000440          FULD:   JSR     R5,TESTA        ;DO TEST A (STEP INST. TEST).
002132  000402                  BR      FULF            ;BRANCH.
002134  004567  000550          FULE:   JSR     R5,TESTB        ;NO. - DO TEST B (NON-STEP INST. TEST).
002140  027767  177426  177452  FULF:   CMP     @SWR,OPSTAT     ;HAS OPERATION STATUS STATUS (SWR) CHANGED?
002146  001403                  BEQ     FULG            ;NO. - BRANCH.
002150  004567  177600          JSR     R5,OPCHG        ;YES. - GO SET UP NEW OPERATION STATUS.
002154  000731                  BR      FULMOD          ;BRANCH.
002156  032767  004000  177434  FULG:   BIT     #4000,OPSTAT    ;NO. - ITERATE?
002164  001006                  BNE     FULH            ;NO. - BRANCH
002166  005367  177422          DEC     ITACNT          ;YES. - DECREMENT ITERATE COUNTER.  IS IT=0?
002172  001342                  BNE     FULC            ;NO. - BRANCH.  (KEEP ITERATING).
002174  016767  177416  177412  MOV     ITANO,ITACNT    ;YES. - SET ITERATE CTR. TO ITERATE NUMBER.
002202  020227  001570          FULH:   CMP     R2,#DATEND      ;HAVE ALL DATA WORDS BEEN TESTED?
002206  001403                  BEQ     FULI            ;YES - BRANCH.
002210  062702  000002          ADD     #2,R2           ;NO. - ADVANCE DATA POINTER (R2).
002214  000715                  BR      FULB            ;BRANCH.
002216  020127  001270          FULI:   CMP     R1,#INTEND      ;HAVE ALL INSTS. BEEN TESTED?
002222  001403                  BEQ     FULJ            ;YES. - BRANCH.
002224  062701  000004          ADD     #4,R1           ;NO. - ADVANCE INST. POINTER (R1).
002230  000705                  BR      FULA            ;BRANCH.
002232  004567  001234          FULJ:   JSR     R5,TYPE         ;YES.  PASS COMPLETE.  RING TTY BELL.
002236  057407                  057407
002240  000677                  BR      FULMOD          ;BRANCH.
```

```
804
805                                     ;SELECT TEST MODE.  CONTROL THE TESTING OF THE INSTRUCTION SELECTED
806                                     ;ON SWR5-0 (00=ALL INSTS.) USING THE DATA WORD SELECTED ON SWR11-6.
807
808  002242  012701  001000           SELMOD: MOV     #INTBEG,R1      ;INST. POINTER (R1) SET TO THE INST.
809  002246  016767  177346  177334           MOV     OPSTAT,IFLG     ;SELECTED ON SR BITS 5-0.
810  002254  042767  177700  177326           BIC     #177700,IFLG
811  002262  016767  177322  177322           MOV     IFLG,IFLGA
812  002270  001412                           BEQ     SELA
813  002272  000241                           CLC
814  002274  006167  177310                   ROL     IFLG
815  002300  006167  177304                   ROL     IFLG
816  002304  162767  000004  177276           SUB     #4,IFLG
817  002312  066701  177272                   ADD     IFLG,R1
818  002316  012702  001374           SELA:   MOV     #DATBEG,R2      ;DATA POINTER (R2) SET TO THE DATA
819  002322  016767  177272  177246           MOV     OPSTAT,DFLG     ;WORD SELECTED ON SR BITS 11-6
820  002330  042767  170077  177240           BIC     #170077,DFLG
821  002336  016767  177234  177234           MOV     DFLG,DFLGA
822  002344  001420                           BEQ     SELB
823  002346  000241                           CLC
824  002350  006067  177222                   ROR     DFLG
825  002354  006067  177216                   ROR     DFLG
826  002360  006067  177212                   ROR     DFLG
827  002364  006067  177206                   ROR     DFLG
828  002370  006067  177202                   ROR     DFLG
829  002374  162767  000002  177174           SUB     #2,DFLG
830  002402  066702  177170                   ADD     DFLG,R2
831  002406  004767  002144           SELB:   JSR     PC,CKSWR        ;CHECK FOR CNTL G TO LOAD SWREG
832  002412  116167  000001  177220           MOVB    +1(R1),SMCNT    ;STEP COUNT (IF ANY) SET FOR SIMULATE.
833  002420  005067  177210                   CLR     SMBCC           ;SIMULATED BCC SET TO 0.
834  002424  052767  000200  177212           BIS     #200,SMDONE     ;SET THE SIMULATED DONE BIT.
835  002432  004571  000002                   JSR     R5,@+2(R1)      ;SIMULATE INST. (VIA R1) ON DATA (VIA R2).
836  002436  105761  000001                   TSTB    +1(R1)          ;IS THE INST. A STEP TYPE?
837  002442  001413                           BEQ     SELD            ;NO. - BRANCH.
838  002444  031127  004000                   BIT     (R1),#4000      ;YES. - IS THE INST. I10,I20,I30, OR I40?
839  002450  001005                           BNE     SELC            ;YES. - BRANCH.
840  002452  021167  176546                   CMP     (R1),I46        ;NO. - IS THE INST. I46?
841  002456  001402                           BEQ     SELC            ;YES. - BRANCH.
842  002460  005067  177160                   CLR     SMDONE          ;NO. - CLEAR THE SIMULATED DONE BIT.
843  002464  004567  000102           SELC:   JSR     R5,TESTA        ;DO TEST A (STEP INST TEST).
844  002470  000402                           BR      SELE            ;BRANCH.
845  002472  004567  000212           SELD:   JSR     R5,TESTB        ;NO - DO TEST B (NON-STEP INST. TEST).
846  002476  026777  177116  177066   SELE:   CMP     OPSTAT,@SWR     ;HAS OPERATION STATUS (SWR SETTINGS) CHANGED?
847  002504  001403                           BEQ     SELF            ;NO. - BRANCH.
848  002506  004567  177242                   JSR     R5,OPCHG        ;YES. - GO SET UP NEW OPERATION STATUS.
849  002512  000653                           BR      SELMOD          ;BRANCH.
850  002514  005767  177060           SELF:   TST     DFLGA           ;IS DATA FLAGA NON-ZERO?
851  002520  001010                           BNE     SELH            ;YES. - DATA POINTER (R2) IS FROZEN. - BRANCH.
852  002522  020227  001570                   CMP     R2,#DATEND      ;NO. - HAVE ALL DATA WORDS BEEN TESTED?
853  002526  001403                           BEQ     SELG            ;YES. - BRANCH.
854  002530  062702  000002                   ADD     #2,R2           ;NO. - ADVANCE DATA POINTER (R2).
855  002534  000724                           BR      SELB            ;BRANCH.
856  002536  012702  001374           SELG:   MOV     #DATBEG,R2      ;DATA POINTER (R2) SET TO BEGIN OF DATA TABLE.
857  002542  005767  177044           SELH:   TST     IFLGA           ;IS INST. FLAGA NON-ZERO?
858  002546  001317                           BNE     SELB            ;YES. - INST. POINTER (R1) IS FROZEN (BRANCH).
859  002550  020127  001270                   CMP     R1,#INTEND      ;NO. - HAVE ALL INSTS. BEEN TESTED?
```

```
   860  002554  001403                        BEQ     SELI            ;YES. - BRANCH.
   861  002556  062701  000004                ADD     #4,R1           ;NO. - ADVANCE INST. POINTER (R1).
   862  002562  000711                        BR      SELB            ;BRANCH.
   863  002564  012701  001000        SELI:   MOV     #INTBEG,R1      ;INST. POINTER (R1) SET TO BEGIN OF INST. TABLE.
   864  002570  000706                        BR      SELB            ;BRANCH.
   865
```

```
                                        ;TEST A.
                                        ;TEST THE INSTRUCTION POINTED AT BY R1 USING THE DATA WORD
                                        ;POINTED AT BY R2.  (HIGH BYTE OF THE INST. WORD IS THE STEP COUNT
                                        ;& LOW BYTE IS THE ACTUAL INST.)  THE FINAL RESULT IS STORED
                                        ;INTO LOC. "HBCC" TO BE COMPARED WITH THE SIMULATED RESULT
                                        ;WHICH HAS BEEN STORED IN LOC. "SMBCC".

002572  104400                  TESTA:  SCOPE                   ;GO RECORD ENTRY TO THIS TEST.
002574  116167  000001  177050          MOVB    +1(R1),STCNT    ;SET UP STEP COUNT.
002602  012763  000020  177776          MOV     #20,-2(R3)      ;CLEAR THE BCC & THE DONE BIT.
002610  111163  177776                  MOVB    (R1),-2(R3)     ;MOVE INST. TO CSR.
002614  011263  000002                  MOV     (R2),+2(R3)     ;MOVE DATA TO DBR.
002620  052763  000040  177776  TAA:    BIS     #40,-2(R3)      ;STEP (SHIFT) ONE.
002626  000240                          NOP                     ;PAUSE.
002630  016367  177776  176750          MOV     -2(R3),HDONE    ;READ & STORE CSR (DONE BIT)
002636  011367  176742                  MOV     (R3),HBCC       ;READ & STORE BCC.
002642  005367  177004                  DEC     STCNT           ;IS STEP COUNT = 0?
002646  001364                          BNE     TAA             ;NO - BRANCH.
002650  042767  177577  176730          BIC     #177577,HDONE   ;YES. - CLEAR ALL BUT THE DONE BIT.
002656  026767  176724  176760          CMP     HDONE,SMDONE    ;HARDWARE DONE BIT = SIMULATED DONE BIT?
002664  001004                          BNE     TAB             ;NO. - BRANCH. (ERROR)
002666  026767  176712  176740          CMP     HBCC,SMBCC      ;YES. - HARDWARE BCC = SIMULATED BCC?
002674  001401                          BEQ     TAC             ;YES. - BRANCH.
002676  104000                  TAB:    HLT                     ;NO. - TRAP TO ERROR HANDLER.
002700  005767  176676          TAC:    TST     EFLG            ;IS AN ERROR SCOPE LOOP RUNNING?
002704  001374                          BNE     TAB             ;YES. - BRANCH.
002706  000205                          RTS     R5              ;NO. - RETURN.
```

```
                                        ;TEST B.
                                        ;TEST THE INSTRUCTION POINTED AT BY R1 USING THE DATA WORD
                                        ;POINTED AT BY R2.  THE RESULT IS STORED IN LOC. "HBCC" TO BE
                                        ;COMPARED WITH THE SIMULATED RESULT WHICH HAS BEEN STORED
                                        ;IN LOC. "SMBCC".

002710  104400                  TESTB:  SCOPE                   ;GO RECORD ENTRY TO THIS TEST.
002712  012763  000020  177776          MOV     #20,-2(R3)      ;CLEAR THE BCC.
002720  011163  177776                  MOV     (R1),-2(R3)     ;MOVE INST. TO CSR.
002724  011263  000002                  MOV     (R2),+2(R3)     ;MOVE DATA TO DBR (COMPUTE BCC).
002730  000240                          NOP                     ;PAUSE.
002732  016367  177776  176646          MOV     -2(R3),HDONE    ;READ & STORE CSR (DONE BIT)
002740  011367  176640                  MOV     (R3),HBCC       ;READ & STORE BCC.
002744  032767  000200  176634          BIT     #200,HDONE      ;IS DONE BIT = 1?
002752  001404                          BEQ     TBA             ;NO. - BRANCH. (ERROR)
002754  026767  176624  176652          CMP     HBCC,SMBCC      ;HARDWARE BCC = SIMULATED BCC?
002762  001401                          BEQ     TBB             ;YES. - BRANCH.
002764  104000                  TBA:    HLT                     ;NO. - TRAP TO ERROR HANDLER.
002766  005767  176610          TBB:    TST     EFLG            ;IS AN ERROR SCOPE LOOP RUNNING.
002772  001374                          BNE     TBA             ;YES. - BRANCH.
002774  000205                          RTS     R5              ;NO. - RETURN.
```

```
                                        ;TRAP SERVICE ROUTINE (CALLED BY PSUEDO-OP HLT)
                                        ;ERROR HANDLER. - TYPEOUTS - HALT - SCOPE LOOP.

002776  004767  001554          ERR:  JSR   PC,CKSWR        ;CHECK FOR CNTL G TO LOAD SWREG
003002  005767  176574                TST   EFLG            ;FIRST ERR CALL FOR CURRENT TEST?
003006  001003                      BNE   ERA             ;NO. - BRANCH.
003010  005267  176566              INC   EFLG            ;YES. - SET ERR FLAG.
003014  000404                      BR    ERB             ;BRANCH. (UNCONDITIONAL TYPE OUT).
003016  032767  020000  176574 ERA:  BIT   #20000,OPSTAT   ;INHIBIT TYPE OUT?
003024  001002                      BNE   ERC             ;YES. - BRANCH.
003026  004567  000130          ERB:  JSR   R5,TYPERR       ;NO. - TYPE ERR MESSAGE.
003032  032777  100000  176532 ERC:  BIT   #100000,@SWR    ;HALT ON ERR?
003040  001401                      BEQ   ERD             ;NO. - BRANCH.
003042  000000                      HALT                  ;YES. - HALT HERE AND WAIT FOR OPERATOR.
003044  004767  001506          ERD:  JSR   PC,CKSWR                ;CHECK FOR CNTL G TO LOAD SWREG
003050  027767  176516  176542      CMP   @SWR,OPSTAT     ;HAS OPERATION STATUS (SWR) CHANGED?
003056  001402                      BEQ   ERE             ;NO. - BRANCH.
003060  004567  176670              JSR   R5,OPCHG        ;YES - GO SET UP NEW OPERATION STATUS.
003064  032767  040000  176526 ERE:  BIT   #40000,OPSTAT   ;SCOPE LOOP?
003072  001403                      BEQ   ERF             ;NO. - BRANCH.
003074  022626                      CMP   (SP)+,(SP)+     ;YES. - POP STACK
003076  000177  176530              JMP   @SCORTN         ;RETURN (SCOPE LOOP).
003102  005067  176474          ERF:  CLR   EFLG            ;CLEAR ERR FLAG.
003106  005767  176516              TST   SELFLG          ;SELECT MODE?
003112  001001                      BNE   ERG             ;YES. - BRANCH.
003114  000002                      RTI                   ;NO. - RETURN (CONTINUE TESTING).
003116  032777  000077  176446 ERG:  BIT   #77,@SWR        ;SWR5-0 = 0?
003124  001410                      BEQ   ERH             ;YES. - BRANCH.
003126  032777  007700  176436      BIT   #7700,@SWR      ;NO. - SWR6-11 = 0?
003134  001404                      BEQ   ERH             ;YES. - BRANCH.
003136  062706  000006              ADD   #6,SP           ;NO. - POP STACK.
003142  000167  177074              JMP   SELMOD          ;RESTART AT SELMOD.
003146  000002                  ERH:  RTI                   ;RETURN (CONTINUE TESTING).


003150  000005          FORCER: RESET                     ;FORCE AN ERROR-TYPE TYPEOUT
003152  004567  000004              JSR   R5,TYPERR       ;WHENEVER STARTED FROM LOC.210,
003156  000000          FEA:  HALT                        ;THEN HALT.
003160  000776                      BR    FEA
```

```
                                        ;SUBROUTINE - SET UP AND TYPE THE ERROR MESSAGE THAT STARTS AT EMA.

003162  105761  000001          TYPERR: TSTB    +1(R1)
003166  001404                          BEQ     TEA
003170  012767  020101  000214          MOV     #20101,EMC
003176  000403                          BR      TEB
003200  012767  020102  000204  TEA:    MOV     #20102,EMC
003206  010167  176442          TEB:    MOV     R1,TEWK
003212  162767  000774  176434          SUB     #INTBEG-4,TEWK
003220  006067  176430                  ROR     TEWK
003224  006067  176424                  ROR     TEWK
003230  042767  177700  176416          BIC     #177700,TEWK
003236  004567  000306                  JSR     R5,OTA
003242  001654                          TEWK
003244  003420                          EMF
003246  000002                          2
003250  010267  176400                  MOV     R2,TEWK
003254  162767  001372  176372          SUB     #DATBEG-2,TEWK
003262  006067  176366                  ROR     TEWK
003266  042767  177700  176360          BIC     #177700,TEWK
003274  004567  000250                  JSR     R5,OTA
003300  001654                          TEWK
003302  003425                          EMH+1
003304  000002                          2
003306  004567  000236                  JSR     R5,OTA
003312  001634                          SMBCC
003314  003436                          EMM
003316  000006                          6
003320  004567  000224                  JSR     R5,OTA
003324  001604                          HBCC
003326  003447                          EMQ+1
003330  000006                          6
003332  112767  000061  000123          MOVB    #61,EMX+1
003340  032767  000200  176276          BIT     #200,SMDONE
003346  001003                          BNE     TEC
003350  112767  000060  000105          MOVB    #60,EMX+1
003356  112767  000061  000101  TEC:    MOVB    #61,EMY+1
003364  032767  000200  176214          BIT     #200,HDONE
003372  001003                          BNE     TED
003374  112767  000060  000063          MOVB    #60,EMY+1
003402  004567  000064          TED:    JSR     R5,TYPE
003406  042524                  EMA:    .ASCII  /TE/
003410  052123                  EMB:    .ASCII  /ST/
003412  020077                  EMC:    .ASCII  /? /
003414  044440                  EMD:    .ASCII  / I/
003416  037477                  EME:    .ASCII  /??/
003420  020040                  EMF:    .ASCII  /  /
003422  037504                  EMG:    .ASCII  /D?/
```

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  1007  003424  020077                    EMH:    .ASCII  /? /
  1008  003426  051440                    EMI:    .ASCII  / S/
  1009  003430  037477                    EMJ:    .ASCII  /??/
  1010  003432  037477                    EMK:    .ASCII  /??/
  1011  003434  037477                    EML:    .ASCII  /??/
  1012  003436  020040                    EMM:    .ASCII  /  /
  1013  003440  037510                    EMN:    .ASCII  /H?/
  1014  003442  037477                    EMO:    .ASCII  /??/
  1015  003444  037477                    EMP:    .ASCII  /??/
  1016  003446  020077                    EMQ:    .ASCII  /? /
  1017  003450  042040                    EMR:    .ASCII  / D/
  1018  003452  047117                    EMS:    .ASCII  /ON/
  1019  003454  020105                    EMU:    .ASCII  /E /
  1020  003456  044502                    EMV:    .ASCII  /BI/
  1021  003460  035124                    EMW:    .ASCII  /T:/
  1022  003462  037440                    EMX:    .ASCII  / ?/
  1023  003464  037534                    EMY:    .ASCII  /\?/
  1024  003466  057536                    EMZ:    .ASCII  /↑←/
  1025  003470  000205                            RTS     R5
```

```
1026
1027                                    ;SUBROUTINE - TYPE ON THE TTY THE MESSAGE IMMEDIATELY FOLLOWING
1028                                    ;THE CALL TO THIS SUBROUTINE.  UP-ARROW (↑) CAUSES A CRLF AND BACK-ARROW
1029                                    ;(←) CAUSES TERMINATION OF TYPEOUT.  RETURN WILL BE TO THE INSTRUCTION
1030                                    ;FOLLOWING THE MESSAGE.
1031   003472  105767  174066          TYPE:   TSTB    TPCSR
1032   003476  100375                          BPL     TYPE
1033   003500  121527  000136                  CMPB    (R5),#136
1034   003504  001005                          BNE     TPA
1035   003506  105725                          TSTB    (R5)+
1036   003510  004567  177756                  JSR     R5,TYPE
1037   003514  005015                          005015
1038   003516  000137                          000137
1039   003520  121527  000137          TPA:    CMPB    (R5),#137
1040   003524  001403                          BEQ     TPB
1041   003526  112567  174034                  MOVB    (R5)+,TPDBR
1042   003532  000757                          BR      TYPE
1043   003534  105725                  TPB:    TSTB    (R5)+
1044   003536  032705  000001                  BIT     #1,R5
1045   003542  001401                          BEQ     TPC
1046   003544  005205                          INC     R5
1047   003546  000205                  TPC:    RTS     R5
```

```
1048
1049                                    ;SUBROUTINE - OCTAL TO ALPHA CONVERSION ACCORDING TO THE THREE WORDS
1050                                    ;IMMEDIATELY FOLLOWING THE CALL TO THIS SUBROUTINE.  THE FIRST WORD POINTS
1051                                    ;AT THE WORD TO BE CONVERTED.  THE SECOND WORD POINTS AT THE STARTING
1052                                    ;LOC. WHERE THE RESULT IS TO BE MOVED.  THE THIRD WORD IS THE NUMBER
1053                                    ;OF CHARACTERS TO BE CONVERTED AND MOVED.  RETURN WILL BE TO THE
1054                                    ;INSTRUCTION FOLLOWING THESE THREE WORDS.
1055
1056  003550  013567  176050           OTA:    MOV     @(R5)+,OTAWKA
1057  003554  012504                           MOV     (R5)+,R4
1058  003556  012567  176040                   MOV     (R5)+,OTACNT
1059  003562  016767  176036  176036  OTALA:  MOV     OTAWKA,OTAWKB
1060  003570  000241                           CLC
1061  003572  006067  176026                   ROR     OTAWKA
1062  003576  000241                           CLC
1063  003600  006067  176020                   ROR     OTAWKA
1064  003604  000241                           CLC
1065  003606  006067  176012                   ROR     OTAWKA
1066  003612  042767  177770  176006          BIC     #177770,OTAWKB
1067  003620  052767  000060  176000          BIS     #60,OTAWKB
1068  003626  116744  175774                   MOVB    OTAWKB,-(R4)
1069  003632  005367  175764                   DEC     OTACNT
1070  003636  001351                           BNE     OTALA
1071  003640  000205                           RTS     R5
1072
1073
```

```
1074
1075                                    ;TRAP SERVICE ROUTINE - SCOPE = TRAP.
1076
1077  003642  011667  175764            SCORCD: MOV     (SP),SCORTN     ;SAVE THE STARTING LOC. OF TESTA OR TESTB.
1078  003646  004767  000704                    JSR     PC,CKSWR        ;CHECK FOR CNTL G TO LOAD SWREG
1079  003652  000002                           RTI                     ;RETURN.
1080
1081                                    ;TRAP SERVICE ROUTINE - "T" BIT SET =TRAP.
1082
1083  003654  000002                    TRTRTN: RTI                     ;GOOD BOY, NOW RETURN.
1084
```

```
 1085                                          ;SUBROUTINE - SIMULATE ALL MODES OF LRC
 1086  003656  012767  000010  175754  SMLRCA: MOV     #10,SMCNT       ;ENTRY LRC16 DOUBLE BYTE DATA.
 1087  003664  062767  000010  175746  SMLRCB: ADD     #10,SMCNT       ;ENTRY LRC16 SINGLE BYTE DATA.
 1088  003672  042767  100000  000070  SMLRCC: BIC     #100000,SMLRCJ  ;ENTRY STEP LRC16.
 1089  003700  000411                          BR      SMLRCG
 1090  003702  012767  000010  175730  SMLRCD: MOV     #10,SMCNT       ;ENTRY LRC8 DOUBLE BYTE DATA.
 1091  003710  062767  000010  175722  SMLRCE: ADD     #10,SMCNT       ;ENTRY LRC8 SINGLE BYTE DATA.
 1092  003716  052767  100000  000044  SMLRCF: BIS     #100000,SMLRCJ  ;ENTRY STEP LRC8.
 1093  003724  005767  175710          SMLRCG: TST     SMCNT
 1094  003730  001002                          BNE     SMLRCH
 1095  003732  005267  175702                  INC     SMCNT
 1096  003736  016767  175672  175672  SMLRCH: MOV     SMBCC,SMBCCA
 1097  003744  011267  175672                  MOV     (R2),SMDATA
 1098  003750  016767  175660  175670  SMLRCI: MOV     SMBCC,SMWKA
 1099  003756  066767  175660  175662          ADD     SMDATA,SMWKA
 1100  003764  006067  175656                  ROR     SMWKA
 1101  003770  006067  175640          SMLRCJ: ROR     SMBCC           ;INSTR. MODIFIED:  LRC16=ROR   LRC8=RORB.
 1102  003774  000241                          CLC
 1103  003776  006067  175640                  ROR     SMDATA
 1104  004002  005367  175632                  DEC     SMCNT
 1105  004006  001360                          BNE     SMLRCI
 1106  004010  000205                          RTS     R5
 1107
```

```
1108
1109
1110                                    ;SUBROUTINE - SIMULATE ALL MODES OF CRC16.
1111
1112  004012  012767  000010  175620  SMC16A: MOV     #10,SMCNT       ;ENTRY CRC16 DOUBLE BYTE DATA.
1113  004020  062767  000010  175612  SMC16B: ADD     #10,SMCNT       ;ENTRY CRC16 SINGLE BYTE DATA.
1114  004026  005767  175606          SMC16C: TST     SMCNT           ;ENTRY STEP CRC16.
1115  004032  001002                          BNE     SMC16D
1116  004034  005267  175600                  INC     SMCNT
1117  004040  016767  175570  175570  SMC16D: MOV     SMBCC,SMBCCA
1118  004046  011267  175570                  MOV     (R2),SMDATA
1119  004052  016767  175556  175566  SMC16E: MOV     SMBCC,SMWKA
1120  004060  066767  175556  175550          ADD     SMDATA,SMWKA
1121  004066  000241                          CLC
1122  004070  006067  175540                  ROR     SMBCC
1123  004074  000241                          CLC
1124  004076  006067  175540                  ROR     SMDATA
1125  004102  006067  175540                  ROR     SMWKA
1126  004106  103014                          BCC     SMC16F
1127  004110  012767  120001  175530          MOV     #120001,SMWKA
1128  004116  046767  175512  175522          BIC     SMBCC,SMWKA
1129  004124  042767  120001  175502          BIC     #120001,SMBCC
1130  004132  066767  175510  175474          ADD     SMWKA,SMBCC
1131  004140  005367  175474          SMC16F: DEC     SMCNT
1132  004144  001342                          BNE     SMC16E
1133  004146  000205                          RTS     R5
1134
1135                                    ;SUBROUTINE - SIMULATE ALL MODES OF CCITT.
1136
1137  004150  012767  000010  175462  SMCITA: MOV     #10,SMCNT       ;ENTRY CCITT DOUBLE BYTE DATA.
1138  004156  062767  000010  175454  SMCITB: ADD     #10,SMCNT       ;ENTRY CCITT SINGLE BYTE DATA.
1139  004164  005767  175450          SMCITC: TST     SMCNT           ;ENTRY STEP CCITT.
1140  004170  001002                          BNE     SMCITD
1141  004172  005267  175442                  INC     SMCNT
1142  004176  016767  175432  175432  SMCITD: MOV     SMBCC,SMBCCA
1143  004204  011267  175432                  MOV     (R2),SMDATA
1144  004210  016767  175420  175430  SMCITE: MOV     SMBCC,SMWKA
1145  004216  066767  175420  175422          ADD     SMDATA,SMWKA
1146  004224  000241                          CLC
1147  004226  006067  175402                  ROR     SMBCC
1148  004232  000241                          CLC
1149  004234  006067  175402                  ROR     SMDATA
1150  004240  006067  175402                  ROR     SMWKA
1151  004244  103014                          BCC     SMCITF
1152  004246  012767  102010  175372          MOV     #102010,SMWKA
1153  004254  046767  175354  175364          BIC     SMBCC,SMWKA
1154  004262  042767  102010  175344          BIC     #102010,SMBCC
1155  004270  066767  175352  175336          ADD     SMWKA,SMBCC
1156  004276  005367  175336          SMCITF: DEC     SMCNT
1157  004302  001342                          BNE     SMCITE
1158  004304  000205                          RTS     R5
1159
1160                                    ;SUBROUTINE - SIMULATE ALL MODES OF CRC12.
1161
1162  004306  012767  000006  175324  SMC12A: MOV     #6,SMCNT        ;ENTRY CRC12 SINGLE BYTE DATA.
1163  004314  005767  175320          SMC12B: TST     SMCNT           ;ENTRY STEP CRC12.
```

```
 1164  004320  001002                          BNE     SMC12C
 1165  004322  005267  175312                  INC     SMCNT
 1166  004326  016767  175302  175302  SMC12C: MOV     SMBCC,SMBCCA
 1167  004334  011267  175302                  MOV     (R2),$MDATA
 1168  004340  016767  175270  175300  SMC12D: MOV     SMBCC,SMWKA
 1169  004346  066767  175270  175272          ADD     SMDATA,SMWKA
 1170  004354  106367  175254                  ASLB    SMBCC
 1171  004360  106367  175250                  ASLB    SMBCC
 1172  004364  006067  175244                  ROR     SMBCC
 1173  004370  106067  175240                  RORB    SMBCC
 1174  004374  106067  175234                  RORB    SMBCC
 1175  004400  042767  160000  175226          BIC     #160000,SMBCC
 1176  004406  006067  175234                  ROR     SMWKA
 1177  004412  103014                          BCC     SMC12E
 1178  004414  012767  036001  175224          MOV     #36001,SMWKA
 1179  004422  046767  175206  175216          BIC     SMBCC,$MWKA
 1180  004430  042767  036001  175176          BIC     #36001,SMBCC
 1181  004436  066767  175204  175170          ADD     SMWKA,SMBCC
 1182  004444  000241                  SMC12E: CLC
 1183  004446  006067  175170                  ROR     SMDATA
 1184  004452  005367  175162                  DEC     SMCNT
 1185  004456  001330                          BNE     SMC12D
 1186  004460  000205                          RTS     R5
```

```
1187
1188
1189                                                    ;SWITCH REGISTER SIZING ROUTINE
1190
1191  004462  013746  000006          SUSWR:  MOV     @#6,-(SP)       ;SAVE VECTORS
1192  004466  013746  000004                  MOV     @#4,-(SP)
1193  004472  012737  004512  000004          MOV     #64$,@#4        ;SET UP FOR TIMEOUT
1194  004500  022777  177777  175064          CMP     #-1,@SWR        ;REFERENCE HARDWARE SWITCH REGISTER
1195  004506  001402                         BEQ     65$
1196  004510  000404                         BR      66$
1197  004512  022626                  64$:    CMP     (SP)+,(SP)+     ;ADJUST STACK
1198  004514  012767  000176  175050  65$:    MOV     #SWREG,SWR      ;POINT TO SOFTWARE SWITCH REG
1199  004522  012637  000004          66$:    MOV     (SP)+,@#4       ;RESTORE VECTORS
1200  004526  012637  000006                  MOV     (SP)+,@#6
1201  004532  022767  000176  175032          CMP     #SWREG,SWR      ;IS SWREG USED
1202  004540  001002                         BNE     67$
1203  004542  004767  000070                  JSR     PC,CNTLU        ;ALLOW SWREG TO BE LOADED
1204  004546  000207                  67$:    RTS     PC
1205
1206
1207                                                    ;CHECK SWITCH REGISTER ROUTINE. CHECKS FOR ↑G TO ALLOW CHANGING
1208                                                    ;OF LOC.176.
1209                                                    ;LOCATIONS USED:
1210  004550  000000                         TEMPST: .WORD   0
1211  004552  000000                         COUNT:  .WORD   0
1212  004554  000000                         TIB:    .WORD   0
1213
1214
1215  004556  022767  000176  175006  CKSWR:  CMP     #SWREG,SWR      ;SOFTWARE SWITCH REGISTER PRESENT
1216  004564  001143                         BNE     OUT             ;NO, GET OUT
1217  004566  105767  172766                  TSTB    TKCSR           ;YES,WAIT FOR
1218  004572  100140                         BPL     OUT             ;READY, GET CHARACTER
1219  004574  016767  172762  177752          MOV     TKDBR,TIB       ;AND STRIP OFF
1220  004602  042767  177600  177744          BIC     #177600,TIB     ;THE GARBAGE
1221  004610  022767  000007  177736          CMP     #7,TIB          ;IS IT A (↑G)
1222  004616  001126                         BNE     OUT
1223  004620  004567  176646                  JSR     R5,TYPE         ;TYPE CNTL G
1224  004624  041536  052116  020114          .ASCII  /↑CNTL G↑←/
1225  004632  057107     137
1226          004636                         .EVEN
1227  004636  004567  176706          CNTLU:  JSR     R5,OTA          ;MOVE CONTENTS
1228  004642  000176                         SWREG                   ;OF SWREG TO BE
1229  004644  004667                         MSWREG                  ;TYPED FOLLOWING
1230  004646  000006                         6                       ;THE MESSAGE SWR=
1231  004650  004567  176616                  JSR     R5,TYPE         ;TYPE THE COMPLETE MESSAGE
1232
1233  004654  051536  051127     075  MSWR:   .ASCII  /↑SWR=/         ;SWR=
1234  004661     077  037477  037477          .ASCII  /??????/        ;      XXXXXX
1235  004666     077
1236  004667     040  020040  020040  MSWREG: .ASCII  /      /
1237  004674     040
1238  004675     040  042516  036527  MNEW:   .ASCII  / NEW= ←/       ;         NEW=
1239  004702  057440
1240                                           .EVEN
1241
```

```
1242  004704  005067  177640          $READ:  CLR     TEMPST
1243  004710  012767  000007  177634          MOV     #7,COUNT
1244  004716  004767  000154          1$:     JSR     PC,TTIN         ;GO  READ A CHARACTER
1245  004722  042767  177600  177624          BIC     #177600,TIB     ;STRIP OFF GARBAGE
1246  004730  122767  000025  177616          CMPB    #25,TIB         ;IS IT A ↑U?>
1247  004736  001001                          BNE     2$              ;BRANCH IF NOT
1248  004740  000736                  3$:     BR CNTLU                ;START OVER
1249  004742  122767  000015  177604  2$:     CMPB    #15,TIB         ;IS IT A <CR>?
1250  004750  001010                          BNE     4$              ;BRANCH IF NOT
1251  004752  004567  176514                  JSR     R5,TYPE         ;TYPE LF,CR
1252  004756  057536                          .ASCII  /↑←/
1253  004760  022767  000007  177564          CMP     #7,COUNT        ;WAS IT FIRST CHARACTER
1254  004766  001036                          BNE     7$              ;CHANGE SWR IF NOT FIRST ONE
1255  004770  000441                  8$:     BR      OUT             ;GET OUT
1256  004772  122767  000060  177554  4$:     CMPB    #60,TIB
1257  005000  003004                          BGT     5$
1258  005002  122767  000067  177544          CMPB    #67,TIB
1259  005010  002005                          BGE     6$
1260  005012  004567  176454          5$:     JSR     R5,TYPE
1261  005016  037536  057536                  .ASCII  /↑?↑←/
1262  005022  000746                          BR      3$              ;START OVER IF NOT LEGAL CHARACTER
1263  005024  006367  177520          6$:     ASL     TEMPST
1264  005030  006367  177514                  ASL     TEMPST
1265  005034  006367  177510                  ASL     TEMPST
1266  005040  142767  000060  177506          BICB    #60,TIB         ;GET NITTY-GRITTY
1267  005046  156767  177502  177474          BISB    TIB,TEMPST
1268  005054  005367  177472                  DEC     COUNT           ;ONLY WANT 6   DIGITS
1269  005060  001754                          BEQ     5$
1270  005062  000715                          BR      1$
1271  005064  016777  177460  174500  7$:     MOV     TEMPST,@SWR     ;CHANGE SWITCH REGISTER CONTENTS
1272  005072  000736                          BR      8$
1273  005074  000207                  OUT:    RTS     PC              ;RETURN TO PROGRAM
```

```
 1274
 1275                                           ;TTY INPUT SUBROUTINE**********
 1276
 1277  005076  005067  172456          TTIN:   CLR     TKCSR
 1278  005102  005067  172454                  CLR     TKDBR
 1279  005106  005067  177442                  CLR     TIB
 1280  005112  005267  172442                  INC     TKCSR
 1281  005116  105767  172436          TTIN1:  TSTB    TKCSR
 1282  005122  100375                          BPL     TTIN1
 1283  005124  016767  172432  177422          MOV     TKDBR,TIB
 1284  005132  105767  172426          TTIN2:  TSTB    TPCSR
 1285  005136  100375                          BPL     TTIN2
 1286  005140  116767  177410  172420          MOVB    TIB,TPDBR
 1287  005146  000207                          RTS     PC
 1288
 1289          000001                          .END
```

```
CKSWR   004556
CNTLU   004636
COUNT   004552
DATBEG= 001374
DATEND= 001570
DEVADR  001574
DFLG    001576
DFLGA   001600
D01     001374
D02     001376
D03     001400
D04     001402
D05     001404
D06     001406
D07     001410
D10     001412
D11     001414
D12     001416
D13     001420
D14     001422
D15     001424
D16     001426
D17     001430
D20     001432
D21     001434
D22     001436
D23     001440
D24     001442
D25     001444
D26     001446
D27     001450
D30     001452
D31     001454
D32     001456
D33     001460
D34     001462
D35     001464
D36     001466
D37     001470
D40     001472
D41     001474
D42     001476
D43     001500
D44     001502
D45     001504
D46     001506
D47     001510
D50     001512
D51     001514
D52     001516
D53     001520
D54     001522
D55     001524
D56     001526
D57     001530
D60     001532
D61     001534
D62     001536
D63     001540
D64     001542
D65     001544
D66     001546
D67     001550
D70     001552
D71     001554
D72     001556
D73     001560
D74     001562
D75     001564
D76     001566
D77     001570
EFLG    001602
EMA     003406
EMB     003410
EMC     003412
EMD     003414
EME     003416
EMF     003420
EMG     003422
EMH     003424
EMI     003426
EMJ     003430
EMK     003432
EML     003434
EMM     003436
EMN     003440
EMO     003442
EMP     003444
EMQ     003446
EMR     003450
EMS     003452
EMU     003454
EMV     003456
EMW     003460
EMX     003462
EMY     003464
EMZ     003466
ERA     003016
ERB     003026
ERC     003032
ERD     003044
ERE     003064
ERF     003102
ERG     003116
ERH     003146
ERR     002776
FEA     003156
FORCER  003150
FORERR  000210
FULA    002044
FULB    002050
FULC    002100
FULD    002126
FULE    002134
FULF    002140
FULG    002156
FULH    002202
FULI    002216
FULJ    002232
FULMOD  002040
HBCC    001604
HDONE   001606
HLT   = 104000
IDENT   001656
IFLG    001610
IFLGA   001612
INIT    001700
INTA    001706
INTB    001712
INTBEG= 001000
INTEND= 001270
ITACNT  001614
ITANO   001616
I01     001000
I02     001004
I03     001010
I04     001014
I05     001020
I06     001024
I07     001030
I10     001034
I11     001040
I12     001044
I13     001050
I14     001054
I15     001060
I16     001064
I17     001070
I20     001074
I21     001100
I22     001104
I23     001110
I24     001114
I25     001120
I26     001124
I27     001130
I30     001134
I31     001140
I32     001144
I33     001150
I34     001154
I35     001160
I36     001164
I37     001170
I40     001174
I41     001200
I42     001204
I43     001210
I44     001214
I45     001220
I46     001224
I47     001230
I50     001234
I51     001240
I52     001244
I53     001250
I54     001254
I55     001260
I56     001264
I57     001270
I60     001274
I61     001300
I62     001304
I63     001310
I64     001314
I65     001320
I66     001324
I67     001330
I70     001334
I71     001340
I72     001344
I73     001350
I74     001354
I75     001360
I76     001364
I77     001370
MNEW    004675
MSWR    004654
MSWREG  004667
NOP   = 000240
NORMAL  000200
OPCA    002006
OPCB    002036
OPCHG   001754
OPSTAT  001620
OTA     003550
OTACNT  001622
OTALA   003562
OTAWKA  001624
OTAWKB  001626
OUT     005074
PC    =%000007
PS    = 177776
R0    =%000000
R1    =%000001
R2    =%000002
R3    =%000003
R4    =%000004
R5    =%000005
R7    =%000007
SCOPE = 104400
SCORCD  003642
SCORTN  001632
SELA    002316
SELB    002406
SELC    002464
SELD    002472
SELE    002476
SELECT  000204
SELF    002514
SELFLG  001630
SELG    002536
SELH    002542
SELI    002564
SELMOD  002242
SMBCC   001634
SMBCCA  001636
SMCITA  004150
SMCITB  004156
SMCITC  004164
SMCITD  004176
SMCITE  004210
SMCITF  004276
SMCNT   001640
SMC12A  004306
SMC12B  004314
SMC12C  004326
SMC12D  004340
SMC12E  004444
SMC16A  004012
SMC16B  004020
SMC16C  004026
SMC16D  004040
SMC16E  004052
SMC16F  004140
SMDATA  001642
SMDONE  001644
SMLRCA  003656
SMLRCB  003664
SMLRCC  003672
SMLRCD  003702
SMLRCE  003710
SMLRCF  003716
SMLRCG  003724
SMLRCH  003736
```

```
.MAIN.  MACY11 27(732)  25-MAR-76  08:43  PAGE 39
DZKGAA.P11      SYMBOL TABLE

SMLRCI  003750          SWREG   000176          TEC     003356          TKDBR = 177562          TTIN1   005116
SMLRCJ  003770          TAA     002620          TED     003402          TPA     003520          TTIN2   005132
SMWKA   001646          TAB     002676          TEMPST  004550          TPB     003534          TYPE    003472
SMWKB   001650          TAC     002700          TESTA   002572          TPC     003546          TYPERR  003162
SP    =%000006          TBA     002764          TESTB   002710          TPCSR = 177564          $READ   004704
STCNT   001652          TBB     002766          TEWK    001654          TPDBR = 177566          .     = 005150


 ERRORS DETECTED:  0
 DEFAULT GLOBALS GENERATED:  0

 *DZKGAA,DZKGAA/SOL←DZKGAA.P11
 RUN-TIME:  4 8  .9 SECONDS
 RUN-TIME RATIO: 31/13=2.3
 CORE USED:  8K  (15 PAGES)
```

Spooler runtime 4 Seconds, 145 KCS, 107 disk reads, 3 disk writes, 38 pages